DES 10-59 • DOE/EIS-0403 December 2010

Draft Programmatic Environmental Impact Statement for

Solar Energy Development in Six Southwestern States

Volume 5, Part 1
Chapter 11: Nevada Proposed Solar Energy Zones

U.S. DEPARTMENT OF ENERGY

NATIONAL SYSTEM OF PUBLIC LANDS

On the cover:
Typical Solar Fields for Various Technology Types (clockwise from upper left):
Solar Parabolic Trough (Source: Hosoya et al. 2008),
Solar Power Tower (Credit: Sandia National Laboratories. Source: NREL 2010a),
Photovoltaic (Credit: Arizona Public Service. Source: NREL 2010b), and
Dish Engine (Credit: R. Montoya. Source: Sandia National Laboratories 2008).
Reference citations are available in Chapter 1.

Background photo: Parabolic trough facility from an elevated viewpoint
(Credit: Argonne National Laboratory)

Draft Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States (DES 10-59; DOE/EIS-0403)

Responsible Agencies: The U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) and the U.S. Department of Energy (DOE) are co-lead agencies. Nineteen cooperating agencies participated in the preparation of this PEIS: U.S. Department of Defense; U.S. Bureau of Reclamation; U.S. Fish and Wildlife Service; U.S. National Park Service; U.S. Environmental Protection Agency, Region 9; U.S. Army Corps of Engineers, South Pacific Division; Arizona Game and Fish Department; California Energy Commission; California Public Utilities Commission; Nevada Department of Wildlife; N-4 Grazing Board, Nevada; Utah Public Lands Policy Coordination Office; Clark County, Nevada, including Clark County Department of Aviation; Dona Ana County, New Mexico; Esmeralda County, Nevada; Eureka County, Nevada; Lincoln County, Nevada; Nye County, Nevada; and Saguache County, Colorado.

Locations: Arizona, California, Colorado, Nevada, New Mexico, and Utah.

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Abstract: The BLM and DOE are considering taking actions to facilitate solar energy development in compliance with various orders, mandates, and agency policies. For the BLM, these actions include the evaluation of a new BLM Solar Energy Program applicable to all utility-scale solar energy development on BLM-administered lands in six southwestern states (Arizona, California, Colorado, Nevada, New Mexico, and Utah). For DOE, they include the evaluation of developing new program guidance relevant to DOE-supported solar projects. The Draft PEIS assesses the environmental, social, and economic effects of the agencies' proposed actions and alternatives.

For the BLM, the Draft PEIS analyzes a no action alternative, under which solar energy development would continue on BLM-administered lands in accordance with the terms and conditions of the BLM's existing solar energy policies, and two action alternatives for implementing a new BLM Solar Energy Program. Under the solar energy development program alternative (BLM's preferred alternative), the BLM would establish a new Solar Energy Program of administration and authorization policies and required design features and would exclude solar energy development from certain BLM-administered lands. Under this alternative, approximately 22 million acres of BLM-administered lands would be available for right-of-way (ROW) application. A subset of these lands, about 677,400 acres, would be identified as solar energy zones (SEZs), or areas where the BLM would prioritize solar energy and associated transmission infrastructure development. Under the SEZ program alternative, the same policies and design features would be adopted, but development would be excluded from all BLM-administered lands except those located within the SEZs.

For DOE, the Draft PEIS analyzes a no action alternative, under which DOE would continue to conduct environmental reviews of DOE-funded solar projects on a case-by-case basis, and one action alternative, under which DOE would develop programmatic guidance to further integrate environmental considerations into its analysis and selection of solar projects that it will support.

The EPA Notice of Availability (NOA) of the Draft PEIS was published in the *Federal Register* on December 17, 2010. Comments on the Draft PEIS are due by March 17, 2011.

SOLAR PEIS CONTENTS

Reader's Guide

The detailed analysis of the proposed solar energy zones (SEZs) in Nevada, provided in Sections 11.1 through 11.7, will be used to inform BLM decisions regarding the size, configuration, and/or management of these SEZs. These sections also include proposed mitigation requirements (termed "SEZ-specific design features"). Please note that the SEZ-specific summaries of Affected Environment use the descriptions of Affected Environment for the six-state study area presented in Chapter 4 of the PEIS as a basis. Also note that the SEZ-specific design features have been proposed with consideration of the general impact analyses for solar energy facilities presented in Chapter 5, and on the assumption that all programmatic design features presented in Appendix A, Section A.2.2, will be required for projects that will be located within the SEZs.

BLM will implement its SEZ-specific decisions through the BLM Record of Decision for the Final PEIS. Comments received during the review period for the Draft PEIS will inform BLM decisions.

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NOTATION

The following is a list of acronyms and abbreviations, chemical names, and units of measure used in this document. Some acronyms used only in tables may be defined only in those tables.

GENERAL ACRONYMS AND ABBREVIATIONS

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
AC	alternating current
ACC	air-cooled condenser
ACEC	Area of Critical Environmental Concern
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AERMOD	AMS/EPA Regulatory Model
AFC	Application for Certification
AGL	above ground level
AIRFA	American Indian Religious Freedom Act
AMA	active management area
AML	animal management level
ANHP	Arizona National Heritage Program
APE	area of potential effect
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
AQCR	Air Quality Control Region
AQRV	air quality-related value
ARB	Air Resources Board
ARRA	American Recovery and Reinvestment Act of 2009
ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee
ARS	Agricultural Research Service
ARZC	Arizona and California
ATSDR	Agency for Toxic Substances and Disease Registry
AUM	animal unit month
AVWS	Audio Visual Warning System
AWBA	Arizona Water Banking Authority
AWEA	American Wind Energy Association
AWRM	Active Water Resource Management
AZ DOT	Arizona Department of Transportation
AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department
AZGS	Arizona Geological Survey

BA	biological assessment
BAP	base annual production
BEA	Bureau of Economic Analysis
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BMP	best management practice
BNSF	Burlington Northern Santa Fe
BO	biological opinion
BOR	U.S. Bureau of Reclamation
BPA	Bonneville Power Administration
BRAC	Blue Ribbon Advisory Council on Climate Change
BSE	Beacon Solar Energy
BSEP	Beacon Solar Energy Project
BTS	Bureau of Transportation Statistics
CAA	Clean Air Act
CAAQS	California Air Quality Standards
Caltrans	California Department of Transportation
C-AMA	California-Arizona Maneuver Area
CAP	Central Arizona Project
CARB	California Air Resources Board
CAReGAP	California Regional Gap Analysis Project
CASQA	California Stormwater Quality Association
CASTNET	Clean Air Status and Trends NETwork
CAWA	Colorado Agricultural Water Alliance
CCC	Civilian Conservation Corps
CDC	Centers for Disease Control and Prevention
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CDWR	California Department of Water Resources
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CES	constant elasticity of substitution
CESA	California Endangered Species Act
CESF	Carrizo Energy Solar Farm
CFR	*Code of Federal Regulations*
CGE	computable general equilibrium
CIRA	Cooperative Institute for Research in the Atmosphere
CLFR	compact linear Fresnel collector
CPC	Center for Plant Conservation
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNHP	Colorado National Heritage Program

Colorado DWR	Colorado Department of Water Resources
CPUC	California Public Utilities Commission
CPV	concentrating photovoltaic
CRBSCF	Colorado River Basin Salinity Control Forum
CREZ	competitive renewable energy zone
CRSCP	Colorado River Salinity Control Program
CSA	Candidate Study Area
CSC	Coastal Services Center
CSFG	carbon-sequestration fossil generation
CSP	concentrating solar power
CSQA	California Stormwater Quality Association
CSRI	Cultural Systems Research, Incorporated
CTG	combustion turbine generator
CTPG	California Transmission Planning Group
CTSR	Cumbres & Toltec Scenic Railroad
CUP	Conditional Use Permit
CVP	Central Valley Project
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
CWHRS	California Wildlife Habitat Relationship System
DC	direct current
DHS	U.S. Department of Homeland Security
DNA	Determination of NEPA Adequacy
DNI	direct normal insulation
DNL	day-night average sound level
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
DRECP	California Desert Renewable Energy Conservation Plan
DSM	demand side management
DTC/C-AMA	Desert Training Center/California–Arizona Maneuver Area
DWMA	Desert Wildlife Management Area
EA	environmental assessment
ECAR	East Central Area Reliability Coordination Agreement
ECOS	Environmental Conservation Online System (USFWS)
EERE	Energy Efficiency and Renewable Energy (DOE)
Eg	band gap energy
EIA	Energy Information Administration
EIS	environmental impact statement
EISA	Energy Independence and Security Act of 2007
EMF	electromagnetic field
E.O.	Executive Order

EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EQIP	Environmental Quality Incentives Program
ERCOT	Electric Reliability Council of Texas
ERO	Electric Reliability Organization
ERS	Economic Research Service
ESA	Endangered Species Act of 1973
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRCC	Florida Reliability Coordinating Council
FSA	Final Staff Assessment
FTE	full-time equivalent
FY	fiscal year
G&TM	Generation and Transmission Modeling
GCRP	U.S. Global Climate Research Program
GDA	generation development area
GHG	greenhouse gas
GIS	geographic information system
GPS	global positioning system
GTM	Generation and Transmission Model
GUAC	Groundwater Users Advisory Council
GWP	global warming potential
HA	herd area
HAP	hazardous air pollutant
HAZCOM	hazard communication
HCE	heat collection element
HCP	Habitat Conservation Plan
HMA	Herd Management Area
HMMH	Harris Miller Miller & Hanson, Inc.
HRSG	heat recovery steam generator
HSPD	Homeland Security Presidential Directive
HTF	heat transfer fluid
HVAC	heating, ventilation, and air-conditioning

I	Interstate
IARC	International Agency for Research on Cancer
IBA	important bird area
ICE	internal combustion engine
ICWMA	Imperial County Weed Management Area
IEC	International Electrochemical Commission
IFR	instrument flight rule
IID	Imperial Irrigation District
IM	Instruction Memorandum
IMPS	Iron Mountain Pumping Station
IMS	interim mitigation strategy
INA	Irrigation Non-Expansion Area
IOP	Interagency Operating Procedure
IOU	investor-owned utility
IPPC	Intergovernmental Panel on Climate Change
ISA	Independent Science Advisor; Instant Study Area
ISB	Intermontane Seismic Belt
ISCC	integrated solar combined cycle
ISDRA	Imperial Sand Dunes Recreation Area
ISEGS	Ivanpah Solar Energy Generating System
ITP	incidental take permit
IUCNNR	International Union for Conservation of Nature and Natural Resources
IUCNP	International Union for Conservation of Nature Pakistan
KGA	known geothermal resources area
KML	keyhole markup language
KOP	key observation point
KSLA	known sodium leasing area
LCC	Landscape Conservation Cooperative
LCOE	levelized cost of energy
L_{dn}	day-night average sound level
LDWMA	Low Desert Weed Management Area
L_{eq}	equivalent sound pressure level
LLA	limited land available
LLRW	low-level radioactive waste (waste classification)
LRG	Lower Rio Grande
LSA	lake and streambed alteration
LSE	load-serving entity
LTVA	long-term visitor area
MAAC	Mid-Atlantic Area Council
MAIN	Mid-Atlantic Interconnected Network
MAPP	methyl acetylene propadiene stabilizer; Mid-Continent Area Power Pool
MCAS	Marine Corps Air Station
MCL	maximum contaminant level

MFP	Management Framework Plan
MIG	Minnesota IMPLAN Group
MLA	maximum land available
MOA	military operating area
MOU	Memorandum of Understanding
MPDS	maximum potential development scenario
MRA	Multiple Resource Area
MRI	Midwest Research Institute
MRO	Midwest Reliability Organization
MSDS	Material Safety Data Sheet
MSL	mean sea level
MTR	military training route
MWA	Mojave Water Agency
MWD	Metropolitan Water District
MWMA	Mojave Weed Management Area
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission (California)
NAIC	North American Industrial Classification System
NASA	National Aeronautics and Space Administration
NCA	National Conservation Area
NCCAC	Nevada Climate Change Advisory Committee
NCDC	National Climatic Data Center
NCES	National Center for Education Statistics
NDCNR	Nevada Department of Conservation and Natural Resources
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWP	Nevada Division of Water Planning
NDWR	Nevada Division of Water Resources
NEAP	Natural Events Action Plan
NEC	National Electric Code
NED	National Elevation Database
NEP	Natural Events Policy
NEPA	National Environmental Policy Act of 1969
NERC	North American Electricity Reliability Corporation
NHA	National Heritage Area
NHNM	National Heritage New Mexico
NHPA	National Historic Preservation Act of 1966
NID	National Inventory of Dams
NM DOT	New Mexico Department of Transportation
NLCS	National Landscape Conservation System
NMAC	*New Mexico Administrative Code*
NMBGMR	New Mexico Bureau of Geology and Mineral Resources

NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMED-AQB	New Mexico Environment Department-Air Quality Board
NMFS	National Marine Fisheries Service
NMOSE	New Mexico Office of the State Engineer
NMSU	New Mexico State University
NNHP	Nevada Natural Heritage Program
NNL	National Natural Landmark
NNSA	National Nuclear Security Administration
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NP	National Park
NPL	National Priorities List
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	*National Register of Historic Places*
NRS	*Nevada Revised Statutes*
NSC	National Safety Council
NSO	no surface occupancy
NSTC	National Science and Technology Council
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range
NVCRS	Nevada Cultural Resources Inventory System
NV DOT	Nevada Department of Transportation
NWCC	National Wind Coordinating Committee
NWI	National Wetlands Inventory
NWPP	Northwest Power Pool
NWR	National Wildlife Refuge
NWSRS	National Scenic River System
O&M	operation and maintenance
ODFW	Oregon Department of Fish and Wildlife
OHV	off-highway vehicle
ONA	Outstanding Natural Area
ORC	organic Rankine cycle
OSE/ISC	Office of the State Engineer/Interstate Stream Commission
OSHA	Occupational Safety and Health Administration
OTA	Office of Technology Assessment
PA	Programmatic Agreement
PAD	Preliminary Application Document
PAH	polycyclic aromatic hydrocarbon

PAT	peer analysis tool
PCB	polychlorinated biphenyl
PCM	purchase change material
PCS	power conditioning system
PCU	power converting unit
PEIS	programmatic environmental impact statement
PFYC	potential fossil yield classification
PIER	Public Interest Energy Research
P.L.	Public Law
PLSS	Public Land Survey System
PM	particulate matter
$PM_{2.5}$	particulate matter with a mean aerodynamic diameter of 2.5 μm or less
PM_{10}	particulate matter with a mean aerodynamic diameter of 10 μm or less
POD	plan of development
POU	publicly owned utility
PPA	Power Purchase Agreement
PPE	personal protective equipment
PSD	Prevention of Significant Deterioration
PURPA	Public Utility Regulatory Policy Act
PV	photovoltaic
PVID	Palo Verde Irrigation District
PWR	public water reserve
QRA	qualified resource area
R&I	relevance and importance
RCI	residential, commercial, and industrial (sector)
RCRA	Resource Conservation and Recovery Act of 1976
RD&D	research, development, and demonstration; research, development, and deployment
RDBMS	Relational Database Management System
RDEP	Restoration Design Energy Project
REA	Rapid Ecoregional Assessment
REAT	Renewable Energy Action Team
REDI	Renewable Energy Development Infrastructure
ReEDS	Regional Energy Deployment System
REPG	Renewable Energy Policy Group
RETA	Renewable Energy Transmission Authority
RETAAC	Renewable Energy Transmission Access Advisory Committee
RETI	Renewable Energy Transmission Initiative
REZ	renewable energy zone
RF	radio frequency
RFC	Reliability First Corporation
RFDS	reasonably foreseeable development scenario
RGP	Rio Grande Project
RGWCD	Rio Grande Water Conservation District

RMP	Resource Management Plan
RMPA	Rocky Mountain Power Area
RMZ	Resource Management Zone
ROD	Record of Decision
ROI	region of influence
ROS	recreation opportunity spectrum
ROW	right-of-way
RPG	renewable portfolio goal
RPS	Renewable Portfolio Standard
RRC	Regional Reliability Council
RSEP	Rice Solar Energy Project
RSI	Renewable Systems Interconnection
RTTF	Renewable Transmission Task Force
RV	recreational vehicle

SAAQS	State Ambient Air Quality Standards
SAMHSA	Substance Abuse and Mental Health Services Administration
SCADA	supervisory control and data acquisition
SCE	Southern California Edison
SCRMA	Special Cultural Resource Management Area
SDRREG	San Diego Regional Renewable Energy Group
SDWA	Safe Drinking Water Act of 1974
SEGIS	Solar Energy Grid Integration System
SEGS	Solar Energy Generating System
SEI	Sustainable Energy Ireland
SEIA	Solar Energy Industrial Association
SES	Stirling Energy Systems
SETP	Solar Energy Technologies Program (DOE)
SEZ	solar energy zone
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SLRG	San Luis & Rio Grande
SMA	Special Management Area
SMP	suggested management practice
SNWA	Southern Nevada Water Authority
SPP	Southwest Power Pool
SRMA	Special Recreation Management Area
SSA	Socorro Seismic Anomaly
SSI	self-supplied industry
ST	solar thermal
STG	steam turbine generator
SUA	special use airspace
SWAT	Southwest Area Transmission
SWIP	Southwest Intertie Project
SWPPP	Stormwater Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project

TAP	toxic air pollutant
TCC	Transmission Corridor Committee
TDS	total dissolved solids
TEPPC	Transmission Expansion Planning Policy Committee
TES	thermal energy storage
TSA	Transportation Security Administration
TSCA	Toxic Substances Control Act of 1976
TSDF	treatment, storage, and disposal facility
TSP	total suspended particulates
UACD	Utah Association of Conservation Districts
UBWR	Utah Board of Water Resources
UDA	Utah Department of Agriculture
UDEQ	Utah Department of Environmental Quality
UDNR	Utah Department of Natural Resources
UDOT	Utah Department of Transportation
UDWQ	Utah Division of Water Quality
UDWR	Utah Division of Wildlife Resources
UGS	Utah Geological Survey
UNEP	United Nations Environmental Programme
UNPS	Utah Native Plant Society
UP	Union Pacific
UREZ	Utah Renewable Energy Zone
USACE	U.S. Army Corps of Engineers
USC	*United States Code*
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Utah DWR	Utah Division of Water Rights
UTTR	Utah Test and Training Range
UWS	Underground Water Storage, Savings and Replenishment Act
VACAR	Virginia-Carolinas Subregion
VCRS	Visual Contrast Rating System
VFR	visual flight rule
VOC	volatile organic compound
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WA	Wilderness Area
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WECC CAN	Western Electricity Coordinating Council – Canada
WEG	wind erodibility group
WGA	Western Governors’ Association

WGFD	Wyoming Game and Fish Department
WHA	wildlife habitat area
WHO	World Health Organization
WRAP	Water Resources Allocation Program; Western Regional Air Partnership
WRCC	Western Regional Climate Center
WREZ	Western Renewable Energy Zones
WRRI	Water Resources Research Institute
WSA	Wilderness Study Area
WSC	wildlife species of special concern
WSMR	White Sands Missile Range
WSR	Wild and Scenic River
WSRA	Wild and Scenic Rivers Act of 1968
WWII	World War II
YPG	Yuma Proving Ground
ZITA	zone identification and technical analysis
ZLD	zero liquid discharge

CHEMICALS

CH_4	methane	NO_2	nitrogen dioxide
CO	carbon monoxide	NO_x	nitrogen oxides
CO_2	carbon dioxide		
CO_2e	carbon dioxide equivalent	O_3	ozone
H_2S	hydrogen sulfide	Pb	lead
Hg	mercury		
		SF_6	sulfur hexafluoride
N_2O	nitrous oxide	SO_2	sulfur dioxide
NH_3	ammonia	SO_x	sulfur oxides

UNITS OF MEASURE

ac-ft	acre-foot (feet)	°F	degree(s) Fahrenheit
bhp	brake horsepower	ft	foot (feet)
		ft^2	square foot (feet)
°C	degree(s) Celsius	ft^3	cubic foot (feet)
cf	cubic foot (feet)		
cfs	cubic foot (feet) per second	g	gram(s)
cm	centimeter(s)	gal	gallon(s)
		GJ	gigajoule(s)
dB	decibel(s)	gpcd	gallon per capita per day
dBA	A-weighted decibel(s)	gpd	gallon(s) per day

gpm	gallon(s) per minute
GW	gigawatt(s)
GWh	gigawatt hour(s)
GWh/yr	gigawatt hour(s) per year
h	hour(s)
ha	hectare(s)
Hz	hertz
in.	inch(es)
J	joule(s)
K	degree(s) Kelvin
kcal	kilocalorie(s)
kg	kilogram(s)
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
kPa	kilopascal(s)
kV	kilovolt(s)
kVA	kilovolt-ampere(s)
kW	kilowatt(s)
kWh	kilowatt-hour(s)
kWp	kilowatt peak
L	liter(s)
lb	pound(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mg	milligram(s)
Mgal	million gallons
mi	mile(s)
mi^2	square mile(s)
min	minute(s)
mm	millimeter(s)
MMt	million metric ton(s)
MPa	megapascal(s)
mph	mile(s) per hour
MW	megawatt(s)
MWe	megawatt(s) electric
MWh	megawatt-hour(s)
ppm	part(s) per million
psi	pound(s) per square inch
psia	pound(s) per square inch absolute
rpm	rotation(s) per minute
s	second(s)
scf	standard cubic foot (feet)
TWh	terawatt hours
VdB	vibration velocity decibel(s)
W	watt(s)
yd^2	square yard(s)
yd^3	cubic yard(s)
yr	year(s)
µg	microgram(s)
µm	micrometer(s)

ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS

The following table lists the appropriate equivalents for English and metric units.

Multiply	By	To Obtain
English/Metric Equivalents		
acres	0.004047	square kilometers (km^2)
acre-feet (ac-ft)	1,234	cubic meters (m^3)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
degrees Fahrenheit (ºF) –32	0.5555	degrees Celsius (ºC)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
miles per hour (mph)	1.609	kilometers per hour (kph)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)
Metric/English Equivalents		
centimeters (cm)	0.3937	inches (in.)
cubic meters (m^3)	0.00081	acre-feet (ac-ft)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
degrees Celsius (ºC) +17.78	1.8	degrees Fahrenheit (ºF)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
kilometers per hour (kph)	0.6214	miles per hour (mph)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km^2)	247.1	acres
square kilometers (km^2)	0.3861	square miles (mi^2)
square meters (m^2)	10.76	square feet (ft^2)
square meters (m^2)	1.196	square yards (yd^2)

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11 AFFECTED ENVIRONMENT AND IMPACT ASSESSMENT FOR PROPOSED SOLAR ENERGY ZONES IN NEVADA

11.1 AMARGOSA VALLEY

11.1.1 Background and Summary of Impacts

11.1.1.1 General Information

The proposed Amargosa Valley solar energy zone (SEZ) is located in Nye County in southern Nevada near the California border (Figure 11.1.1.1-1). The SEZ has a total area of 31,625 acres (128 km^2). In 2008, the county population was 44,175, while adjacent Clark County to the southeast had a population of 1,879,093. The closest towns to the SEZ are Beatty, about 11 mi (18 km) north on U.S. 95, and Amargosa Valley, about 12 mi (20 km) southeast on U.S. 95. Las Vegas is about 84 mi (135 km) southeast.

Access to the Amargosa Valley SEZ is via U.S. 95, which passes through the northeast edge of the SEZ. Access to the interior of the SEZ is by dirt roads. The nearest railroad access is approximately 100 mi (161 km) away, and one small airport near Beatty serves the area. The Nevada Test Site (NTS) lies about 10 mi (16 km) east, and the Nellis Air Force Range lies a similar distance northeast of the proposed SEZ.

A 138-kV transmission line runs along the northeast side of U.S. 95 and along the northeast border of the SEZ. It is assumed that this transmission line could potentially provide access from the SEZ to the transmission grid (see Section 11.1.1.1.2).

As of February 2010, there was one solar fast-track application within 50 mi (80 km) of the SEZ (a fast-track application is a proposed project on Bureau of Land Management (BLM) lands that is far along in the permitting process). In addition, there were 12 ROW applications for solar projects and 3 wind site testing applications that would be located either within the Amargosa Valley SEZ or within 50 mi (80 km) of the SEZ. These applications are discussed in Section 11.1.22.2.1.

The proposed Amargosa Valley SEZ is undeveloped and remote. The overall character of the surrounding land is rural. The SEZ is located in the Amargosa Desert, which lies in a valley between the Funeral Mountains to the southwest and Yucca Mountain to the northeast. The valley extends to Amargosa Flat to the southeast, and the Bullfrog Hills border the northwest end of the valley. The Amargosa River, an ephemeral river, drains the valley and passes across the proposed SEZ from northwest to southeast. Land within the SEZ is undeveloped scrubland characteristic of a semi-arid basin.

The proposed Amargosa Valley SEZ and other relevant information are shown in Figure 11.1.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar energy development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than

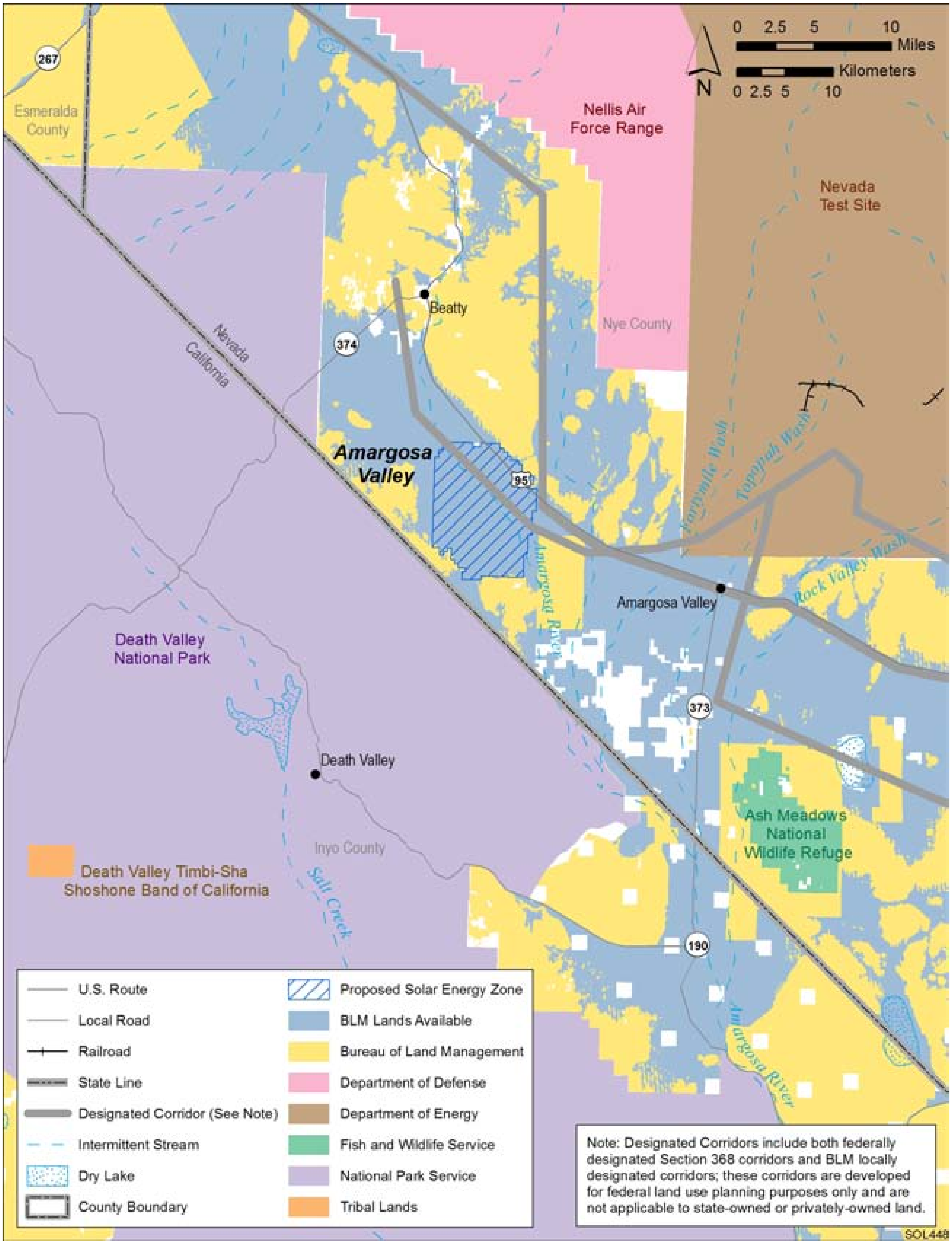

FIGURE 11.1.1.1-1 Proposed Amargosa Valley SEZ

2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as U.S. Fish and Wildlife Service (USFWS) designated critical habitat for threatened and endangered species, Areas of Critical Environmental Concern (ACECs), Special Recreation Management Areas (SRMAs), and National Landscape Conservation System (NLCS) lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Amargosa Valley SEZ, other restrictions might be appropriate. The analyses in the following sections address the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

Subsequent to the study area scoping period, the boundaries of the proposed Amargosa Valley SEZ were altered somewhat to facilitate the BLM's administration of the SEZ area. Borders with irregularly shaped boundaries were adjusted to match the section boundaries of the Public Lands Survey System (PLSS) (BLM and USFS 2010a). The revised SEZ is approximately 1,055 acres (4.3 km^2) smaller than the original SEZ as published in June 2009.

11.1.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the proposed Amargosa Valley SEZ is assumed to be 80% of the SEZ area over a period of 20 years, a maximum of 25,300 acres (102 km^2). These values are shown in Table 11.1.1.2-1, along with other development assumptions. Full development of the Amargosa Valley SEZ would allow development of facilities with an estimated total of 2,811 MW of electrical power capacity if power tower, dish engine, or photovoltaic (PV) technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 5,060 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 138-kV line that runs adjacent to the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 138-kV capacity of that line would be inadequate for 2,811 to 5,060 MW of new capacity (note: a 500 kV line can accommodate approximately the load of one 700 MW facility). At full build-out capacity, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Amargosa Valley SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in the PEIS, it was assumed that an existing 138-kV transmission line which runs along the northeast border of the SEZ could provide initial access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed. Access to an existing transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site

TABLE 11.1.1.2-1 Proposed Amargosa Valley SEZ—Assumed Development Acreages, Maximum Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area Transmission Line ROW and Road ROW	Distance to Nearest Designated Transmission Corridor[e]
31,625 acres and 25,300 acres[a]	2,811 MW[b] and 5,060 MW[c]	U.S. 95: 0 mi[d]	0 mi and 138 kV	0 acres and 0 acres	0 mi

a To convert acres to km^2, multiply by 0.004047.

b Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

c Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

d To convert mi to km, multiply by 1.609.

e BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

Existing road access to the proposed Amargosa Valley SEZ should be adequate to support construction and operation of solar facilities, because U.S. 95 passes through the northeast edge of the SEZ. Thus, no additional road construction outside of the SEZ was assumed to be required to support solar development. While there are existing dirt/ranch roads within the SEZ, additional internal road construction would likely be required to support solar facility construction.

11.1.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 11.1.2 through 11.1.21 for the proposed Amargosa Valley SEZ are summarized in tabular form. Table 11.1.1.3-1 is a comprehensive list of the impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 11.1.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Amargosa Valley SEZ are included in Sections 11.1.2 through 11.1.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program, are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 11.1.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Amargosa Valley SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ for utility-scale solar energy production (80% of the total area) could disturb up to 25,300 acres (102 km^2) and would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and rural, utility-scale solar energy development would be a new and discordant land use to the area. Travel on existing dirt roads and in dry washes would be disrupted, resulting in the creation of isolated parcels of public land between the SEZ and the Death Valley NP boundary.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	Wilderness characteristics on 19,406 acres of designated wilderness within the Death Valley NP would be adversely affected. Night sky viewing from the NP could be impaired. Additional groundwater withdrawals could adversely affect portions of the Death Valley NP, the NWR, and three ACECs that are dependent on maintaining current water levels.	Design features for visual resources should be implemented to reduce impacts on wilderness characteristics. Water use for any solar energy development would be reviewed to ensure that impacts on Death Valley NP, the NWR, or ACECs would be neutral or positive.
Rangeland Resources: Livestock Grazing	None.	None.
Rangeland Resources: Wild Horses and Burros	None.	None.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Recreation	Recreation use would be eliminated from portions of the SEZ that would be developed for solar energy production. There would be impact on the existing OHV use in the area but the magnitude is not known. Portions of an approved desert racing and commercial tour route would be lost. Access to public land and NPS areas south and west of the SEZ would be lost or, at a minimum, made much more difficult by development of the SEZ.	Relocation of the designated route used for desert racing and commercial tours should be considered at the time specific solar development proposals are analyzed.
Military and Civilian Aviation	The military has expressed serious concern over solar energy facilities being constructed within the SEZ, and Nellis Air Force Base has indicated that any facilities of more than 50 ft (15 m) may be incompatible with low-level aircraft use of the MTR. Further, the NTTR has indicated that solar technologies requiring structures higher than 50 ft (15 m) above ground level may present unacceptable electromagnetic compatibility concerns for their test mission. The closest civilian municipal aviation facility is the Nye County Airport at Beatty, Nevada, about 7 mi (11 km) northwest of the SEZ but it is anticipated there would be no impact on the operation of the airport.	None.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase. Impacts would include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation). A study may be required to evaluate the potential impacts of building a solar facility in close proximity to the Big Dune to the east of the site.	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Water Resources	Ground-disturbance activities (affecting up to 28% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 4,886 ac-ft (6.0 million m^3) of water during peak construction year. Construction activities would generate as high as 222 ac-ft (273,800 m^3) of sanitary wastewater. Assuming full development of the SEZ, operations would use the following amounts of water: • For parabolic trough facilities (5,060-MW capacity), 3,613 to 7,661 ac-ft/yr (4.5 million to 9.4 million m^3/yr) for dry-cooled systems; 25,371 to 75,971 ac-ft/yr (31.3 million to 93.7 million m^3/yr) for wet-cooled systems. • For power tower facilities (2,811-MW capacity), 2,000 to 4,249 ac-ft/yr (2.5 million to 5.2 million m^3/yr) for dry-cooled systems; 14,088 to 42,199 ac-ft/yr (17.4 million to 52.1 million m^3/yr) for wet-cooled systems. • For dish engine facilities (2,811-MW capacity), 1,438 ac-ft/yr (177,600 million m^3/yr). • For PV facilities (2,811-MW capacity), 144 ac-ft/yr (176,400 m^3/yr). Assuming full development of the SEZ, operations would generate up to 71 ac-ft/yr (87,600 m^3/yr) of sanitary wastewater and up to 1,437 ac-ft/yr (1.8 million m^3/yr) of blowdown water.	Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures. Land disturbance activities should minimize impacts on natural drainage patterns near the Amargosa River to avoid erosion issues and clogging of groundwater recharge zones and affecting critical habitats. Siting of solar facilities and construction activities should be avoided within the 100-year floodplain of the Amargosa River (3,915 acres [16 km2]). Coordination with the NDWR should be conducted during the process of obtaining water rights in the over-allocated Amargosa Desert Basin in order to reduce basin-wide groundwater extractions and to comply with the State Engineer's Order 1197 (2008) addressing the priority water rights and protections pertaining to Ash Meadows National Wildlife Refuge and Devils Hole. Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection. Groundwater monitoring and production wells should be constructed in accordance with state standards. Water for potable uses would have to meet or be treated to meet water quality standards in according to *Nevada Administrative Code*.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Vegetation[b]	Up to 80% (25,300 acres [102.4 km^2]) of the SEZ would be cleared of vegetation; re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Groundwater discharges at a number of areas near the SEZ, such as the Amargosa River and the springs at Ash Meadows, and Death Valley National Park support wetland communities. Groundwater depletion related to solar development projects could result in subsequent reductions in groundwater discharges at the river and springs and could result in degradation of these habitats. Playa habitats, such as those on the SEZ and the large playas associated with the Amargosa River southeast of the SEZ; desert dry washes; desert chenopod scrub; greasewood flats communities; or other intermittently flooded areas downgradient from solar projects in the SEZ could be affected by ground-disturbing activities.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as Mediterranean grass. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. All playa, chenopod scrub, and desert dry wash habitats, shall be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area shall be maintained around playas and dry washes to reduce the potential for impacts on these habitats on or near the SEZ. Appropriate engineering controls should be used to minimize impacts on the Amargosa River, and dry wash, playa, riparian, marsh, and greasewood flat habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. Appropriate measures to minimize impacts to Big Dunes habitats should be determined through agency consultation.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*		Groundwater withdrawals should be limited to reduce the potential for indirect impacts on groundwater-dependent habitats in the Amargosa Desert groundwater basin, or in other hydraulically connected basins, such as springs at Ash Meadows and Death Valley National Park, other locations of groundwater discharge, such as the Amargosa River, or other groundwater-dependent habitats in the vicinity of the SEZ, such as mesquite bosque communities.
Wildlife: Amphibians and Reptiles[b]	Direct impacts on representative amphibian and reptile species from SEZ development would be moderate (i.e., loss of >1.0 to ≤10% of potentially suitable habitats) for the glossy snake and sidewinder and small (i.e., loss of ≤1% of potentially suitable habitats) for all other representative amphibian and reptile species. With implementation of design features, indirect impacts would be expected to be negligible for all amphibian and reptile species.	The Amargosa River should be avoided.
Wildlife: Birds[b]	Direct impacts on the black-tailed gnatcatcher would be moderate (i.e., loss of >1.0 to ≤10% of potentially suitable habitats). Impacts on all other representative bird species from SEZ development would be small (i.e., loss of ≤1% of potentially suitable habitats). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act. The Amargosa River should be avoided.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Wildlife: Mammals[b]	Direct impacts on Botta's pocket gopher and western harvest mouse would be moderate (i.e., loss of >1.0 to ≤10% of potentially suitable habitats). Direct impacts on all other representative mammal species would be small (i.e., loss of ≤1% of potentially suitable habitats).	The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. The Amargosa River should be avoided.
Aquatic Biota[b]	No permanent water bodies, wetlands, or streams are present within the boundaries of the Amargosa Valley SEZ or the area of indirect effects; the nearest permanent surface water is about 20 mi (32 km) from the SEZ boundary. Therefore, no direct impacts to permanent surface water features are expected. Ground disturbance for solar energy development within the SEZ could result in airborne and waterborne sediment deposition into the Amargosa River. However, the Amargosa River is typically dry near the SEZ and aquatic habitat is not likely to be present. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for solar energy facilities.	Appropriate engineering controls should be implemented to minimize the amount of contaminants and sediment entering the Amargosa River. If groundwater is used, withdrawal should not affect aquatic habitat in the Amargosa River ACEC and the Ash Meadows NWR.
Special Status Species[b]	Potentially suitable habitat for 52 special status species occurs in the affected area of the Amargosa Valley SEZ. For most of these special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects. For several species, up to 2% of the potentially suitable habitat in the region occurs in the area of direct effects. There are 25 groundwater dependent species that occur outside of the areas of direct and indirect effects. Potential impacts on these species could range from small to large depending on the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals.	Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible for some species, translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Avoiding or minimizing disturbance to desert wash or riparian habitat on the SEZ could reduce or eliminate impacts on 3 special status species. Avoidance or minimization of groundwater withdrawals to serve solar energy development on the SEZ could reduce or eliminate impacts on 25 special status species. In particular, impacts on aquatic and riparian habitat associated with the Ash Meadows system should be avoided. Consultation with the USFWS and NDOW should be conducted to address the potential for impacts on the following species currently listed as threatened or endangered under the ESA: Amargosa niterwort, Ash Meadows blazingstar, Ash Meadows gumplant, Ash Meadows ivesia, Ash Meadows sunray, spring-loving centaury, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, Devils Hole pupfish, Warm Springs Amargosa pupfish, and desert tortoise. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Coordination with the USFWS and NDOW should be conducted to address the potential for impacts on species under review for listing under the ESA that may be affected by solar energy development on the SEZ: Amargosa tryonia, Ash Meadows pebblesnail, crystal springsnail, distal gland springsnail, elongate gland springsnail, Fairbanks springsnail, median gland springsnail, minute tryonia, Oasis Valley springsnail, Point of Rocks tryonia, sporting goods tryonia, Amargosa naucorid, Oasis Valley speckled dace, and Amargosa toad. Coordination would identify an appropriate survey protocol, and mitigation requirements, which may include avoidance, minimization, translocation, or compensation. Coordination with the USFWS and NDOW should be conducted to address potential indirect impacts (e.g. site runoff and erosion) and the effectiveness of design features for three special status species that are endemic to the Big Dune system. Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Air Quality and Climate	*Construction*: Predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentrations could exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. These concentrations would decrease quickly with distance. Modeling indicates that emissions from construction activities are anticipated to be slightly higher than Class I PSD PM_{10} increments at the nearest federal Class I area (John Muir WA in California, about 78 mi [126 km] west of the SEZ). Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on air-quality-related values (e.g., visibility and acid deposition) at the nearby federal Class I areas; however, such emissions would be temporary and any impacts would be short term. *Operations*: Positive impact due to avoided emission of air pollutants from combustion-related power generation: 13 to 23% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada avoided (up to 12,508 tons/yr SO_2, 10,728 tons/yr NO_x, 0.071 ton/yr Hg, and 6,885,000 tons/yr CO_2).	None.
Visual Resources	Solar development could produce large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape; potential additional impacts could occur from construction and operation of transmission lines and access roads within the transmission line and road viewsheds. The SEZ is located within 1 mi (1.6 km) of the CDCA. Because of the open views of the SEZ and elevated viewpoints, weak to strong visual contrasts could be observed by CDCA visitors. The SEZ is located within 1 mi (1.6 km) of Death Valley NP and WA. Because of the open views of the SEZ and elevated viewpoints, weak to strong visual contrasts could be observed by NP and WA visitors.	Within the SEZ, in areas visible from and within 5 mi (8 km) of Death Valley NP, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by BLM) within the NP.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	The SEZ is located 0.5 mi (0.8 km) from Big Dune SRMA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by SRMA visitors. Approximately 31 mi (50 km) of U.S. 95 is within the SEZ viewshed, and 4.8 mi (7.7 km) of U.S. 95 is within the SEZ. Strong visual contrasts could be observed within the SEZ by travelers on U.S. 95. Approximately 9 mi (14 km) of State Route 374 is within the SEZ viewshed. Weak to moderate visual contrasts could be observed by travelers on that state road. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including U.S. 95 and State Routes 374 and 373.	
Acoustic Environment	*Construction*. For construction activities occurring near the southern SEZ boundary, estimated noise level at the nearest residence would be about 25 dBA, well below a typical daytime mean rural background level of 40 dBA. In addition, an estimated 40 dBA L_{dn} at this residence is well below the EPA guidance of 55 dBA L_{dn} for residential areas. *Operations*. For a facility located near the southern SEZ boundary, the predicted noise level from a parabolic trough or power tower facility would be about 29 dBA at the nearest residence located about 4.5 mi (7.2 km) from the SEZ boundary, which is much lower than typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would not be exceeded outside of the proposed SEZ boundary. In the case of 6-hour	None.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Acoustic Environment (Cont.)	TES, the estimated sound level at the nearest residence would be 39 dBA, which is higher than typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 43 dBA L_{dn}, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. If the SEZ was developed with dish engine facilities, the estimated noise level at the nearest residence about 4.5 mi (7.2 km) from the SEZ boundary would be about 41 dBA, which is comparable to typical daytime mean rural background level of 40 dBA. If assuming 12-hour daytime operation, the estimated 42 dBA L_{dn} at this residence would be well below the EPA guideline of 55 dBA L_{dn} for residential areas.	
Paleontological Resources	Few, if any, impacts on significant paleontological resources are likely to occur in the proposed SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted.	None.
Cultural Resources	Direct impacts on significant cultural resources could occur during site preparation and construction activities in the proposed SEZ. At least four sites have been recorded within the proposed SEZ, and at least one of them is considered potentially eligible for listing in the NRHP. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties.	SEZ-specific design features would be determined through consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Native American Concerns	While no comments specific to the proposed Amargosa Valley SEZ have been received from Native American tribes to date, the Big Pine Paiute Tribe of the Owens Valley has commented on the scope of the PEIS. They recommend that the BLM preserve undisturbed lands intact, and that lands that have been recently disturbed, such as abandoned farm fields, rail yards, mines, and air fields be given primary consideration for solar energy development. Potential impacts on existing water supplies were also a primary concern. During energy development projects in adjacent areas, the Southern Paiute have expressed concern over adverse effects on a wide range of resources. As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native American concerns will be expressed over potential visual and other effects of solar energy development within the SEZ on specific resources and culturally important landscapes.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.
Socioeconomics	*Construction:* 662 to 8,765 total jobs; $40.9 million to $541.7 million income in ROI. *Operations:* 73 to 1,655 annual total jobs; $2.5 million to $62.7 million annual income in the ROI.	None.
Environmental Justice	Using the aggregate numbers for the 50-mi (80-km) area around the proposed SEZ, there are no minority or low-income populations, as defined in CEQ guidelines; however, on an individual census block group basis, minority and low-income populations are present. Therefore, potential impacts (although likely small) could be incurred by low-income and minority populations as a result of the construction and operation of solar facilities.	None.

TABLE 11.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Amargosa Valley SEZ	SEZ-Specific Design Features
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The volume of traffic on U.S. 95 would represent an increase in traffic of about two-thirds in the area of the SEZ. Should up to three large projects with approximately 1,000 daily workers each be under development simultaneously, an additional 6,000 vehicle trips per day could be added to U.S. 95 in the vicinity of the SEZ, which is about a 200% increase in the current average daily traffic level on most segments of U.S. 95 near the SEZ.	None.

Abbreviations: ACEC = Area of Critical Environmental Concern; BLM = Bureau of Land Management; CDCA = California Desert Conservation Area; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; dBA = A-weighted decibel; DoD = U.S. Department of Defense; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; FAA = Federal Aviation Administration; Hg = mercury; KOP = key observation point; L_{dn} = day-night average sound level; MTR = military training route; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NNHP = Nevada Natural Heritage Program; NO_x = nitrogen oxides; NP = National Park; NPS = National Park Service; NRHP = *National Register of Historic Places*; NTTR = Nevada Test and Training Range; NWR = National Wildlife Refuge; OHV = off-highway vehicle; PEIS = programmatic environmental impact statement; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 μm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 μm or less; PSD = prevention of significant deterioration; ROI = region of influence; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; SRMA = Special Recreation Management Area; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; VRM = visual resource management; WA = Wilderness Area.

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Amargosa Valley SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 11.1.10 through 11.1.12.

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11.1.2 Lands and Realty

11.1.2.1 Affected Environment

The proposed Amargosa Valley SEZ is a large, well-blocked area of public land ownership with only one 80-acre (0.3-km^2) parcel of private land along the northern border of the area; this parcel is a low-level radioactive waste disposal facility that is located close to U.S. 95. About 2,200 acres (9 km^2), or about 7%, of the SEZ are separated from the majority of the 31,625-acre (128-km^2) SEZ by U.S. 95. The overall character of the land around the SEZ is rural and undeveloped. Numerous well-developed and normally dry washes pass through the area in a southeasterly direction. The major drainage of the SEZ is the Amargosa River, which also is normally dry. Access to the Amargosa Valley SEZ from U.S. 95 is very good, and there are several dirt roads that penetrate the area. The dry washes are used for vehicle travel, although they would be unacceptable for permanent travel. There is an abandoned railroad grade that passes through the area in a northwest–southeast orientation. A 138-kV transmission line passes through the area on a route paralleling U.S. 95 about 0.5 mi (1 km) southwest of the highway, and a Section 368 (of the Energy Policy Act of 2005) designated energy corridor borders the northeastern corner of the SEZ.

U.S. 95 and the 138-kV transmission line are the only rights-of way (ROWs) currently located within the SEZ. As of February 2010, there was one application for a solar energy facility ROW on the SEZ. An additional seven solar applications, one of which is a fast-track project, have been filed on BLM-administered lands within 15 mi (24 km) of the SEZ, and additional applications have been filed farther to the southeast near U.S. 95.

11.1.2.2 Impacts

11.1.2.2.1 Construction and Operations

Full development of the proposed Amargosa Valley SEZ would disturb up to 25,300 acres (102 km^2) (Table 11.1.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and rural, utility-scale solar energy development would be a new and discordant land use to the area.

Existing ROW authorizations on the SEZ would not be affected by solar energy development since they are prior existing rights. Should the proposed SEZ be identified as an SEZ in the Record of Decision (ROD) for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development. Because the area currently has so few ROWs, it is not anticipated that approval of solar energy development would have a significant impact on ROW availability in the area.

The combination of how the SEZ is sited on the land, topographic features, and the blockage of travel on existing dirt roads and in washes wherever solar development occurs within the SEZ would result in the creation of isolated parcels of public land between the SEZ and the National Park Service (NPS) boundary southwest of the SEZ

11.1.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 138kV transmission line passes through the Amargosa Valley SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed. The presence of the Section 368 corridor that borders the northeast side of the SEZ would provide a possible route for new transmission when and if new transmission construction is required.

Road access to the area is readily available from U.S. 95 which passes through the SEZ, so no new road access to the area would be required. Roads and transmission lines would be constructed within the SEZ as part of development of the area.

11.1.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide mitigation for impacts to the lands and realty program.

11.1.3 Specially Designated Areas and Lands with Wilderness Characteristics

11.1.3.1 Affected Environment

There are nine specially designated areas near the proposed Amargosa Valley SEZ that could be affected by solar energy development. The first is Death Valley National Park (NP), which includes a large amount of designated wilderness and is located about 1 mi (1.6 km) southwest of the SEZ. The National Park is located primarily in California, but one portion of the park is in Nevada, north of the SEZ. The unique Devil's Hole unit, which is also in Nevada, is located within the boundaries of the Ash Meadows National Wildlife Refuge (NWR). The developed trail system in Death Valley NP is limited, but backcountry hiking routes access the ridge looking down on the proposed SEZ. Primary access to the National Park is via developed roads that do not pass through the SEZ; there is informal access to the boundary of the National Park through the SEZ along old roads/tracks and desert washes.

The proposed SEZ is not located within the California Desert Conservation Area (CDCA), but development within the SEZ would be visible from portions of the CDCA.

The BLM-administered Funeral Mountains Wilderness is located about 18 mi (29 km) south–southeast of the SEZ, also in California and adjacent to Death Valley NP.

The Ash Meadows NWR is a unique 23,000 acre (97 m^2) refuge located about 20 mi (32 km) southeast of the SEZ and 90 mi (145 km) northwest of Las Vegas. The refuge includes numerous spring-fed wetlands and is home to 24 species of plants and animals found nowhere else in the world. Four fish and one plant found in the NWR are listed as endangered.

The Amargosa Mesquite Trees ACEC is about 25 mi (40 km) southeast of the SEZ, and the Ash Meadows ACEC, which partially surrounds the NWR, is about 17 mi (27 km) southeast of the SEZ. Both of these areas are administered by the BLM. These ACECs were established to protect neo-tropical bird habitat and special status species habitat, respectively.

The BLM-administered Amargosa River ACEC is composed of three separate units and was designated to protect riparian and wetland communities, scenic resources, and threatened and endangered species. The unit nearest to the SEZ is located about 16 mi (26 km) south–southeast of the SEZ in California.

The Big Dune ACEC, which is administered by the BLM, was designated to protect special species habitat and is included within the boundaries of the Big Dune SRMA. The ACEC and SRMA are located about 2 mi (3.2 km) east of the SEZ. The SRMA was established to provide a management framework primarily for off-highway vehicle (OHV) use of the open dune area included within the SRMA. The SRMA/ACEC has areas designated for OHV use as open, limited to designated routes, and closed to OHV use. (See Figure 11.1.3.1-1 for the locations of these areas.). The Big Dune SRMA receives about 31,330 recreation visitor days of use per year (Sanchez 2010). This use is primarily motorized, although other uses or uses

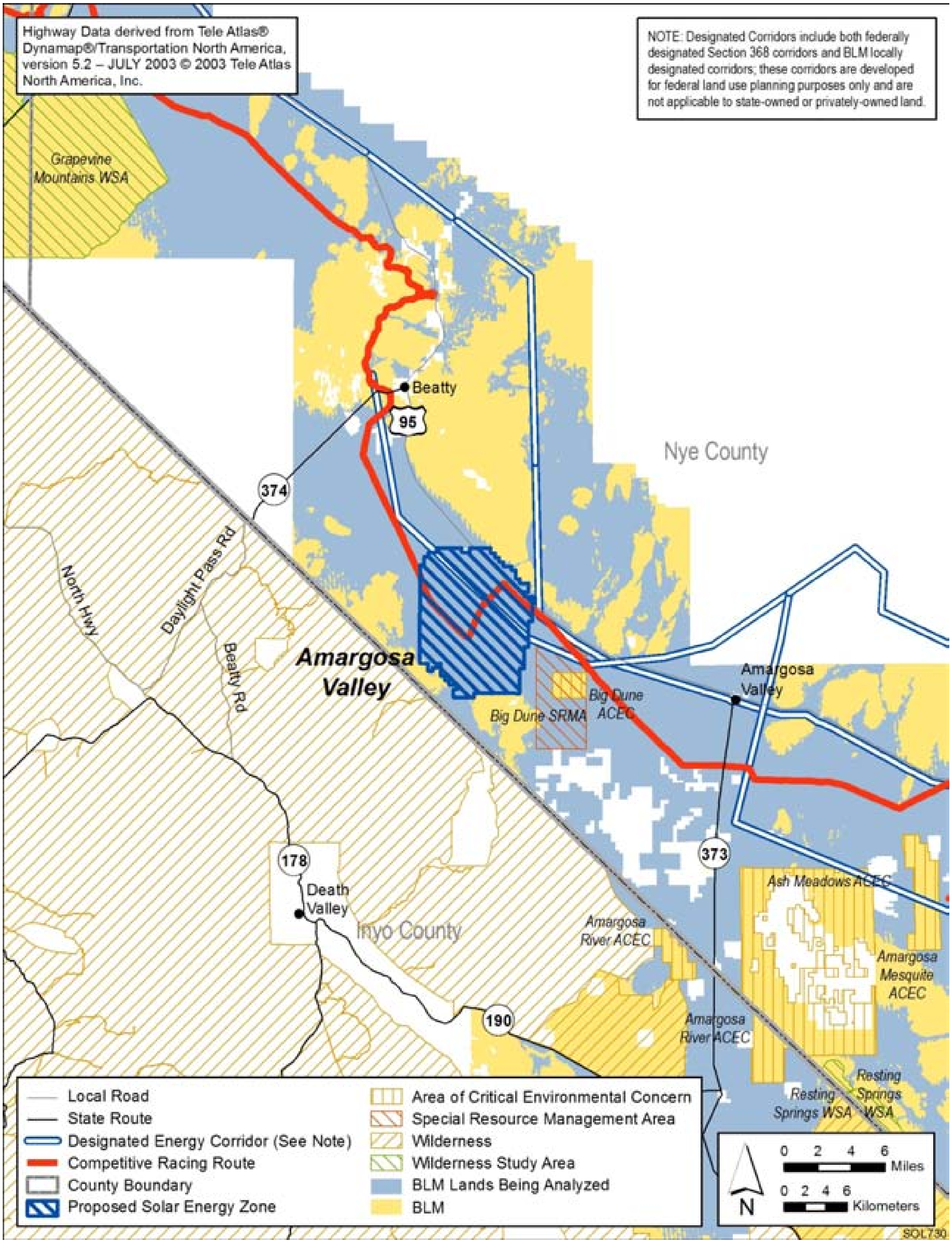

FIGURE 11.1.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Amargosa Valley SEZ

associated with motorized access include camping, hiking, small game hunting, and photography. These uses also occur throughout the SEZ although at a much lower level.

The status of water supplies for portions of Death Valley NP, the NWR, and the Ash Meadows and Amargosa River ACECs has been a major concern and a focus of litigation. The Nevada State Engineer has declared the basin as over-appropriated and has stated that new water right applications in the Amargosa Desert Basin would be denied, as would any application seeking to change an existing point of diversion closer to Devils Hole (defined by a 25-mi [40-km] radius around Devils Hole). Numerous applications for new groundwater withdrawals have since been denied. For details on this issue see Section 11.1.9.1.3.

No lands with wilderness characteristics outside of designated wilderness areas or WSAs have been identified within 25 mi (40 km) of the SEZ.

11.1.3.2 Impacts

11.1.3.2.1 Construction and Operations

The primary potential impacts to specially designated areas generally are from visual impacts of solar energy development that could affect scenic, recreational, or wilderness characteristics of the areas. This visual impact is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Assessment of the visual impact of solar energy projects must be done on a site specific and technology specific basis to accurately identify impacts.

In general, the closer a viewer is to solar development, the greater the impact on an individual's perception. From a visual analysis perspective, the most sensitive viewing distances generally are from 0-5 mi (8 km). The viewing height above a solar energy development area, the size of the solar development area, and the purpose for which a person is visiting an area is also important. Individuals seeking a wilderness or scenic experience within these areas could be expected to be more adversely affected than those simply traveling along a highway with another destination in mind.

The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas that were used to assess potential impacts on specially designated areas do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

The following areas could potentially be affected by development of the SEZ:

Death Valley National Park and Designated Wilderness

Visual impacts are a major concern for Death Valley NP, and based on viewshed analysis[1] solar development within the proposed Amargosa Valley SEZ would be visible from about 3% of the National Park that is within 25 mi (40 km) of the SEZ. Most of the National Park is designated as wilderness, and about 2.2% of the designated WA is located within the viewshed of the SEZ. Table 11.1.3.2-1 provides summary information from the viewshed analysis broken down into three distance zones. The data presented in the table are based on the assumption that power tower solar energy technology would be used, which, because of the potential height of these facilities, could be visible from the largest amount of land of the technologies being considered in the PEIS. The potential visual impact of solar energy development in terms of the amount of acreage affected within the National Park and WA within the viewshed of the SEZ, could be less for solar energy facilities with lower structures. Assessment of the visual impact must be conducted on a site-specific and technology-specific basis to accurately identify impacts

For the Amargosa Valley SEZ, the low-lying location of the SEZ in relation to portions of Death Valley NP would highlight the industrial-like nature of solar energy development in the SEZ. In addition, because of the generally undeveloped nature of the SEZ and surrounding area, impacts on wilderness characteristics may be more significant than in areas with a less pristine nature.

While the degree of impact is difficult to assess, scenic and wilderness characteristics within the portions of the National Park that are within 5 mi (8 km) of the Amargosa Valley SEZ, would be adversely affected by solar development within the SEZ. The areas primarily affected would be located either in the Amargosa Range along the California–Nevada border or at lower elevations in the Nevada portion of the National Park. Most views of the SEZ in these areas would be from elevated viewpoints, and strong visual contrasts would be likely to occur where clear views of the SEZ exist, even beyond 5 mi (8 km) of the SEZ. As shown in Table 11.1.3.2-1, large areas of Death Valley NP and wilderness would not have views of development in the SEZ. Visibility of the SEZ from within Death Valley NP does extend beyond 25 mi (40 km), but because of topographic screening and the long distance to the SEZ from these areas, expected visual contrasts would be very small and impacts would not be significant.

Because of the lack of development in the immediate region of the SEZ, the night sky is very dark and night sky viewing is a popular activity in the National Park. The NPS has identified concerns that solar facility development in the region adjacent to the National Park could adversely affect the quality of the night sky environment. The amount of light that could emanate from solar facilities is not known, but it could adversely affect Death Valley NP and the adjoining wilderness.

Potential impacts of water withdrawals adjacent to or near the National Park have historically been a concern. Additional or relocated groundwater withdrawals have the potential to adversely affect resources within the National Park, especially the Devil's Hole unit; however,

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[1] See Section 11.1.14 for a thorough description of the viewshed analysis.

the existing State Engineer's order currently has a protective effect that would not allow adverse impacts associated with water withdrawals to occur. Section 11.1.9 provides a more detailed analysis of the water resource issues.

California Desert Conservation Area

The viewshed within 25 mi (40 km) of the Amargosa SEZ includes about 94,485 acres (382 km^2) or about 0.2% of the CDCA (Table 11.1.3.2-1). Full development of the SEZ would adversely affect wilderness characteristics in Death Valley NP, which is within the CDCA, but impacts on the CDCA would be minimal.

TABLE 11.1.3.2-1 Potentially Affected Specially Designated Areas within a 25-mi (40-km) Viewshed of the Proposed Amargosa Valley SEZ[a]

		Feature Area or Highway Length		
			Visible between	
Feature Type	Feature Name (Total Acreage/Highway Length)[b,c]	Visible within 5 mi	5 mi and 15 mi	15 mi and 25 mi
National Park	Death Valley (3,397,062 acres)	19,406 acres (0.6)	53,176 acres (2)	32,937 acres (1)
WAs	Death Valley (3,074,256 acres)	18,638 acres (0.6)	30,371 acres (1)	18,935 acres (0.6)
	Funeral Mountains (27,567 acres)	0	0	3,876 (14)
Wildlife Refuges	Ash Meadows (24,193 acres)	0	0	11,731 acres (49)
SRMA	Big Dune	–[d]	–	–
ACECs designated for outstanding scenic values	Amargosa River (27,797 acres)	0	0	2,919 acres (11)
National Conservation Areas	California Desert (25,919,319 acres)	19,699 acres (0.08)	34,626 acres (0.1)	40,160 acres (0.2)

a Assuming power tower technology with a height of 650 ft (198.1 m)

b To convert acres to km^2, multiply by 0.004047. To convert mi to km, multiply by 1.609.

c Total acres included in the feature in parentheses.

d A dash indicates no GIS data available.

Funeral Mountains Wilderness Area

The Funeral Mountains Wilderness Area (WA) is located about 18 mi (29 km) distant from the SEZ and development within the SEZ would be visible from about 14% of the WA. Because of the long distance, development in the SEZ would not be an important component of the viewshed of the WA and would not be expected to have a significant impact on wilderness characteristics of the area.

Ash Meadows National Wildlife Refuge

Although portions of the Ash Meadows NWR would have some visibility of solar development within the SEZ, since the area is about 20 mi (32 km) from the SEZ, visual impacts associated with solar development within the SEZ would not be significant.

The major concern for the refuge is maintenance of adequate groundwater levels to support existing vegetation and the unique species that are present. While the NWR is down gradient from the SEZ, current water withdrawal restrictions may prevent adverse effects from solar energy development of the SEZ that could be associated with lowering the groundwater level at the refuge. However, concerns still exist regarding the long-term future of withdrawals and the relocation of existing withdrawals.

Ash Meadows, Amargosa Mesquite Trees, and Amargosa River ACECs

As is the case with the Ash Meadows NWR, the major concern for all three of the BLM-administered ACECs is maintaining adequate groundwater levels to support existing vegetation and the species that are present. Although the areas are down gradient from the SEZ, current water withdrawal restrictions by the Nevada State Engineer may prevent adverse effects from solar energy development of the SEZ that could be associated with lowering of groundwater levels. However, concerns still exist regarding the long-term future of withdrawals and the relocation of existing withdrawals and the potential to adversely affect these ACECs.

The Amargosa River ACEC consists of three separate units, and two of these are within 25 mi (40 km) of the SEZ; the nearest is about 16 mi (26 km) from the SEZ and the second is about 23 mi (37 km) distant. All of the units are located along the Amargosa River. The third unit, which is slightly more than 50 mi (80 km) from the SEZ, surrounds a large portion of the Amargosa Wild and Scenic River (WSR). It is not anticipated that there would be any effects on water flow of the WSR in this unit. Additionally, although there is a scenic component to this ACEC, because of the relatively long distance from the SEZ and the lower elevation of the ACEC units to the SEZ, no visual impact on the scenic values of the ACEC is anticipated.

Big Dune ACEC and SRMA

With the proposed SEZ located within 2 mi (3 km) of the ACEC/SRMA, solar energy development would be readily visible from these areas. Because of the nature of the activities in these areas, it is difficult to assess the potential impact of solar development. Since the use of the area is oriented to motorized recreation, it is possible that current users would not be adversely affected by solar development. Alternatively, industrial-type development would create a dramatically different landscape in which to recreate and may cause the displacement of users to other areas. The impact on these areas is anticipated to be minor.

11.1.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Since there is an existing 138-kV transmission line within the SEZ, no additional construction of transmission facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts to specially designated areas. See Section 11.1.1.2 for the development assumptions underlying this analysis.

Road access to the area is readily available from U.S. 95 which passes through the SEZ, so no new road access to the area would be required. Roads and transmission lines would be constructed within the SEZ as part of development of the area.

11.1.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide some mitigation for some identified impacts. The exceptions would be: adverse impacts to wilderness characteristics in Death Valley NP and potential impacts on night sky viewing.

Proposed design features specific to the Amargosa Valley SEZ include the following:

- Design features for visual resources presented in Section 11.1.14 should be implemented to reduce impacts on wilderness characteristics. However, even with the adoption of design features for visual resources, it is anticipated that adverse impacts on wilderness characteristics would not be completely mitigated.

- Water use for any solar energy development would be reviewed to ensure that impacts on Death Valley NP, Ash Meadows NWR, or the ACECs would be neutral or positive.

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11.1.4 Rangeland Resources

11.1.4.1 Livestock Grazing

11.1.4.1.1 Affected Environment

The area within and around the proposed Amargosa Valley SEZ is not included within a grazing allotment and is not used for grazing (Johnson 2010).

11.1.4.1.2 Impacts

Construction and Operations

There would be no impact since the area is currently not being used for grazing.

Transmission Facilities and Other Off-Site Infrastructure

There would be no impact on livestock grazing.

11.1.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features are required.

11.1.4.2 Wild Horses and Burros

11.1.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nearly one hundred wild horse and burro herd management areas (HMAs) occur within Nevada (BLM 2009e). Also, several HMAs in California are located near the California–Nevada border. One HMA (Bullfrog) and portions of seven other HMAs occur within the 50-mi (80-km) SEZ region for the proposed Amargosa Valley SEZ (Figure 11.1.4.2-1). The closest HMA is the Bullfrog HMA, located 5.3 mi (8.5 km) north of the SEZ. The Bullfrog HMA contains an estimated population of 101 burros (BLM 2010a).

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah, and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to

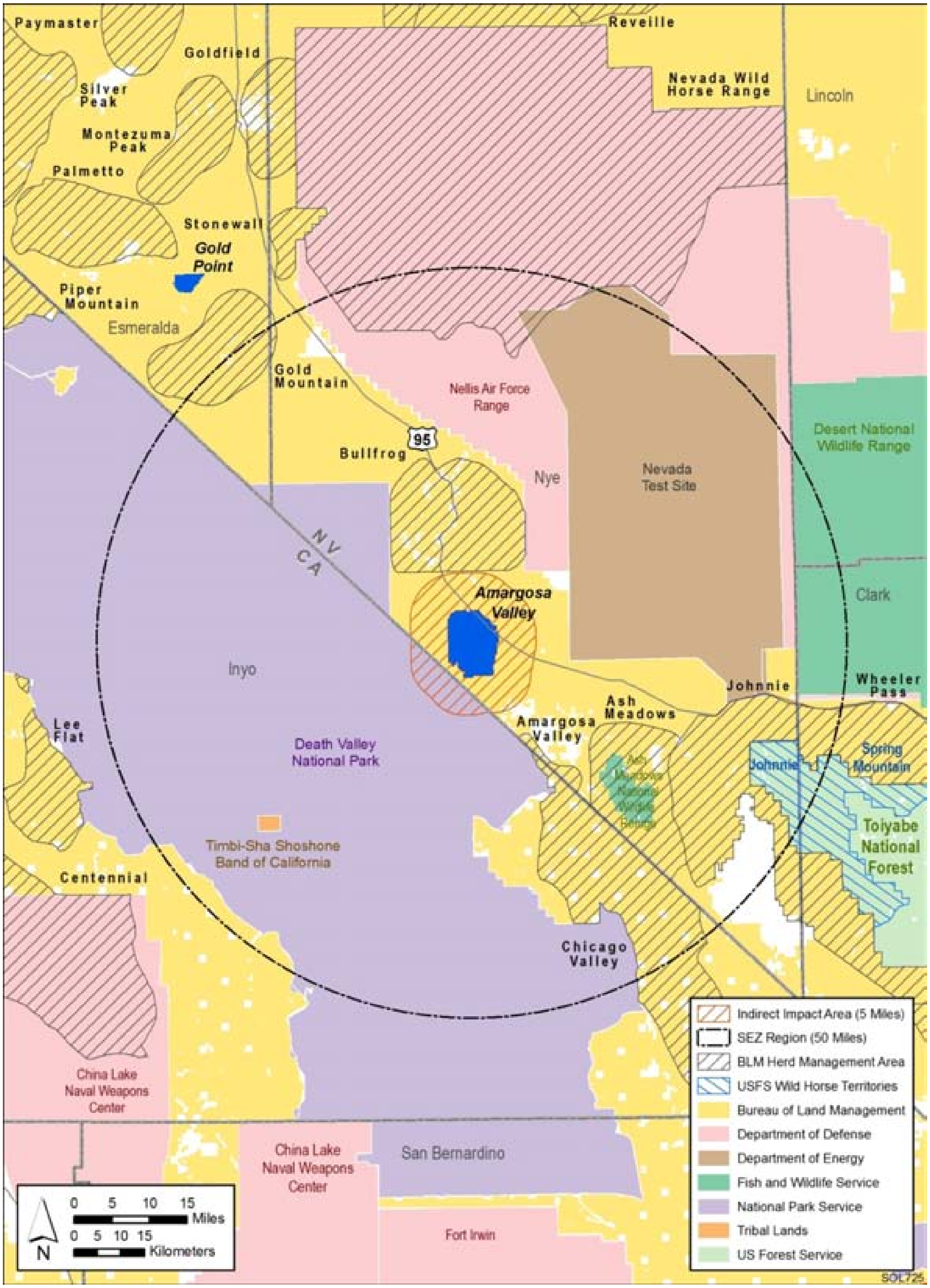

FIGURE 11.1.4.2-1 Wild Horse and Burro Herd Management Areas and Territories within the Analysis Area for the Proposed Amargosa Valley SEZ (Sources: BLM 2009e; USFS 2007).

the proposed Amargosa Valley SEZ is the Johnnie Territory located within a portion of the Toiyabe National Forest. It is located more than 35 mi (56 km) southeast of the SEZ (Figure 11.1.4.2-1). Information on the management of this territory for wild horses and burros was not available.

11.1.4.2.2 Impacts

Because the proposed Amargosa Valley SEZ is 5.3 mi (8.5 km) or more from any wild horse and burro HMA managed by the BLM and more than 35 mi (56 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly affect wild horses and burros that are managed by these agencies.

11.1.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features for solar development within the proposed Amargosa Valley SEZ would be necessary to protect or minimize impacts on wild horses and burros.

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11.1.5 Recreation

11.1.5.1 Affected Environment

The site of the proposed Amargosa Valley SEZ is relatively flat with numerous roads, trails, and desert washes. Although there are no recreation use figures for the SEZ, OHV use is likely the major recreational activity in the area; there are also camping, photography, and small game hunting opportunities. Use in the area tends to be seasonal, with most use in the cooler months, but the area is used year-round. The area in and around the proposed SEZ has been designated as "Limited to existing roads, trails, and dry washes," indicating that these features are open to vehicle travel (BLM 2010b). Much of the use in the area is likely spillover from the Big Dune SRMA that is located just east of the SEZ, since the SRMA is the focus for OHV use in the area. There is a designated route that accommodates desert racing and commercial tours that passes through the SEZ. Twelve race events have been held in the past seven years using this designated route as a portion of the race course (Sanchez 2010). The SEZ provides a good view of the Amargosa Mountains that are located in Death Valley NP southwest of the SEZ. A site visit in September 2009 showed signs of recent vehicle and OHV use in the SEZ.

11.1.5.2 Impacts

11.1.5.2.1 Construction and Operations

Recreational use would be eliminated from portions of the SEZ that would be developed for solar energy production. Since the SEZ sits astride numerous trails and desert washes, construction of solar energy facilities would cause impact to the existing OHV use. The magnitude of this impact is unknown. Whether recreational visitors would continue to use any remaining undeveloped portions of the SEZ is unknown. Access to public land and NPS areas south and west of the SEZ would be lost or would be made much more difficult by development of the SEZ, unless access routes were identified and retained. If solar development obstructs the route currently permitted for desert racing and for commercial use, those uses would be lost unless it would be possible to relocate the route outside the development area.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If open routes within a proposed project area were identified during project-specific analyses, they would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

11.1.5.2.1 Transmission Facilities and Other Off-Site Infrastructure

Since there is an existing 138-kV transmission line within the SEZ, no additional construction of transmission facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts to specially designated areas. See Section 11.1.1.2 for the development assumptions underlying this analysis.

Road access to the area is readily available from U.S. 95 which passes through the SEZ, so no new road access to the area would be required. Roads and transmission lines would be constructed within the SEZ as part of development of the area.

11.1.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide some mitigation for some impacts. The exceptions may be that recreational use of the area developed for solar energy production would be lost and would not be mitigatable, and possible loss of the desert racing and commercial tour route.

Proposed design features specific to the Amargosa Valley SEZ include the following:

- Relocation of the designated route used for desert racing and commercial tours should be considered at the time specific solar development proposals are analyzed.

11.1.6 Military and Civilian Aviation

11.1.6.1 Affected Environment

The proposed Amargosa Valley SEZ is completely covered by several military training routes (MTRs) that include both visual and instrument routes. One of the training routes has an operating elevation from ground level up to 9,400 ft (2,865 m) mean sea level (MSL). The closest military installations to the proposed Amargosa Valley SEZ are the Nevada Test and Training Range (NTTR), which is located just to the north and east of the SEZ, and Nellis Air Force Base, which is located about 90 mi (145 km) southeast of the area.

The closest civilian municipal aviation facility is the Nye County Airport at Beatty, Nevada, located about 7 mi (11 km) northwest of the SEZ.

11.1.6.2 Impacts

The military has expressed serious concern over solar energy facilities being constructed within the SEZ, and Nellis Air Force Base has indicated that any facilities higher than 50 ft (15 m) may be incompatible with low-level aircraft use of the MTR. Further, the NTTR has indicated that solar technologies requiring structures higher than 50 ft (15 m) above ground level may present unacceptable electromagnetic compatibility concerns for its test mission. The NTTR maintains that a pristine testing environment is required for the unique national security missions conducted on the NTTR. The potential electromagnetic interference impacts from solar facilities on testing activities at the NTTR, coupled with potential training route obstructions created by taller structures, make it likely that solar facilities exceeding 50 ft (15 m) would significantly affect military operations.

Because the Beatty Airport is located 7 mi (11 km) from the SEZ it is not anticipated there would be any impacts on airport operation. It is assumed that through the application of standard Federal Aviation Administration (FAA) clearance and marking requirements, there would be no impact on airport operations.

11.1.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features are required. The programmatic design features described in Appendix A, Section A.2.2, would require early coordination with the DoD to identify and mitigate, if possible, potential impacts on the use of MTRs.

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11.1.7 Geologic Setting and Soil Resources

11.1.7.1 Affected Environment

11.1.7.1.1 Geologic Setting

Regional Setting

The proposed Amargosa Valley SEZ is located in the Amargosa Desert region of the Basin and Range physiographic province in southern Nevada. The desert lies between the Funeral Mountains to the southwest and Yucca Mountain to the northeast and extends to Amargosa Flat to the southeast. The Bullfrog Hills border the northwest end of the valley (Figure 11.1.7.1-1).

The Amargosa Desert is one of the largest intermontane basins in Nevada. Basin fill consists of Quaternary and Tertiary river channel, alluvial fan, and playa deposits of variable thickness and induration. Sediments are thickest in the southern part of the basin near Amargosa Flat and Ash Meadows, ranging from 3,500 to 5,000 ft (1,070 to 1,520 m). In the north area, sediments are up to 3,500 ft (1,070 m) thick, but thin to about 1,400 ft (430 m) near Lathrop Wells. Tertiary conglomerates of alluvial fan sediments are moderately indurated. Tertiary rhyolite flows and tuffs interbedded with basin-fill sediments occur at depth and in outcrops along the edge of the basin. Several thousand feet of rhyolite tuffs are exposed in the Bullfrog Hills. Paleozoic carbonate rocks are known to occur in the southeastern end of the basin beneath Amargosa Flat and may be limited in extent. The surrounding mountains are composed primarily of thick sequences of Paleozoic limestone and Paleozoic and Precambrian metamorphic rocks (quartzite) (Burbey 1997; Kilroy 1991; Winograd and Thordarson 1975). A geologic map of the Amargosa Desert region is shown in Figure 11.1.7.1-2.

The structural geology of the southern Basin and Range province is complex, and interpretations vary among investigators. The Amargosa Desert lies within the Walker Lane Belt, a 61-mi (100-km) wide seismic region that extends northwestward from the Las Vegas area along the Nevada–California state border and into northern California (Figure 11.1.7.1-1). Strike-slip faulting predominates within the Walker Lane Belt and to the southwest; however, in the area to the northeast, extensional faulting predominates. An important structural feature in the region is the Amargosa Desert rift zone (trough), which extends from north of Crater Flat and Yucca Mountain southward to the Ash Meadows area in the southern part of the Amargosa Desert (and possibly on into Death Valley). The northern part of the rift zone is marked by north–northeast striking normal faults and a series of caldera complexes (Brocher et al. 1993; Byers et al. 1989; Hamilton 1988; McKee 1997; Stuckless and O'Leary 2007; Wright 1989). Burbey (1997) attributes the presence of springs in Ash Meadows to movement along high-angle normal faults intersecting the southern part of the Amargosa Desert that "juxtapose" the highly

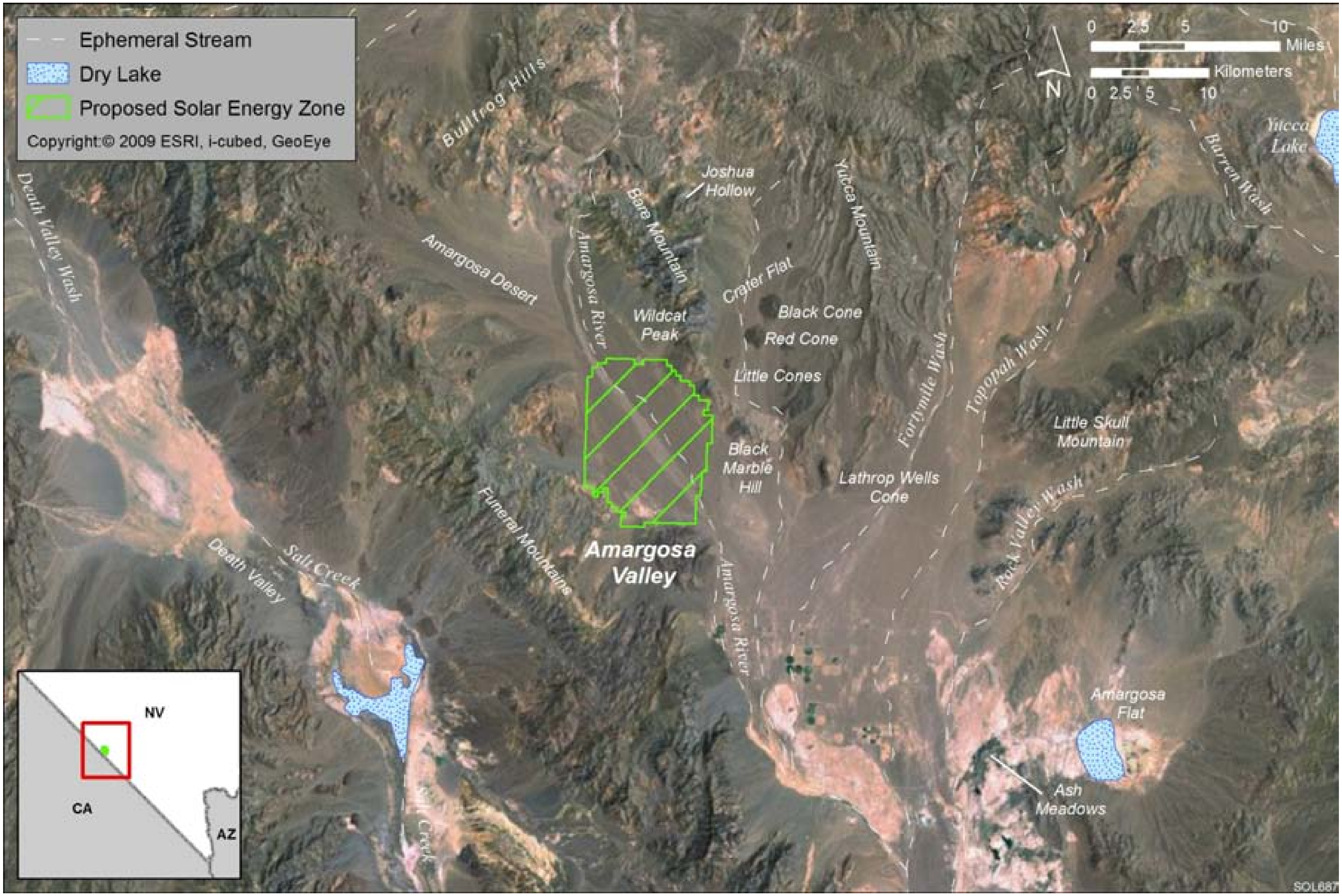

FIGURE 11.1.7.1-1 Physiographic Features of the Amargosa Desert Region

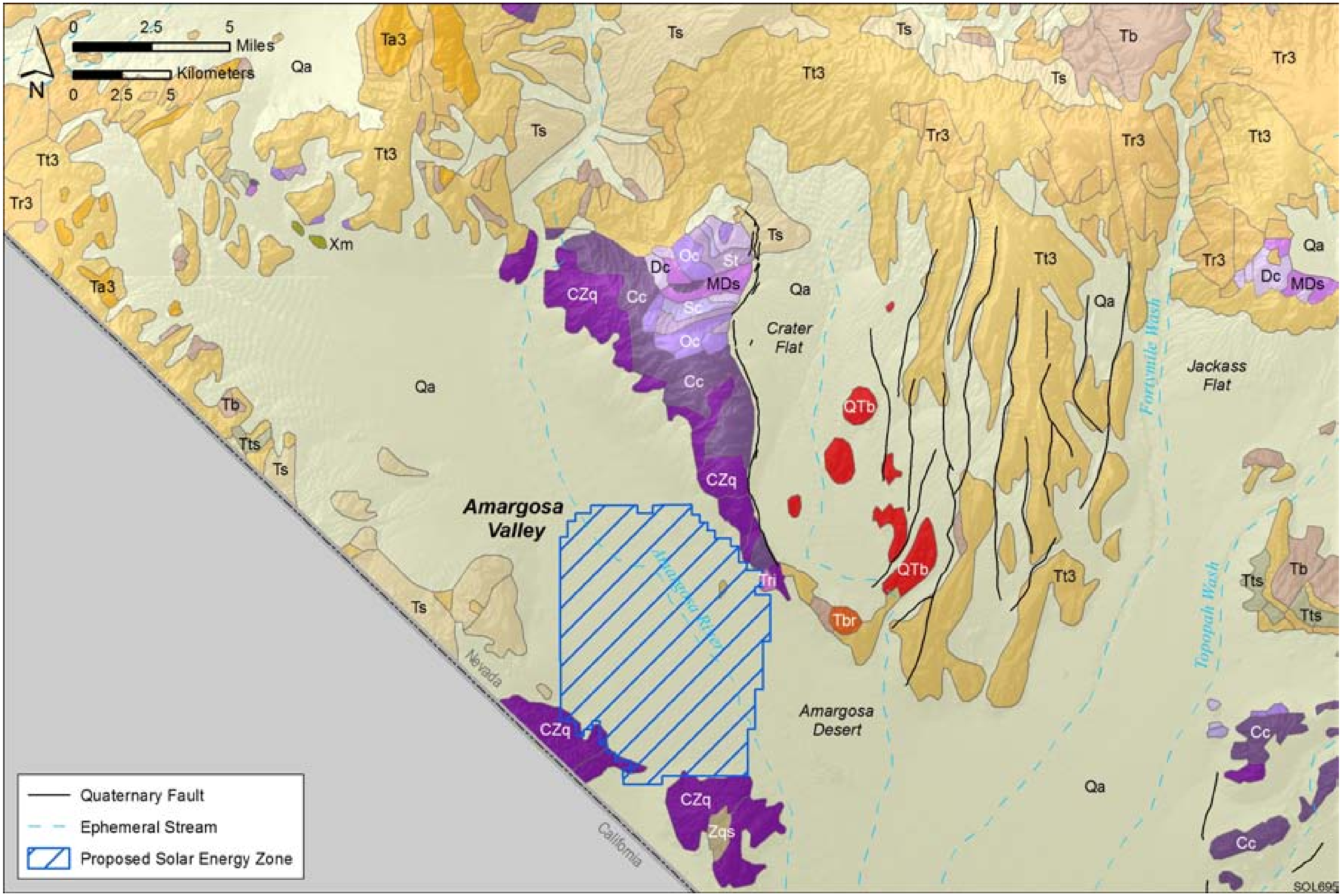

FIGURE 11.1.7.1-2 Geologic Map of the Amargosa Desert Region (Sources: Ludington et al. 2007; Stewart and Carlson 1978)

Cenozoic (Quaternary, Tertiary)

- Qa — Alluvial deposits; locally includes beach and sand dune deposits
- QTb — Basalt flows
- Tri — Rhyolitic intrusive rocks
- Tbr — Breccia
- Tt3 — Welded and nonwelded silic ash-flow tuffs
- Tr3 — Rhyolitic flows and shallow instrusive rocks
- Ta3 — Andesite and related rocks of intermediate composition
- Tb — Basalt flows
- Tts — Ash-flow tuffs and tuffaceous sedimentary rocks
- Ts — Tuffaceous sedimentary rocks; locally includes minor amounts of tuff (Ts2 and Ts3)

Paleozoic

- MDs — Shale, siltstone, sandstone, chert-pebble conglomerate and limestone
- Dc — Dolomite, limestone and minor amounts of sandstone and quartzite
- St — Platy limestone and limy siltstone, chert at base
- Sc — Dolomite
- Oc — Limestone, dolomite, shale and quartzite
- Cc — Limestone and dolomite; locally thick sequences of shale and siltstone
- CZq — Quartzite and minor amounts of conglomerate, phyllitic siltstone, limestone and dolomite (Proterozoic - Cambrian)
- Zqs — Quartzite, phyllitic siltstone, conglomerate, limestone and dolomite

Precambrian

- Xm — Metamorphic rocks; includes gneiss, schist and gneissic granite

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FIGURE 11.1.7.1-2 (Cont.)

permeable Paleozoic carbonate rock aquifer against low-permeability Tertiary basin-fill sediments.

Topography

The Amargosa Valley is a northwest-trending basin, about 50 mi (80 km) long and 20 mi (30 km) wide (Stuckless and O'Leary 2007). Elevations along the valley axis range from about 3,610 ft (1,100 m) near the northwest end and along the valley sides to about 2,330 ft (710 m) at the southwestern end of the valley within Amargosa Flat (Figure 11.1.7.1-1). Gently to moderately sloping alluvial fan deposits occur along the mountain fronts. The valley is drained by the Amargosa River, an ephemeral river that is essentially dry except along short segments fed by springs that flow seasonally (Stonestrom et al. 2007; USGS 2001) The river originates in the mountains to the north and flows to the southeast, draining into the southern part of Death Valley. The valley floor is broad and flat; topographic features include sand dunes and volcanic cones (in Crater Flat). There is an alkali playa in Amargosa Flat.

The proposed Amargosa Valley SEZ is located in the northwest part of Amargosa Valley, immediately south of Bare Mountain and southwest of Crater Flat (Figure 11.1.7.1-3). Its terrain slopes gently to the southeast. Elevations range from about 2,800 ft (850 m) in the northwest corner to 2,520 ft (770 m) in the southeast corner. A large sand dune known as the Big Dune lies immediately to the east of the southeast corner of the SEZ, on the opposite side of the Amargosa River; the dune is protected as a BLM ACEC because it provides habitat for sensitive beetle species (Section 11.1.10).

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Amargosa Valley SEZ. Although extensive geologic studies have been conducted in the region as part of the hazards assessment for the proposed Yucca Mountain repository, solar project developers may need to conduct a geotechnical investigation to identify and assess geologic hazards locally to better identify facility design criteria and site-specific mitigation measures to minimize their risk.

Seismicity. The Amargosa Desert is located within the Walker Lane Belt, a northwest-trending seismic region along the Nevada–California border that accommodates (right-lateral shear) strain from movement between the Pacific and North American plates. The proposed Amargosa Valley SEZ lies just to the west–southwest of two extensional (normal) fault systems: the Bare Mountain fault, which runs along the base of Bare Mountain, separating it from the down-faulted Crater Flat basin to the east, and the eastern and western fault groups of the Yucca Mountain fault system, located within Crater Flat and on the southern flank of the southwestern Nevada volcanic field (Figure 11.1.7.1-4).

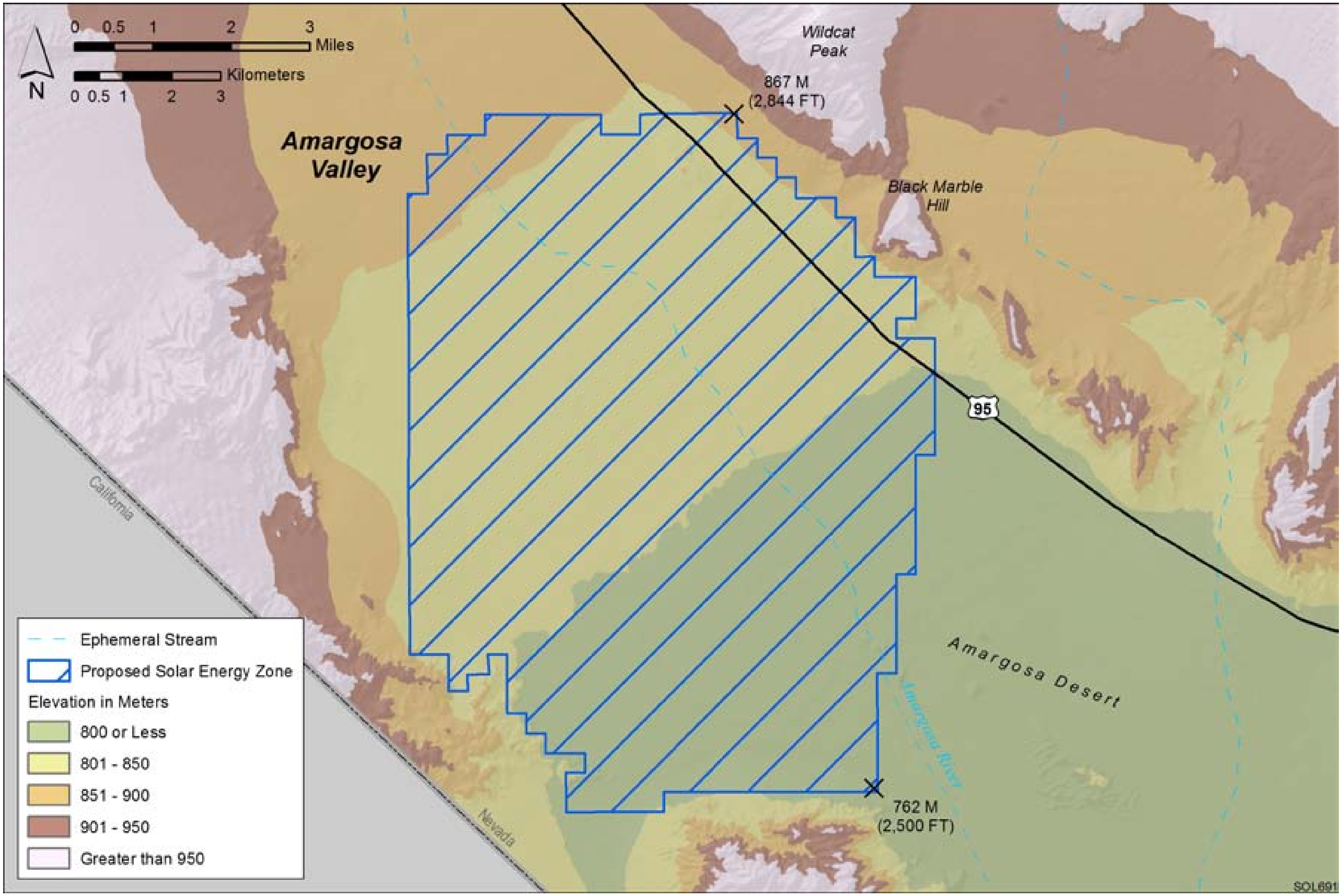

FIGURE 11.1.7.1-3 General Terrain of the Proposed Amargosa Valley SEZ

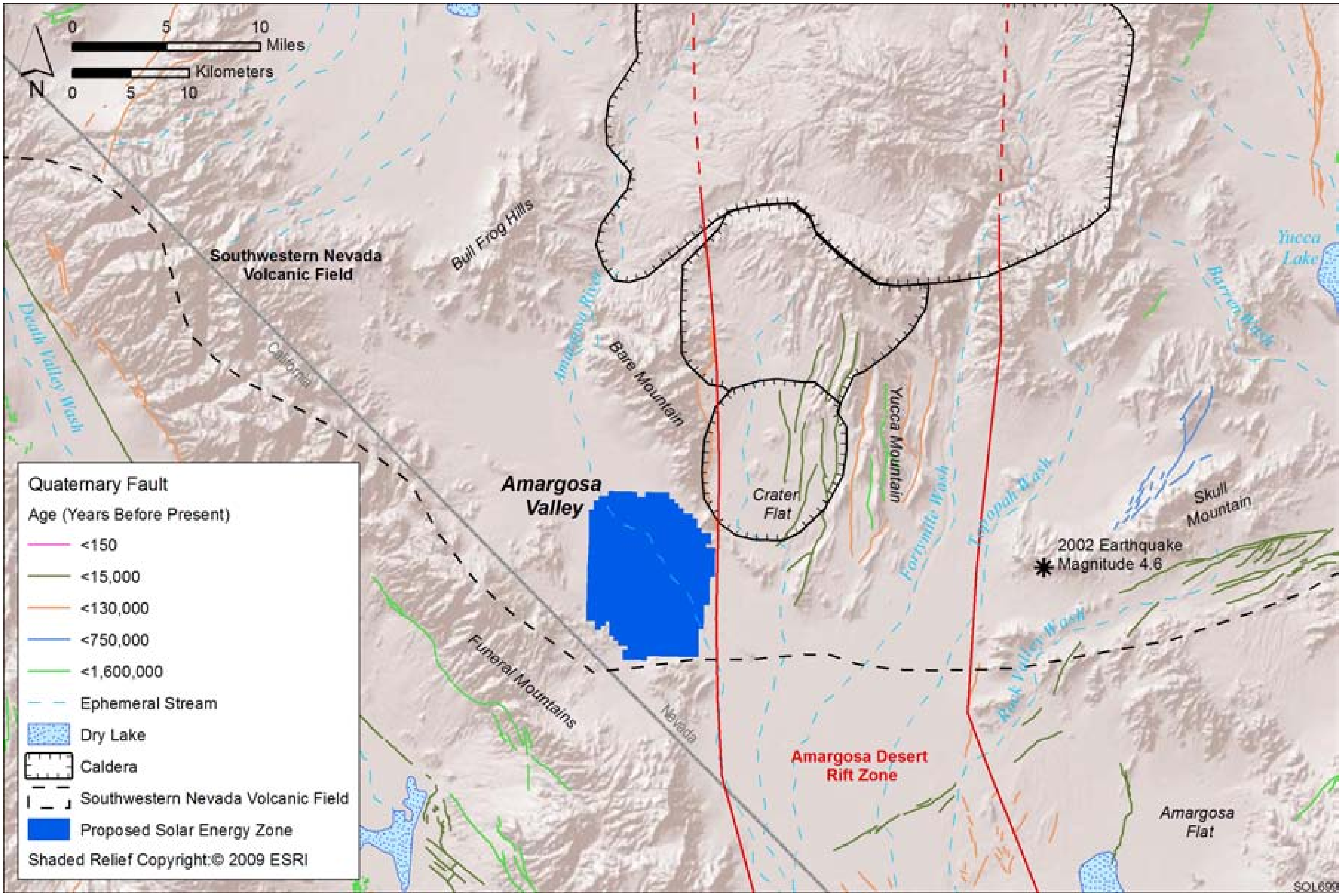

FIGURE 11.1.7.1-4 Quaternary Faults in Amargosa Valley Region (USGS and NBMG 2010; USGS 2010c)

The Bare Mountain fault extends 12 mi (20 km) along the eastern front of Bare Mountain, from Joshua Hollow south to the southeastern end of Black Marble Hill; its surface trace is mostly concealed by alluvial deposits but is generally thought to be defined by the sharp change in slope at the contact between mountain bedrock and valley alluvium. Displacement of about 10 ft (3 m) has been reported along a few scarps. Displaced sediments are predominantly Late Pleistocene (10,000 to 130,000 years old) or older, although displacements as recent as 9,000 years ago have been reported by Reheis (1988) near Wildcat Peak. Slip rates along the fault have been estimated to be less than 0.008 in./yr (0.2 mm/yr). Recurrence intervals are on the order of many tens of thousands of years (Anderson 1998a).

The western group of Yucca Mountain faults is located in the central part of Crater Flat, about 7 mi (11 km) east of the Amargosa Valley SEZ (Figure 11.1.7.1-4). This north-striking group of extensional (normal) faults displaces Quaternary deposits and Tertiary (Miocene) volcanic rocks. The faults tend to branch and splay to the north. Quaternary displacement within this group of faults is discontinuous and considered minor. Where there are scarps in Quaternary alluvium, they are typically less than 10 ft (3 m) high. Offsets of Holocene and Pleistocene age deposits place the most recent activity at less than 15,000 years ago. Slip rates along these faults are low, ranging from 0.001 to 0.03 mm/yr. Recurrence intervals are estimated at 17,000 to 40,000 years (Anderson 1998b).

Faults in the Yucca Mountain eastern group run along the eastern and western sides of Yucca Mountain (Figure 11.1.7.1-4). This group also consists of north-striking extensional (normal) faults with down displacement mainly to the west. The latest movement along the west-side faults was more recent than that along the east-side faults. Offsets of Pleistocene age deposits place the most recent activity at less than 130,000 years ago, with more recent movement along some individual faults (as recent as 5,000 to 10,000 years ago). Slip rates along these have been estimated to be less than 0.008 in./yr (0.2 mm/yr). Recurrence intervals are estimated at 17,000 to 40,000 years (Anderson 1998c).

From June 1, 2000 to May 31, 2010, 101 earthquakes were recorded within a 61-mi (100-km) radius of the proposed Amargosa Valley SEZ. The largest earthquake during that period occurred on June 14, 2002. It was located 20 mi (34 km) due east of the SEZ near Little Skull Mountain and was assigned a moment magnitude (Mw[2]) of 4.6 (Figure 11.1.7.1-4). An earthquake with a moment magnitude of 5.6 also occurred in this area on June 29, 1992 (USGS 2010c).

Liquefaction. The proposed Amargosa Valley SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.15 and 0.20 g. Shaking associated with this level of acceleration is generally perceived as strong to

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2 Moment magnitude (Mw) is used for earthquakes with magnitudes greater than 3.5 and is based on the moment of the earthquake, equal to the rigidity of the earth times the average amount of slip on the fault times the amount of fault area that slipped (USGS 2010e).

very strong; however, potential damage to structures is light to moderate (USGS 2008). Given the deep water table (generally over 300 ft (90 m) deep; USGS [2010b]) and the low to moderate intensity of ground shaking estimated for Amargosa Valley, the potential for liquefaction in valley sediments is likely to be low.

Volcanic Hazards. The Amargosa Desert is situated within the southwestern Nevada volcanic field, which consists of volcanic rocks (tuffs and lavas) of the Timber Mountain-Oasis Valley caldera complex and Silent Canyon and Black Mountain calderas. The area has been studied extensively because of its proximity to the Nevada Test Site and Yucca Mountain repository. Two types of fields are present in the region: (1) large-volume, long-lived fields with a range of basalt types associated with more silicic volcanic rocks produced by melting of the lower crust, and (2) small-volume fields formed by scattered basaltic scoria cones during brief cycles of activity, called rift basalts because of their association with extensional structural features. The basalts of the region typically belong to the second group; examples include the basalts of Silent Canyon and Sleeping Butte (Byers et al. 1989; Crowe et al. 1983).

The oldest basalts in the region were erupted during the waning stages of silicic volcanism in the southern Great Basin in the Late Miocene and are associated with silicic volcanic centers like Dome Mountain (the first group). Rates of basaltic volcanic activity in the region have been relatively constant but generally low. Basaltic eruptions closest to the proposed Amargosa Valley SEZ occurred from 1.7 million to 700,000 years ago, creating the cinder cones within Crater Flat (Stuckless and O'Leary 2007). The most recent episode of basaltic eruptions occurred at the Lathrop Wells Cone complex about 80,000 years ago (about 8 mi [13 km] east of the SEZ) (Stuckless and O'Leary 2007). There has been no silicic volcanism in the region in the past 5 million years. Current silicic volcanic activity occurs entirely along the margins of the Great Basin (Crowe et al. 1983).

Crowe et al. (1983) determined that the annual probability of a volcanic event for the region is very low (3.3×10^{-10} to 4.7×10^{-8}), similar to the probability of 1.7×10^{-8} calculated for the proposed Yucca Mountain repository (Cline et al. 2005). The volcanic risk in the region is associated only with basaltic eruptions; the risk of silicic volcanism is negligible. Perry (2002) cites geologic data that could indicate an increase in the recurrence rate (and thus the probability of disruption). These data include hypothesized episodes of an anomalously high strain rate, the hypothesized presence of a regional mantle hot spot, and new aeromagnetic data that suggest that previously unrecognized volcanoes may be buried in the alluvial-filled basins in the region.

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to facilities on the relatively flat terrain of valley floors like the Amargosa Valley, if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

Katzenstein and Bell (2005) report ground subsidence of (2.5 to 3.5 cm) related to groundwater withdrawal in the region, which has caused compaction in the underlying aquifer. Subsidence is not generally a serious hazard if it occurs as a broad depression over a large region (except in flood-prone areas sensitive to changes in elevation). The major problems associated with subsidence occur as a result of differential vertical subsidence, horizontal displacement, and earth fissures (Burbey 2002).

Other Hazards. Other potential hazards at the proposed Amargosa Valley SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Disturbance of soil crusts and desert pavement on soil surfaces may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those found in the Amargosa Valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) will depend on specific morphology of the fan (National Research Council 1996). Section 11.1.9.1.1 provides further discussion of flood risks within the Amargosa Valley SEZ.

11.1.7.1.2 Soil Resources

Soils within the proposed Amargosa Valley SEZ are gravelly sandy loams and gravelly loams of the Yermo, hot-Yermo, and Arizo Series, which together make up about 91% of the soil coverage at the site (Figure 11.1.7.1-5). Soil map units within the Amargosa Valley SEZ are described in Table 11.1.7.1-1. The level to nearly level soils are derived from alluvium from mixed sources, typical of soils on alluvial fans and fan remnants. They are characterized as deep and well to excessively drained. Most soils on the site have moderate surface runoff potential and moderate permeability. The natural soil surface is suitable for roads with a slight erosion hazard when used as roads or trails. Several of the soils (e.g., the Arizo very gravelly sandy loam and the Yermo-Greyeagle-Arizo association) are not suitable for roads (because of high flooding potential or severe erosion hazard when used as roads). The water erosion potential is low for most soils. The susceptibility to wind erosion is moderate, with as much as 56 tons (51 metric tons) of soil eroded by wind per acre (4,000 m^2) each year (NRCS 2010). Desert pavement is common on alluvial surfaces throughout the valley (Pelletier et al. 2007). Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

None of the soils within the proposed Amargosa Valley SEZ is rated as hydric.[3] Flooding is rare for most soils at the site except for the Arizo very gravelly sandy loam along the Amargosa River, which covers about 3,961 ac (km^2) and has an occasional flooding rating (with a 5 to 50% chance in any year). None of the soils is classified as prime or unique farmland (NRCS 2010).

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[3] A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding (NRCS 2010).

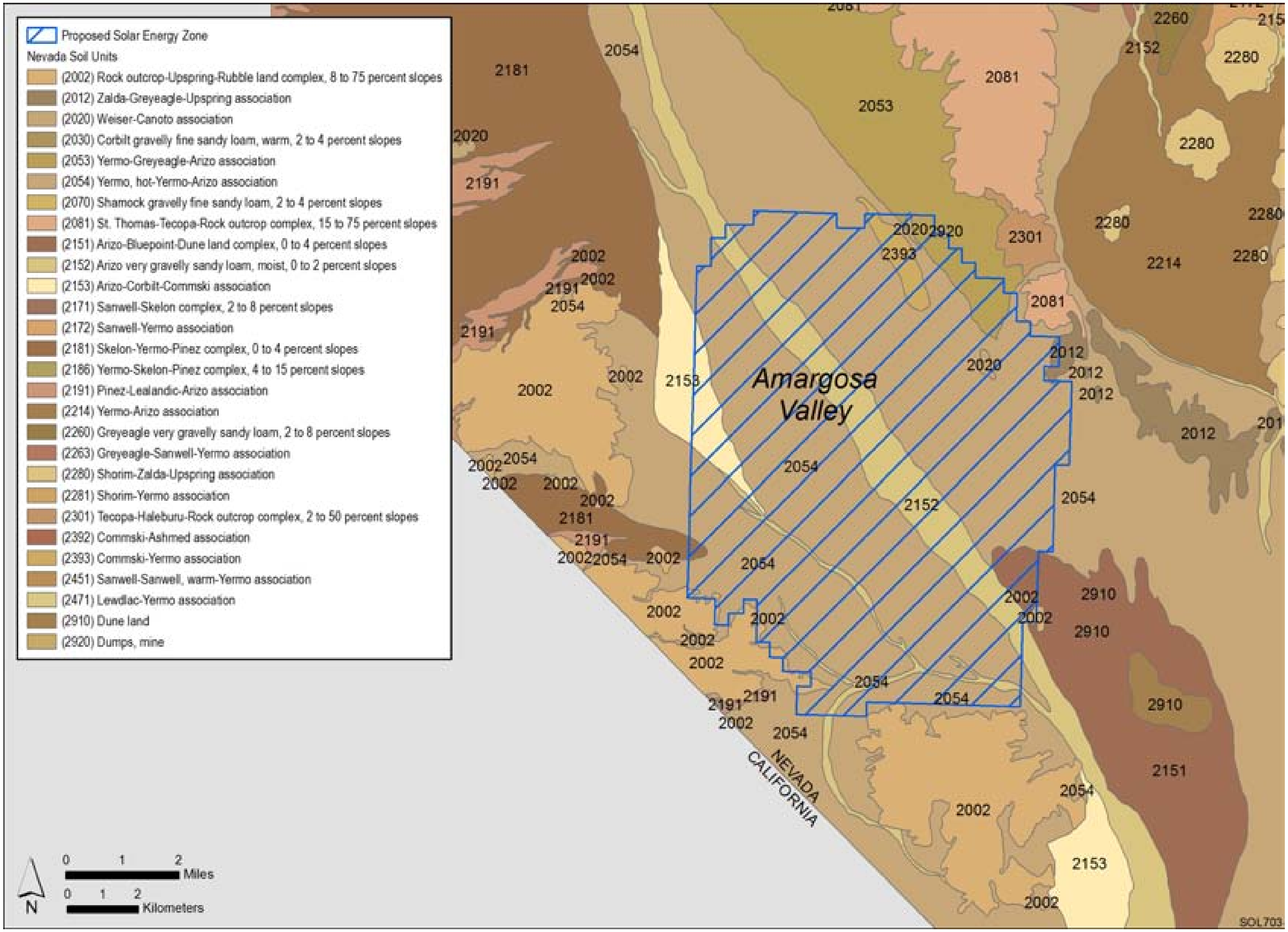

FIGURE 11.1.7.1-5 Soil Map for the Proposed Amargosa Valley SEZ (Source: NRCS 2008)

TABLE 11.1.7.1-1 Summary of Soil Map Units within the Proposed Amargosa SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
2054	Yermo, hot-Yermo-Arizo association (2 to 4% slopes)	Low (0.05)	Moderate (WEG 5)[d]	Consists of about 30% Yermo stratified extremely gravelly sandy loam to gravelly loam, 40% hot-Yermo very gravelly sandy loam, and 15% Arizo very gravelly sandy loam. Level to nearly level soils on inset fans and fan remnants. Parent material is alluvium from mixed sources. Deep to very deep and well to excessively drained, with moderate surface runoff potential and moderately rapid to very rapid permeability. Available water capacity is low. Slight rutting hazard. Used mainly as rangeland and wildlife habitat; unsuitable for cultivation.	24,801 (78)
2152	Arizo very gravelly sandy loam, moist (0 to 2% slopes)	Low (0.10)	Moderate (WEG 5)	Level to nearly level soils on inset fans and flood plains. Parent material is alluvium from mixed sources. Deep to very deep, well to excessively drained, with low surface runoff potential (high infiltration rate) and rapid to very rapid permeability. Available water capacity is low. Slight rutting hazard. Used mainly as rangeland and wildlife habitat; unsuitable for cultivation.	3,961 (13)
2053	Yermo-Greyeagle-Arizo association	Low (0.05)	Moderate (WEG 5)	Consists of 60% Yermo stratified extremely gravelly sandy loam to gravelly loam, 20% Greyeagle very gravelly sandy loam, and 15% Arizo very stony sandy loam. Sloping soils on alluvial fans, inset fans, and fan remnants. Parent material consists of alluvium from mixed sources. Shallow to moderately deep and well to excessively drained, with moderate surface runoff potential and moderately rapid to very rapid permeability. Available water capacity is very low to low. Slight rutting hazard. Used mainly as rangeland, wildlife habitat, and recreation land; unsuitable for cultivation.	804 (3)

TABLE 11.1.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
2153	Arizo-Corbilt-Commski association	Low (0.10)	Moderate (WEG 5)	Consists of 35% Arizo very gravelly sandy loam, 25% Corbilt very gravelly sandy loam, and 25% Commski very gravelly fine sandy loam. Level to nearly level soils on inset fans, fan skirts, and fan remnants. Parent material consists of alluvium from mixed sources, including limestone and dolomite. Deep to very deep and well to excessively drained, with moderate surface runoff potential and moderate to very rapid permeability. Available water capacity is very low to low. Slight rutting hazard. Used mainly as rangeland and wildlife habitat; unsuitable for cultivation.	761 (2)
2393	Commski-Yermo association	Low (0.15)	Moderate (WEG 5)	Consists of 70% Commski very gravelly fine sandy loam and 25% Yermo stratified extremely gravelly sandy loam to gravelly loam. Nearly level soils formed on inset fans and fan remnants. Parent material consists of alluvium derived from mixed sources, including limestone and dolomite. Moderately deep and well drained, with moderate surface runoff potential and moderate to very rapid permeability Low resistance to compaction. Available water capacity is high. Slight rutting hazard. Used mainly as rangeland and wildlife habitat; unsuitable for cultivation.	458 (1)
2151	Arizo-Bluepoint-Dune land complex (0 to 4% slopes)	Low (0.10)	Moderate (WEG 5)	Consists of 40% Arizo very gravelly sandy loam, 35% Bluepoint loamy fine sand, and 15% Dune land fine sand. Level to nearly level soils on inset fans, sand sheets, and dunes. Parent material consists of alluvium from mixed sources and eolian sands. Deep to very deep and somewhat excessively to excessively drained, with low surface runoff potential (high infiltration rate) and rapid to very rapid permeability. Available water capacity is low. Moderate rutting hazard. Used mainly as rangeland and wildlife habitat; unsuitable for cultivation.	415 (1)

TABLE 11.1.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
2002	Rock outcrop-Upspring-Rubble land complex (8 to 75% slopes)	Not rated	Not rated	Consists of 45% rock outcrop, 30% Upspring very gravelly sandy loam, and 15% rubble land fragments. Steeply sloping soils on hills. Very shallow and somewhat excessively to excessively drained. Parent material (Upspring) consists of colluvium from volcanic rocks over residuum weathered from volcanic rocks. Available water capacity is moderate. Available water capacity is very low. Slight rutting hazard. Upspring soils used mainly for watershed, wildlife habitat, and recreation land.	228 (<1)

[a] Water erosion potential rates based on soil erosion factor K, which indicates the susceptibility of soil to sheet and rill erosion by water. Values range from 0.02 to 0.69 and are provided in parentheses under the general rating; a higher value indicates a higher susceptibility to erosion. Estimates based on the percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8 low (see footnote d for further explanation).

[c] To convert from acres to km^2, multiply by 0.004047.

[d] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year.

[e] To convert from in. to cm, multiply by 2.54.

Source: NRCS (2010).

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11.1.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy facilities in varying degrees and are described in more detail for the four phases of development in Section 5.7 1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility since some components would involve greater disturbance and would take place over a longer timeframe.

It is not known whether construction within the proposed Amargosa Valley SEZ would affect the eolian processes that maintain the Big Dune to the east of the site. Because the area is a designated ACEC and provides habitat for sensitive species, the BLM may require a study to evaluate the impacts of building a solar facility in close proximity to the landform and to develop specific mitigation measures to avoid or minimize them.

11.1.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Amargosa SEZ. Implementing the programmatic design features described under both Soils and Air Quality in Appendix A, Section A.2.2., as required under BLM's Solar Energy Program, would reduce the potential for soil impacts during all project phases.

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11.1.8 Minerals (Fluids, Solids, and Geothermal Resources)

11.1.8.1 Affected Environment

There are no locatable mining claims within the proposed Amargosa Valley SEZ (BLM and USFS 2010c). The land of the SEZ was closed to locatable mineral entry in June 2009, pending the outcome of this solar energy PEIS. There is a closed oil and gas lease in the northwest corner of the SEZ, but no development has occurred (BLM and USFS 2010b). The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals and for disposal of salable minerals. There is an area just outside the northeast boundary of the SEZ that has been nominated for geothermal leasing, but no geothermal leasing or development has occurred within or adjacent to the Amargosa Valley SEZ (BLM and USFS 2010b).

11.1.8.2 Impacts

If the area is identified as a solar energy development zone, it will continue to be closed to all incompatible forms of mineral development. Since the SEZ does not contain existing mining claims, it is assumed there would be no future loss of locatable mineral production.

For the purpose of this analysis, it is assumed that future development of oil and gas and geothermal resources would continue to be possible, since such development could occur from directional drilling from outside of the SEZ.

The production of common minerals, such as sand and gravel and mineral materials used for road construction, might take place in areas not directly developed for solar energy production.

11.1.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for impacts to mineral resources.

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11.1.9 Water Resources

11.1.9.1 Affected Environment

The proposed Amargosa Valley SEZ is located within the Northern Mojave-Mono Lake subbasin of the California hydrologic region (USGS 2010a) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The Amargosa Desert Valley is oriented from northwest to southeast with surface elevations in the surrounding mountains reaching up to 6,275 ft (1,913 m) in the Bare Mountains (Figure 11.1.9.1-1), and surface elevations in the valley region of the proposed SEZ ranging between 2,500 and 2,825 ft (762 and 861 m). The climate in this region of Nevada is characterized as having low humidity and precipitation, with mild winters and hot summers (Planert and Williams 1995; WRCC 2010a). The average annual precipitation in the Amargosa Desert Valley is 4 in./yr (10 cm/yr), with average annual snowfalls in the surrounding mountains near the town of Beatty on the order of 3 in./yr (8 cm/yr) (WRCC 2010b,c). Water losses by evapotranspiration often exceed precipitation amounts in the Basin and Range physiographic province (Planert and Williams 1995), and pan evaporation rates are on the order of 93 in./yr (236 cm/yr) (Cowherd et al. 1988; WRCC 2010d). Reference crop evapotranspiration has been estimated at 70 in./yr (178 cm/yr) near the Amargosa Farms area (Huntington and Allen 2010).

11.1.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

There are no perennial surface water features in the proposed Amargosa Valley SEZ. The Amargosa River is an intermittent stream that enters the valley out of the Bare Mountains to the northwest and flows south and southeast across the valley and through the proposed SEZ (Figure 11.1.9.1-1). In the region of the proposed SEZ, the Amargosa River forms a braided pattern of poorly defined ephemeral stream channels that cover a total width ranging from 0.5 to 1.0 mi (0.8 to 1.6 km). The Amargosa River is typically dry except for peak flows that typically last hours to days as the result of regional precipitation events; the peak flows typically generate substantial debris flows, channel incision, and erosion (Beck and Glancy 1995). Peak flows in the Amargosa River range from 1 to 1,300 ft^3/s (0.03 to 37 m^3/s) coming out of the Bear Mountains near the town of Beatty, Nevada (USGS 2010b; gauges 10251217, 10251220), and from 0 to 700 ft^3/s (0 to 20 m^3/s) in the desert valley near the proposed SEZ (USGS 2010b; gauges 10251223, 10251225). The recorded peak flows in the Amargosa River have typically occurred during the late spring and summer months as the result of either short or moderate duration rainfall events with the potential of snowpack melting contributing to the rainfall runoff (Tanko and Glancy 2001).

Several ephemeral drainages and intermittent streams also drain the surrounding mountains of the Amargosa Desert Valley. Three intermittent streams are located to the east of the proposed SEZ and drain into the Amargosa River approximately 25 mi (40 km) to the southeast of the SEZ: an unnamed intermittent stream, located 4 mi (6.4 km) east; Fortymile Wash, located 9.5 mi (15.3 km) east; and Topopah Wash, located 13 mi (21 km) east of the SEZ (Figure 11.1.9.1-1). Other surface water features near the proposed SEZ include the reservoirs,

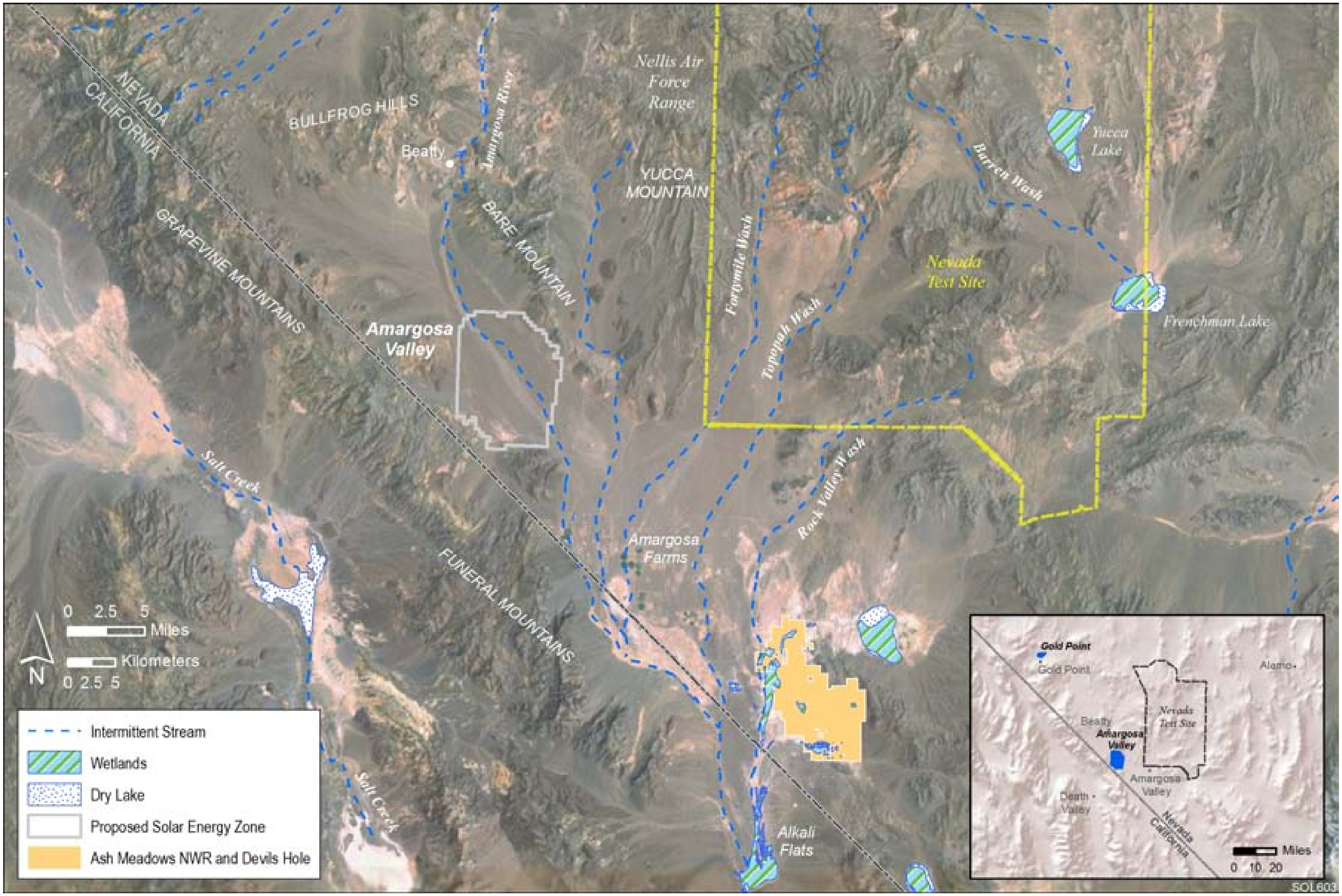

FIGURE 11.1.9.1-1 Surface Water Features near the Proposed Amargosa Valley SEZ

wetlands, streams, and springs located near Ash Meadows NWR, Devils Hole (a unit of Death Valley NP), and the Alkali Flats area, which are located approximately 25 mi (40 km) southeast of the proposed SEZ (Figure 11.1.9.1-1).

The majority of the northern portion of the Amargosa Desert Valley is classified as having minimal to moderate flood hazard potential (Zone X) and is within the 500-year floodplain (FEMA 2009). The intermittent stream channels of the Amargosa River are within the 100-year floodplain (Zone A) that covers an area of 3,915 acres (16 km^2) within the proposed SEZ (Figure 11.1.9.1-1). As mentioned previously, flooding in the Amargosa River occurs during large rainfall events lasting hours to days and can cause significant debris flows, erosion, and sedimentation issues (Beck and Glancy 1995; Tanko and Glancy 2001). For the rest of the proposed SEZ, intermittent flooding may occur with temporary ponding and erosion.

No wetlands have been identified on the proposed SEZ according to the National Wetlands Inventory (NWI) (USFWS 2009). The most significant wetlands within the Amargosa Desert Valley are located within Ash Meadows NWR, located approximately 25 mi (40 km) southeast of the proposed SEZ (Figure 11.1.9.1-1). A few small wetlands (less than 35 acres [0.1 km^2]) are located along the Amargosa River near the town of Beatty in the Bare Mountains to the north of the proposed SEZ. Further information regarding the wetlands within the region of the proposed SEZ is described in Section 11.1.10.1.

11.1.9.1.2 Groundwater

The proposed Amargosa Valley SEZ is located within the Amargosa Desert groundwater basin (NDWR 2010a). The primary groundwater resources available to the proposed SEZ are in the basin-fill aquifer of the northern portion of the Amargosa Desert Valley. The basin-fill aquifer consists of river channel, playa, alluvial fan, freshwater limestone, and conglomerate units of Quaternary and late Tertiary age deposits. The river channel, alluvial fan, and conglomerate units consist of well-sorted clay to gravel; the limestone and playa units consist of fine-grained sediments (Kilroy 1991). The basin-fill deposits are on the order of 1,500 ft (457 m) thick in the region of the proposed SEZ and up to 5,000 ft (1,524 m) in thickness towards the southern portion of the Amargosa Desert Basin (Burbey 1997; Sweetkind et al. 2001). The bedrock below the basin-fill deposits is primarily Precambrian and Cambrian noncarbonate rocks in the north and Paleozoic carbonate rocks in the southeastern part of the Amargosa Desert Basin (Burbey 1997). The carbonate rocks are a part of the carbonate rock province (covering a large portion of eastern Nevada and western Utah, along with portions of Arizona and California), which forms several hydraulically-connected, interbasin groundwater flow systems (Harrill and Prudic 1998).

Flow in the basin-fill aquifer generally follows the Amargosa River from northwest to southeast in the northwestern portion of the Amargosa Desert Basin, and then south into California (Kilroy 1991). Complex faulting occurs within the Amargosa Desert Valley (see Section 11.1.7.1.1) and near the vicinity of Ash Meadows NWR, a series of northwest-southeast trending faults (referred to as the Gravity Fault) creates a juxtaposition between the low-permeability, basin-fill deposits and the highly-permeable, carbonate-rock aquifer (Burbey 1997;

Sweetkind et al. 2004). The hydraulic connectivity along the Gravity Fault is not fully realized; however, historical groundwater withdrawals in the basin-fill aquifer have been linked with declines in water levels of surface springs and seeps in Ash Meadows NWR and at geothermal groundwater pool at Devils Hole (Faunt et al. 2004). Transmissivity values in the basin-fill aquifers of the Amargosa Desert Valley and adjacent valleys range from 0.02 to 64,600 ft^2/day (0.002 to 6,000 m^2/day), and from 0.05 to 366,000 ft^2/day (0.005 to 34,000 m^2/day) in the regional-scale carbonate-rock aquifer (Belcher et al. 2001).

The carbonate-rock aquifer in this region is a part of an interbasin groundwater system flowing from northeast to southwest, and the geologic and hydraulic interactions occurring at the Gravity Fault causes groundwater discharge to a series of approximately 30 springs near Ash Meadows NWR (Faunt et al. 2004). The springs located at Ash Meadows NWR support 26 species of endemic plants and animals (see Sections 11.1.10.1 and 11.1.12.1 for further details) (NPS 2007). Additionally, the collapsed limestone cavern and geothermal pool at Devils Hole (referred to as a "skylight to the water table") is the only remaining habitat for an endangered species of pupfish (Riggs and Deacon 2004).

The Amargosa Desert Basin is a part of the regional-scale Death Valley Regional Groundwater Flow System (DVRFS) (information on the DVRFS is available at http://regmod.wr.usgs.gov) that encompasses several surrounding valleys in southern Nevada and portions of California. Groundwater recharge is primarily derived from snow and precipitation runoff in the high-elevation mountains, with interbasin transfers primarily through the regional-scale carbonate-rock aquifers (San Juan et al. 2004). The proposed Amargosa Valley SEZ is situated over a basin-fill aquifer that receives approximately 90 ac-ft/yr (111,000 m^3/yr) groundwater recharge from infiltration of the Amargosa River as it enters the Amargosa Desert Valley near the town of Beatty, a location of intermittent flow that becomes ephemeral within approximately 2 mi (3 km) downstream into the desert valley (Stonestrom et al. 2007). Estimates of groundwater recharge from precipitation in the valley and the surrounding mountains range from 600 ac-ft/yr (740,000 m^3/yr) (NDWR 2007) to 1,200 ac-ft/yr (1.5 million m^3/yr) (Burbey 1997). Another source of recharge to the basin-fill aquifer of the Amargosa Desert Basin is discharge from the carbonate-rock aquifer in the area of Ash Meadows NWR (Faunt et al. 2004), with estimates of recharge ranging from 19,000 to 44,000 ac-ft/yr (23.4 million to 54.3 million m^3/yr) (Burbey 1997; NDWR 2007). Discharge of groundwater from the Amargosa Desert Basin is largely driven by evapotranspiration, groundwater withdrawals, discharge to springs near Ash Meadows, and subsurface outflow (San Juan et al. 2004). Evapotranspiration from phreatophytes, bare soils, and surface springs combined is from 17,000 to 24,000 ac-ft/yr (Burbey 1997). Groundwater withdrawals were 16,380 ac-ft/yr (22 million m^3/yr) in 2009 (NDWR 2010b).

Groundwater flows from northwest to southeast under the proposed Amargosa Valley SEZ with groundwater surface elevations ranging from 2,365 to 2,470 ft (721 to 753 m) in the western portion of the SEZ and from 2,349 to 2,358 ft (716 to 719 m) in the eastern portion of the SEZ (USGS 2010b; well numbers 364246116445701, 364600116410901, 364141116351402). Groundwater surface elevations have been relatively steady over time in the northern portion of the Amargosa Desert Valley, with significant groundwater drawdown occurring near the irrigated fields of the Amargosa Farms region located approximately 10 to

15 mi (16 to 24 km) southeast of the proposed SEZ. Groundwater surface elevations have fallen at a rate of 0.5 to 1.5 ft/yr (0.2 to 0.5 m/yr) since the late 1980s near Amargosa Farms (USGS 2010b; well numbers 363310116294001, 363317116270801), where groundwater surface elevations had previously declined an approximate 27 ft (8 m) from 1962 to 1984 (Nichols and Akers 1985). Groundwater surface elevations have been steady over the past two decades at Ash Meadows (Fenelon and Moreo 2002), with depth to groundwater approximately 20 ft (6 m) below the land surface (USGS 2010b; well number 362425116181001). The Devils Hole geothermal pool gauge measures water table levels relative to a set datum. Water table elevations in Devils Hole were drastically lowered during the 1960s and 1970s as a result of nearby groundwater withdrawals for irrigation, which were then ceased by the mid-1970s (Riggs and Deacon 2004; Section 11.1.9.1.3). The water table levels reached a low of 3.7 ft (1.2 m) below the datum between 1972 to 1973, and slowly recovered by the late 1980s to a level around 2 ft (0.6 m) below the datum (USGS 2010b; well number 362532116172700). From 1988 to 2004, water table elevations in Devils Hole have gradually declined, which has been suspected to be a result of regional-scale groundwater withdrawals and changes to groundwater recharge rates (Bedinger and Harrill 2006).

Groundwater quality varies across the Amargosa Desert Valley in relation to the locations of the dominant basin-fill and carbonate-rock aquifers, respectively (Claassen 1985). Overall, the water quality is relatively good with exceptions for elevated total dissolved solids (TDS, 200 to 1,100 mg/L), arsenic (0.01 to 0.02 mg/L), fluoride (1.6 to 3.4 mg/L), and sulfate (18 to 420 mg/L) concentrations (DOE 2002; USGS 2010b). Primary drinking water maximum contaminant levels (MCL) are 0.01 mg/L arsenic and 4.0 mg/L for fluoride, and in Nevada, secondary MCL standards are 1,000 mg/L for TDS and 500 mg/L for sulfate (*Nevada Administrative Code* 445A.455 [NAC 445A.455]). An additional water quality concern is the potential for the transport of radioactive compounds from the Nevada Test Site in groundwater. However, several studies investigating the potential Yucca Mountain Repository project found concentrations of radionuclides in the Amargosa Desert Valley to be well below primary drinking water MCLs (DOE 2002). Elevated concentrations of naturally occurring radon and uranium also occur in the Amargosa Desert Valley that are below the MCL for uranium and above the proposed MCL for radon (DOE 2008).

11.1.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Nye County were 76,859 ac-ft/yr (94.8 million m^3/yr), of which 41% came from surface waters and 59% came from groundwater. The largest water use category was irrigation, at 56,583 ac-ft/yr (69.8 million m^3/yr), of which 55% came from surface waters and 45% came from groundwater. Groundwater supplied the majority of the remaining water uses, with 12,431 ac-ft/yr (15.3 million m^3/yr) for domestic supply and 6,580 ac-ft/yr (8.1 million m^3/yr) for mining (Kenny et al. 2009).

All waters in Nevada are the property of the public in the State of Nevada and subject to the laws described in *Nevada Revised Statutes* (NRS), Chapters 532 through 538 (available at http://leg.state.nv.us/nrs). The Nevada Division of Water Resources (NDWR), led by the State

Engineer, is the agency responsible for managing both the surface water and groundwater resources, which includes overseeing water right applications, appropriations, and interbasin transfers (NDWR 2010c). The two principle ideas behind water rights in Nevada are the prior appropriations doctrine and the concept of beneficial use. A water right establishes an appropriation amount and date such that more senior water rights have priority over newer water rights. Additionally, water rights are treated as both real and personal property, such that water rights can be transferred without affecting the land ownership (NDWR 2010c). Water rights applications (new or transfer of existing) are approved if the water is available to be appropriated, if existing water rights will not be affected, and if the proposed use is not deemed to be harmful to the public interest. If these conditions are satisfied according to the State Engineer, a proof of beneficial use of the approved water must be provided within a certain time period, and following that a certificate of appropriation is issued (BLM 2001).

The proposed Amargosa Valley SEZ is located in the Amargosa Desert groundwater basin (NDWR 2010a). The NDWR estimates the perennial yield for each groundwater basin as the amount of water that can be economically withdrawn for an indefinite period without depleting the source (NDWR 1999). The perennial yield for the Amargosa Desert basin (in combination with five smaller adjacent basins to the north and east) is 24,000 ac-ft/yr (29.6 million m^3/yr), of which 17,000 ac-ft/yr (21.0 million m^3/yr) is committed to the USFWS for wildlife purposes and accounted for as discharge to the system of springs at Ash Meadows NWR (NDWR 2007). The remaining 7,000 ac-ft/yr (8.6 million m^3/yr) of the perennial yield is over-appropriated in the Amargosa Desert Basin, with 25,335 ac-ft/yr (31.5 million m^3/yr) committed to beneficial uses (NDWR 2010d). In 2009, the actual amount of groundwater withdrawal was 16,380 ac-ft/yr (22.0 million m^3/yr), which is slightly more than double the amount of available allocations of the perennial yield (NDWR 2010b).

Groundwater management in the Amargosa Desert Basin is largely affected by the U.S. Supreme Court decision of *Cappaert v. U.S.* (1976), which recognized the water right at Devils Hole (a set water level relative to the gauge datum) and subsequently limited groundwater withdrawals in the nearby vicinity (NPS 2007). In 1979, in order to maintain the Devils Hole water level and to prevent overuse of the region's groundwater, the State Engineer declared the Amargosa Desert Basin a designated groundwater basin (NDWR 1979; Order 724), which essentially limits well drilling prior to the permit application, with exception to domestic wells (NDWR 1999). Numerous applications for new groundwater withdrawals were denied by State Engineer's Ruling 5750 (NDWR 2007), which stated that the Amargosa Desert Basin was over-appropriated. In 2008, the State Engineer's Order 1197 (NDWR 2008) stated that new water right applications in the Amargosa Desert Basin would be denied, as would any application seeking to change the point of diversion closer to Devils Hole (defined by a 25-mi [40-km] radius around Devils Hole). There were five exemptions regarding water right transfer applications listed in Order 1197, and the one most applicable to potential solar energy development is that the NDWR would assess the potential impacts at Devils Hole on a case-by-case basis for projects seeking to transfer multiple existing water rights (presumably moving points of diversion away from Devils Hole in order to reduce impacts). This exception suggests that developers need to assess the location and connectivity of existing water right locations to Devils Hole when seeking available water right transfers.

11.1.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, and off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water–wetland–groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by the excessive withdrawal from aquifers).

11.1.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy facilities, which are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of design features described in Appendix A, Section A.2.2. Land disturbance activities should be minimized in the vicinity of the ephemeral stream channels of the Amargosa River. During large storm events, peak flows in the Amargosa River can cause substantial debris flow that could damage any structures related to a solar energy facility. In addition, extensive alterations to the natural drainage pattern of the Amargosa River could enhance erosion processes, disrupt groundwater recharge, and negatively affect plant and animal habitats associated with the ephemeral channels.

11.1.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Amargosa Valley SEZ include the following:

- On the basis of a total area of 31,625 acres (128 km^2), it is assumed that three solar projects would be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;

- The maximum land disturbance for an individual solar facility during the peak construction year is 3,000 acres (12 km^2);

- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, results in the potential to disturb up to 28% of the SEZ total area during the peak construction year; and

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry cooling (see Section 5.9.2.1).

Site Characterization

During site characterization, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for controlling fugitive dust and the workforce potable water supply. Because there are no significant surface water bodies on the proposed Amargosa Valley SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources. Water requirements for dust suppression and potable water supply during construction are shown in Table 11.1.9.2-1 and could be as high as 4,886 ac-ft (6.0 million m^3). The assumptions underlying these estimates for each solar energy technology are described in Appendix M.

TABLE 11.1.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Amargosa Valley SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	3,168	4,752	4,752	4,752
Potable supply for workforce (ac-ft)	222	135	56	28
Total water use requirements (ac-ft)	3,390	4,886	4,808	4,780
Wastewater generated				
Sanitary wastewater (ac-ft)	222	135	56	28

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Table M.9-1 (Appendix M0.

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 93 in./yr (236 cm/yr) (Cowherd et al. 1988; WRCC 2010d).

[c] To convert ac-ft to m^3, multiply by 1,234.

Groundwater wells would have to yield an estimated 2,100 to 3,027 gpm (7,949 to 11,458 L/min) to meet the estimated construction water requirements. These well yields are on the same order of magnitude as large municipal and agricultural production wells (Harter 2003), so multiple wells may be needed in order to obtain the water requirements. Groundwater to be used for potable water supply needs to meet or be treated to meet drinking water standards according to NAC (445A.453-445A.455). In addition, up to 222 ac-ft (273,800 m^3) of sanitary wastewater would be generated and would need to be treated either on-site or sent to an off-site facility.

The estimated total water use requirements during the peak construction year are substantial given the limited groundwater resources available in the Amargosa Desert Basin. Obtaining groundwater sources in the Amargosa Desert Basin is difficult because of over-allocated condition of water rights in the basin. The senior water rights of the USFWS constitute a substantial portion of the perennial yield in the Amargosa Desert Basin with the remaining 7,000 ac-ft/yr (8.6 million m^3/yr) of perennial yield being over-allocated by approximately a factor of two (see Section 11.1.9.1.3). The water use needs during the peak construction year represent as much as 70% of the available perennial yield available to the basin, and all water rights would need to be purchased and transferred. While groundwater surface elevations have been relatively steady in the northern portion of the Amargosa Desert Basin where the proposed SEZ is located, the addition of groundwater withdrawals for the peak construction year could potentially cause drawdown of the groundwater similar to that experienced near the irrigated fields of the Amargosa Farms area.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 11.1.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, hybrid, wet). Further refinements to water requirements for cooling would result from the percentage of time the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 11.1.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per MW. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 141 to 2,530 ac-ft/yr (173,900 to 3.1 million m^3/yr), and the workforce potable water supply from 3 to 71 ac-ft/yr (3,700 to 87,600 m^3/yr). Groundwater used for the potable supply may need treatment to conform to drinking water quality standards, described previously. The determination of water quality for potable water supply would be done during the site characterization phase. The maximum total water usage during normal operation at full build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 75,971 ac-ft/yr (93.7 million m^3/yr). Water usage for dry-cooling systems would be as high as 7,661 ac-ft/yr (9.4 million m^3/yr), approximately a factor of 10 times less than the wet-cooling option. Non-cooled technologies, dish engine and PV systems, require substantially

TABLE 11.1.9.2-2 Estimated Water Requirements during Operations at the Proposed Amargosa Valley SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	5,060	2,811	2,811	2,811
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	2,530	1,406	1,406	141
Potable supply for workforce (ac-ft/yr)	71	32	32	3
Dry-cooling (ac-ft/yr)[e]	1,012–5,060	562–2,811	NA[f]	NA
Wet-cooling (ac-ft/yr)[e]	22,770–73,370	12,650–40,761	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	1,438	144
Dry-cooled technologies (ac-ft/yr)	3,613–7,661	2,000–4,249	NA	NA
Wet-cooled technologies (ac-ft/yr)	25,371–75,971	14,088–42,199	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	1,437	799	NA	NA
Sanitary wastewater (ac-ft/yr)	71	32	32	3

[a] Land area for parabolic trough was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

[b] Water needs are linearly related to power. Water usage for any other size project can be estimated by using the multipliers provided in Table M.9-2 (Appendix M).

[c] Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

[d] To convert ac-ft to m^3, multiply by 1,234.

[e] Dry-cooling value assumes 0.2 to 1.0 ac-ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac-ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009).

[f] NA = not applicable.

[g] Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

less water at full build-out capacity, at 1,438 ac-ft/yr (1.8 million m^3/yr) for dish engine and 144 ac-ft/yr (177,600 m^3/yr) for PV (Table 11.1.9.2-2). Operations would produce up to 71 ac-ft/yr (87,600 m^3/yr) of sanitary wastewater; in addition, for wet-cooled technologies, 799 to 1,437 ac-ft/yr (1 million to 1.8 million m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed Amargosa Valley SEZ. Water use requirements for parabolic trough and power tower facilities using wet cooling are typically greater than the perennial yield for the Amargosa

Desert Basin. Therefore, wet-cooling would not be a feasible option for development at the proposed Amargosa Valley SEZ. The water use estimates for dry-cooling range from 2,000 to 7,661 ac-ft/yr (2.5 million to 9.4 million m^3/yr), which could potentially cause impacts associated with the drawdown of groundwater surface elevations at the upper ends of this water use range. In addition, obtaining water rights in the Amargosa Desert Basin requires the transfer of existing rights, as well as the review process of the NDWR to ensure more senior rights and the aquifer's sustainability are not impaired. Given that the higher values of water use for dry-cooling are of similar magnitude to the available portion of the perennial yield for the Amargosa Desert Basin, securing water rights may be cost or time prohibitive. Dish engine and PV facilities would be the preferred technologies for use at the proposed Amargosa Valley SEZ with respect to water use requirements.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled and the site reclaimed to its pre-construction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and may also include water to establish vegetation in some areas, but the total volume of water needed is expected to be less. Because quantities of water needed during the decommissioning/reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

11.1.9.2.3 Off-Site Impacts: Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. The extent of the impacts on water resources is proportional to the amount and location of land disturbance needed to connect the proposed SEZ to major roads and existing transmission lines. The proposed Amargosa Valley SEZ is located adjacent to existing roads and transmission lines, as described in Section 11.1.1.2, so it is assumed that impacts associated with the construction of roads and transmission lines outside of the SEZ would be negligible.

11.1.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy at the proposed Amargosa Valley SEZ are associated with land disturbance effects on the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation issues, as well as altering groundwater recharge and discharge processes. The multithread channels of the Amargosa River should be avoided for siting infrastructure for solar energy development (an area of 3,915 acres [16 km^2] within the proposed SEZ), as this area is within a 100-year floodplain and has a history of conveying substantial debris flows during large storm events

(Beck and Glancy 1995; Tanko and Glancy 2001). In addition, alterations to ephemeral washes that feed into the Amargosa River should be minimized to avoid potential erosion issues and to maintain the infiltration capacity of the channels, which are a primary groundwater recharge source for the basin-fill aquifer. The water quality of the groundwater in the Amargosa Desert Basin is relatively good, but it may need some treatment if used for a potable water supply source.

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater is the primary water resource available to solar energy facilities in the proposed Amargosa Valley SEZ. The water use requirements for technologies using wet cooling are greater than the perennial yield of the Amargosa Desert groundwater basin, so wet cooling would not be feasible for the full build-out scenario. Dry-cooling technologies for the full build-out scenario have the potential to cause drawdown of groundwater surface elevations, especially at higher operating times. Additionally, the upper ranges of water use requirements for dry-cooling technologies are on the same order of magnitude as the transferrable portion of the perennial yield available to the Amargosa Desert Basin. Given that all water rights must be purchased and transferred, which involves a substantial review process by the NDWR, securing water rights for dry-cooling technologies may become cost and time prohibitive. Facilities seeking to use dry-cooling technologies should implement water conservation practices to limit water needs. Dish engine and PV systems would be the preferred technologies for development at the proposed Amargosa Valley SEZ in terms of water use requirements.

The limited groundwater resources available in the Amargosa Desert Basin and its designated status means that water right transfer applications face scrutiny with respect to potential drawdown effects in the basin and with particular emphasis on discharges to the springs at Ash Meadows and water table elevations at Devils Hole. While the perennial yield of the Amargosa Desert Basin is 24,000 ac-ft/yr (29.6 million m^3/yr), 17,000 ac-ft/yr (20.9 million m^3/yr) is committed to wildlife purposes as discharge to the system of springs located within Ash Meadows NWR. The remaining 7,000 ac-ft/yr (8.6 million m^3/yr) of the perennial yield is over-allocated with 25,335 ac-ft/yr (31.2 million m^3/yr) committed for beneficial uses, of which 16,380 ac-ft/yr (22.0 million m^3/yr) was used in 2009 (see Section 11.1.9.1.3 for details). Given these constraints of limited water resources and over-allocated water rights, solar energy developers will need to limit water requirements through whatever means are available, which could potentially include any combination of the following: choosing low-water demanding dish engine and PV technologies, implementing water conservation measures including the use of recycled water sources, and by purchasing water rights in excess of the needed requirements in order to retire over-allocated water rights.

11.1.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require the programmatic design features given in Appendix A, Section A.2.2, to be implemented, thus mitigating some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Design features specific to the proposed Amargosa Valley SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures;

- Land disturbance activities should minimize impacts on natural drainage patterns near the Amargosa River to avoid erosion issues and clogging of groundwater recharge zones and affecting critical habitats;

- Siting of solar facilities and construction activities should be avoided within the 100-year floodplain of the Amargosa River (3,915 acres [16 km2]);

- Coordination with the NDWR should be conducted during the process of obtaining water rights in the over-allocated Amargosa Desert Basin in order to reduce basin-wide groundwater extractions and to comply with the State Engineer's Order 1197 (NDWR 2008) addressing the priority water rights and protections pertaining to Ash Meadows National Wildlife Refuge and Devils Hole;

- Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection (NDEP 2010);

- Groundwater monitoring and production wells should be constructed in accordance with state standards (NDWR 2006); and

- Water for potable uses would have to meet or be treated to meet water quality standards in according to NAC (445A.453-445A.455).

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11.1.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Amargosa Valley SEZ. The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects is defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included only the SEZ. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. No area of direct or indirect effects was assumed for new access roads or transmission lines outside of the SEZ because they are not expected to be needed for development due to the proximity of an existing U.S. highway and existing transmission lines.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but do not include ground-disturbing activities because these would not take place outside of the SEZ. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

11.1.10.1 Affected Environment

The proposed Amargosa Valley SEZ is located within the Amargosa Desert Level IV ecoregion, which primarily supports a creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) community (Bryce et al. 2003). Additional commonly occurring species include wolfberry (*Lycium torreyi*), shadscale (*Atriplex confertifolia*), Joshua tree (*Yucca brevifolia*) and other *Yucca* species, and Indian ricegrass (*Achnatherum hymenoides*), a perennial grass. This internally drained ecoregion includes nearly level to rolling valleys and scattered hills. Extensive underground water systems discharge within this ecoregion, resulting in many springs and seeps, including those at Ash Meadows NWR. Wetland oases form where the Amargosa River surfaces, and intermittent and ephemeral washes and streams commonly have subsurface flow. Many endemic plants occur in this ecoregion, particularly at Ash Meadows.

The Amargosa Desert lies within the Mojave Basin and Range Level III ecoregion (see Appendix I). This ecoregion is characterized by broad basins and scattered mountains. Communities of sparse, scattered shrubs and grasses including creosotebush, white bursage, and big galleta grass (*Pleuraphis rigida*) occur in basins; Joshua tree, other *Yucca* species, and cacti occur on arid footslopes; woodland and shrubland communities occur on mountain slopes, ridges, and hills (Bryce et al. 2003). Creosotebush, all-scale (*Atriplex polycarpa*), brittlebush (*Encelia farinosa*), desert holly (*Atriplex hymenelytra*), white burrobrush (*Hymenoclea salsola*), shadscale (*Atriplex confertifolia*), blackbrush (*Coleogyne ramosissima*), and Joshua tree are dominant species within the Mojave desertscrub biome (Turner 1994). Precipitation in the Mojave Desert occurs primarily in winter. Many ephemeral species (winter annuals) germinate in response to winter rains (Turner 1994). Annual precipitation in the vicinity of the SEZ is very low, averaging 4.4 in. (11.3 cm) at Amargosa Farms Garey (see Section 11.1.13).

The area surrounding the SEZ also includes the Arid Footslopes Level IV ecoregion. This ecoregion supports a sparse mixture of Mojave desert species, such as creosotebush, white bursage, and *Yucca* species, including Joshua tree, on alluvial fans, basalt flows, hills, and low mountains. Cacti occur in rocky areas. Blackbrush is dominant on upper-elevation slopes.

Land cover types described and mapped under the Southwest Regional Gap Analysis Project (SWReGAP) (USGS 2005a) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Amargosa Valley SEZ are shown in Figure 11.1.10.1-1. Table 11.1.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the proposed Amargosa Valley SEZ are classified primarily as Sonora–Mojave Creosotebush–White Bursage Desert Scrub. Additional cover types within the SEZ are given in Table 11.1.10.1-1. Creosotebush was observed to be the dominant species in the low scrub communities present throughout the SEZ in August 2009, with white bursage co-dominant in portions of the SEZ. Sensitive habitats on the SEZ include desert dry washes, desert chenopod scrub/mixed salt desert scrub, and playas.

The indirect impact area, including the area surrounding the SEZ within 5 mi (8 km), includes 18 cover types, which are listed in Table 11.1.10.1-1. The predominant cover type is Sonora–Mojave Creosotebush–White Bursage Desert Scrub. Big Dune, a large dune area mapped as North American Active and Stabilized Dune, is located southeast of the SEZ within the indirect impact area.

There are no wetlands mapped by the National Wetland Inventory within the SEZ (USFWS 2009). However, one palustrine wetland with an emergent plant community occurs southeast of the SEZ, in the indirect impact area. This wetland is intermittently flooded, and 7.9 acres (0.03 km^2) of this 11.2-acre (0.05-km^2) wetland lie within the indirect impact area. It is mapped as Sonora-Mojave Mixed Salt Desert Scrub. Numerous dry washes occur within the SEZ, generally flowing to the southeast. These washes typically do not support wetland or riparian habitats and many convey surface runoff to the Amargosa River or to playa areas, such as those located in the southern portion of the SEZ. Several terminate in the dune area. The Amargosa River occurs within the SEZ and consists of a wide, shallow, braided channel, supporting a higher shrub density along much of the margin or in protected areas of the channel. Large playa areas are located southeast of the SEZ and are associated with the Amargosa River. These playas and dry washes and the Amargosa River typically contain water for short periods during or following precipitation events. Springs occur southeast of the SEZ at Ash Meadows and support significant wetland communities.

The State of Nevada maintains an official list of weed species that are designated noxious species. Table 11.1.10.1-2 summarizes the noxious weed species regulated in Nevada that are known to occur in Nye County (USDA 2010), which includes the proposed Amargosa Valley

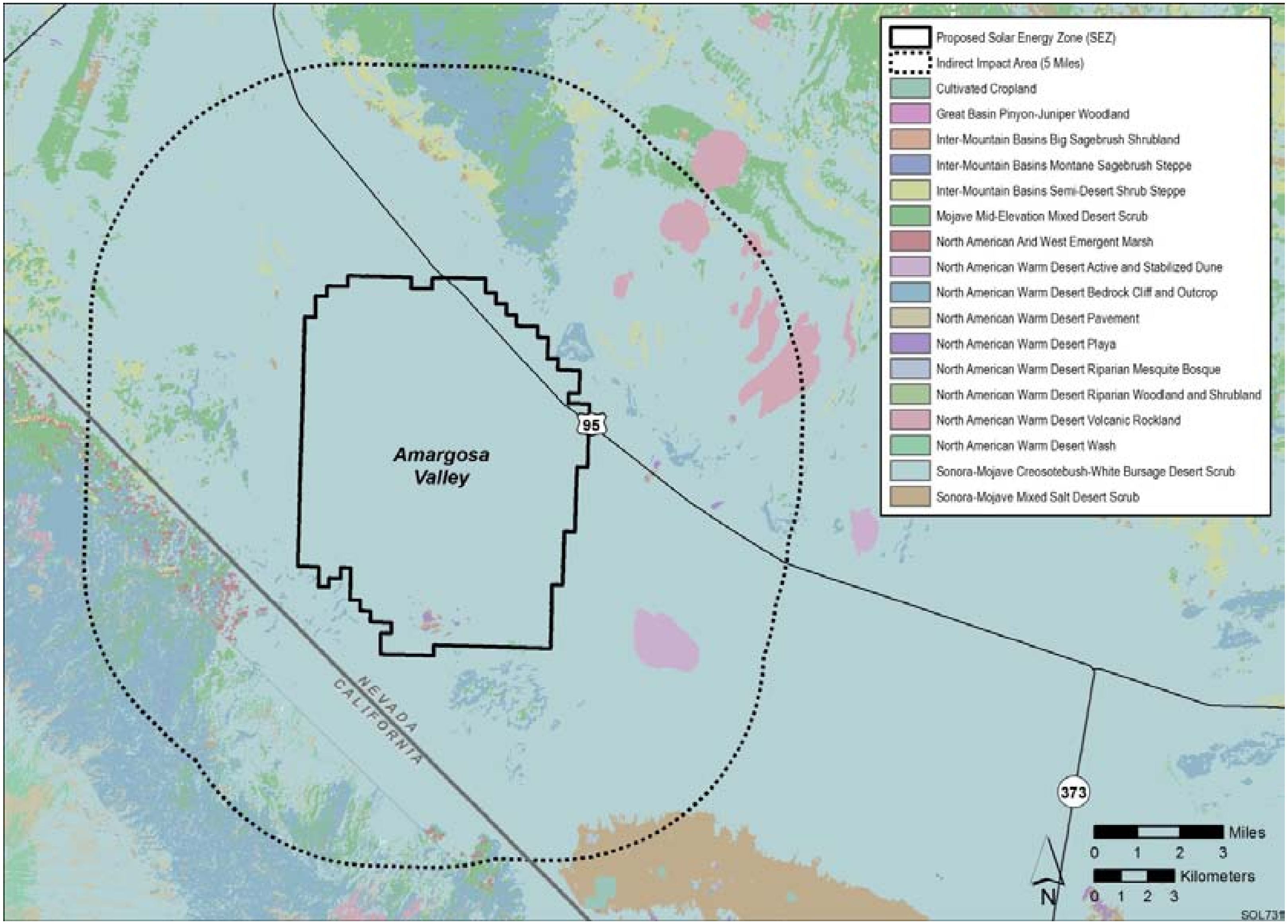

FIGURE 11.1.10.1-1 Land Cover Types within the Proposed Amargosa Valley SEZ (Source: USGS 2004)

TABLE 11.1.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Amargosa Valley SEZ and Potential Impacts

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
5264 Sonora–Mojave Creosotebush–White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran deserts. Shrubs form a sparse to moderately dense cover (2–50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	31,474 acres[f] (2.0%, 4.3%)	109,036 acres (7.1%)	Moderate
3161 North American Warm Desert Playa: Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant.	63 acres (<0.1%, 0.1%)	94 acres (0.1%)	Small
5265 Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even co-dominant. Grasses occur at varying densities.	59 acres (<0.1%, 0.1%)	1,122 acres (0.8%)	Small
9151 North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	21 acres (<0.1%, 1.1%)	234 acres (0.5%)	Small

TABLE 11.1.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
3120 North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, and unstable scree and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	0 acres	13,942 acres (1.8%)	Small
5259 Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs, and grasses and may include *Yucca* spp.	0 acres	7,492 acres (0.9%)	Small
3180 North American Warm Desert Volcanic Rockland: Consists of barren and sparsely vegetated (<10% plant cover) areas. Vegetation is variable and typically includes scattered desert shrubs.	0 acres	2,385 acres (2.6%)	Small
S079 Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	0 acres	1,986 acres (0.8%)	Small
3121 North American Warm Desert Active and Stabilized Dune: Consists of unvegetated to sparsely vegetated (generally <10% plant cover) active dunes and sandsheets. Vegetation includes shrubs, forbs, and grasses. Includes unvegetated "blowouts" and stabilized areas.	0 acres	1,040 acres (2.9%)	Small
S100 North American Arid West Emergent Marsh: Occurs in natural depressions, such as ponds, or bordering lakes, or slow-moving streams or rivers. Alkalinity is highly variable. The plant community is characterized by herbaceous emergent, submergent, and floating leaved species.	0 acres	789 acres (19.1%)	Small
3143 North American Warm Desert Pavement: Consists of unvegetated to very sparsely vegetated (<2% plant cover) areas, usually in flat basins, with ground surfaces of fine to medium gravel coated with "desert varnish." Desert scrub species are usually present. Herbaceous species may be abundant in response to seasonal precipitation.	0 acres	384 acres (0.1%)	Small

TABLE 11.1.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
S071 Inter-Mountain Basins Montane Sagebrush Steppe: Occurs on flats, ridges, level ridgetops, and mountain slopes. Mountain big sagebrush (*Artemisia tridentata vaseyana*) and related taxa such as big sagebrush (*Artemisia tridentata spiciformis*) are typically the dominant species. Perennial herbaceous species, especially grasses, are usually abundant, although shrublands are also present.	0 acres	76 acres (4.5%)	Small
S054 Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	0 acres	66 acres (<0.1%)	Small
9182 North American Warm Desert Riparian Woodland and Shrubland: Occurs along medium to large perennial streams in canyons and desert valleys. Consists of a mix of riparian woodlands and shrublands. Vegetation is dependent upon annual or periodic flooding, along with substrate scouring, and/or a seasonally shallow water table.	0 acres	36 acres (0.5%)	Small
3139 Inter-Mountain Basins Shale Badland: Typically occurs on rounded hills and plains. Consists of barren and sparsely vegetated areas (<10% plant cover) with high rate of erosion and deposition. Vegetation consists of sparse dwarf shrubs and herbaceous plants.	0 acres	29 acres (0.3%)	Small
9178 North American Warm Desert Riparian Mesquite Bosque: Occurs along perennial and intermittent streams as relatively dense riparian corridors composed of trees and shrubs. Honey mesquite (*Prosopis glandulosa*) and velvet mesquite (*P. velutina*) are the dominant trees. Vegetation is supported by groundwater when surface water is absent.	0 acres	28 acres (0.5%)	Small

TABLE 11.1.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
S040 Great Basin Pinyon-Juniper Woodland: Occurs on low-elevation slopes and ridges. Singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), or both are the dominant species, generally associating with curl-leaf mountain mahogany (*Cercocarpus ledifolius*). Understory species include shrubs and grasses.	0 acres	6 acres (<0.1%)	Small
9103 Inter-Mountain Basins Greasewood Flat: Dominated or co-dominated by greasewood (*Sarcobatus vermiculatus*) and generally occurring in areas with saline soils, a shallow water table, and intermittent flooding, although remaining dry for most growing seasons. This community type generally occurs near drainages or around playas. These areas may include or be co-dominated by other shrubs and include a graminoid herbaceous layer.	0 acres	4 acres (0.2%)	Small

[a] Land cover descriptions are from USGS (2005a). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from USGS (2004).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region. The SEZ region intersects portions of Nevada and California. However, the SEZ occurs only in Nevada.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project development. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. Includes the area of the cover type within the indirect effects area and the percentage that area represents of all occurrences of that cover type within the SEZ region. The area of indirect effects intersects portions of Nevada and California.

[e] Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

[f] To convert acres to km^2, multiply by 0.004047.

TABLE 11.1.10.1-2 Designated Noxious Weeds of Nevada Occurring in Nye County

Common Name	Scientific Name	Category
Johnsongrass	*Sorghum halepense*	C
Malta star thistle	*Centaurea melitensis*	A
Musk thistle	*Carduus nutans*	B
Puncture vine	*Tribulus terrestris*	C
Russian knapweed	*Acroptilon repens*	B
Saltcedar	*Tamarix* spp.	C
Sow thistle	*Sonchus arvensis*	A
Spotted knapweed	*Centaurea maculosa*	A
Water hemlock	*Cicuta maculata*	C
White horse-nettle	*Solanum elaeagnifolium*	B

Sources: NDA (2010); USDA (2010).

SEZ. No species included in Table 11.1.10.1-2 were observed on the SEZ in August 2009. Mediterranean grass (*Schismus arabicus, S. barbatus*), an invasive species known to occur within the SEZ, is not included in this table.

The Nevada Department of Agriculture classifies noxious weeds into one of three categories (NDA 2010):

- "Category A: Weeds not found or limited in distribution throughout the state; actively excluded from the state and actively eradicated wherever found; actively eradicated from nursery stock dealer premises; control required by the state in all infestations."

- "Category B: Weeds established in scattered populations in some counties of the state; actively excluded where possible, actively eradicated from nursery stock dealer premises; control required by the state in areas where populations are not well established or previously unknown to occur."

- "Category C: Weeds currently established and generally widespread in many counties of the state; actively eradicated from nursery stock dealer premises; abatement at the discretion of the state quarantine officer."

11.1.10.2 Impacts

The construction of solar energy facilities within the proposed Amargosa Valley SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (25,300 acres [102.4 km^2]) is assumed to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations, and could include any of the communities occurring on the SEZ. Therefore, for the purposes of this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (caused, for example, by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation that are encountered within the SEZ are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and from any additional mitigation applied. Section 11.1.10.2.3 identifies design features of particular relevance to the proposed Amargosa Valley SEZ.

11.1.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (<1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); a moderate impact (>1 but <10%) could affect an intermediate proportion of cover type; a large impact could affect greater than 10% of a cover type.

Solar facility construction and operation in the proposed Amargosa Valley SEZ would primarily affect communities of the Sonora–Mojave Creosotebush–White Bursage Desert Scrub cover type. Additional cover types that would be affected within the SEZ include North American Warm Desert Playa, Sonora-Mojave Mixed Salt Desert Scrub, and North American Warm Desert Wash. Table 11.1.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed Amargosa Valley SEZ. Most of these cover types are relatively common in the SEZ region; however, North American Warm Desert Wash is relatively uncommon, representing 0.9% of the land area within the SEZ region. Desert dry washes, desert chenopod scrub/mixed salt desert scrub, and playas are important sensitive habitats on the SEZ.

The construction, operation, and decommissioning of solar projects within the proposed Amargosa Valley SEZ would result in moderate impacts on Sonora–Mojave Creosotebush–White Bursage Desert Scrub. Solar project development within the SEZ would result in small impacts on the remaining cover types in the affected area.

Because of the arid conditions, re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region. Damage to these crusts, as by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect impact area identified in Table 11.1.10.1-1. The construction of solar projects within the SEZ could alter deposition processes within the Big Dune area southeast, potentially affecting dune habitats.

Communities associated with playa habitats, such as those on the SEZ and the large playas southeast of the SEZ associated with the Amargosa River, greasewood flats communities, riparian habitats, marshes, or other intermittently flooded areas downgradient from solar projects in the SEZ could be affected by ground-disturbing activities. Site clearing and grading could disrupt surface-water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter playa, riparian, or greasewood flats plant communities and affect community function. Increases in surface runoff from a solar energy project site could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect dry washes within the SEZ. Alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation. Several dry washes terminate in the Big Dune area. The construction of solar projects within the SEZ could alter sediment deposition in the area of the Big Dune, potentially affecting the maintenance of dune habitats.

Land-disturbance activities can also alter groundwater recharge and discharge processes, and alter surface water-wetland-groundwater connectivity (see Section 11.1.9.2). Extensive alterations to the ephemeral channels of the natural drainage pattern of the Amargosa River could disrupt groundwater recharge. These effects could affect wetland habitats that are associated with areas of groundwater discharge.

The use of groundwater within the proposed Amargosa Valley SEZ for technologies with high water requirements, such as dry-cooling systems, has the potential to cause drawdown of groundwater surface elevations (see Section 11.1.9.2). Groundwater-dependent plant communities within the Amargosa Desert groundwater basin, or in other hydraulically connected basins, could be affected by changes in groundwater elevations. Springs occur at Ash Meadows and in Death Valley National Park and support extensive wetland communities. Groundwater depletion and subsequent reductions in groundwater discharges at the springs could result in degradation of these habitats. Groundwater depletion could also potentially affect other wetland habitats in the vicinity of the SEZ, such as those associated with the Amargosa River. Other communities that depend on accessible groundwater, such as mesquite bosque communities, which occur in the indirect affects area, could also become degraded or lost as a result of lowered groundwater levels. Studies of the Amargosa Valley groundwater recharge and discharge processes would be necessary to determine potential effects of groundwater withdrawals within the proposed Amargosa Valley SEZ on these springs and other locations of groundwater discharge.

11.1.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

Executive Order (E.O.) 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential effects of noxious weeds and invasive plant species that could result from solar energy facilities are described in Section 5.10.1. Noxious weeds and invasive species could inadvertently be brought to a project site by equipment previously used in infested areas, or they may be present on or near a project site. Despite required programmatic design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Amargosa Valley SEZ, and increase the probability that weeds could be transported into areas that were previously relatively weed-free. This could result in reduced restoration success and possible widespread habitat degradation.

Noxious weeds, including Mediterranean grass, occur on the SEZ. Additional species designated as noxious weeds in Nevada, and those known to occur in Nye County, are given in Table 11.1.10.1-2. Past or present land uses, such as OHV use, may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Disturbance may promote the establishment and spread of invasive species. Disturbance associated with existing roads and transmission lines within the SEZ area of potential impacts also likely contributes to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

11.1.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to the programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While the specifics of some of these practices are best established when considering specific project details, some SEZ-specific design features can be identified at this time, as follows:

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as

Mediterranean grass. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- All playa, chenopod scrub, and desert dry wash habitats, shall be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area shall be maintained around playas and dry washes to reduce the potential for impacts on these habitats on or near the SEZ.

- Appropriate engineering controls should be used to minimize impacts on the Amargosa River, and dry wash, playa, riparian, marsh, and greasewood flat habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. Appropriate measures to minimize impacts to Big Dunes habitats should be determined through agency consultation.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on groundwater-dependent habitats in the Amargosa Desert groundwater basin, or in other hydraulically connected basins, such as springs at Ash Meadows and Death Valley National Park, other locations of groundwater discharge, such as the Amargosa River, or other groundwater-dependent habitats in the vicinity of the SEZ, such as mesquite bosque communities.

If these SEZ-specific design features are implemented in addition to other programmatic design features, it is anticipated that a high potential for impacts from invasive species and impacts to dry washes, playas, greasewood flats, chenopod scrub, mesquite bosque, springs, riparian habitats, and wetlands would be reduced to a minimal potential for impact.

11.1.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Amargosa Valley SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from the California Wildlife Habitat Relationships System (CWHRS) (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ by using available geographical information system (GIS) surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) within the SEZ. The maximum developed area within the SEZ would be 25,300 acres (102 km^2). No areas of direct effects would occur for either a new transmission line or a new access road because existing transmission line and road corridors are adjacent to or through the SEZ.

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills in the SEZ). Potentially suitable habitat within the SEZ greater than the maximum of 25,300 acres (102 km^2) of direct effects was also included as part of the area of indirect effects. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. The area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. These areas of direct and indirect effects are defined and the impact assessment approach is described in Appendix M.

The primary land cover habitat type within the affected area is Sonora–Mojave creosotebush white bursage desert scrub (see Section 11.1.10). Potentially unique habitats in the affected area include cliffs and rock outcrops, washes, and playa habitats. Wash and playa habitats occur within the proposed Amargosa Valley SEZ. The Amargosa River flows northwest to southeast within the SEZ and the area of indirect effects. This feature is one of two intermittent streams known to occur within the affected area. The other intermittent stream is an unnamed wash east of the SEZ in the area of indirect effects (see Figure 11.1.9.1-1).

11.1.11.1 Amphibians and Reptiles

11.1.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Amargosa Valley SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from the Nevada Natural Heritage Program (NNHP) (NDCNR 2002) and range maps and habitat information available from the CWHRS (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

On the basis of species distributions within the area of the proposed Armargosa Valley SEZ and habitat preferences of the amphibian species, the Amargosa toad (*Bufo nelsoni*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). Because of its special status standing, information on the Amargosa toad is provided in Section 11.1.12. As the red-spotted toad prefers dry, rocky areas near temporary sources of standing water, its occurrence within the SEZ would be spatially limited. It would most likely occur in the portion of the SEZ that overlaps Amargosa River.

More than 25 reptile species occur within the area that encompasses the proposed Amargosa Valley SEZ (USGS 2007; Stebbins 2003). The desert tortoise (*Gopherus agassizii*) is a federal- and state-listed threatened species. This species is discussed in Section 11.1.12. Lizard species expected to occur within the SEZ include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), side-blotched lizard (*Uta stansburiana*), western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*). Snake species expected to occur within the SEZ include the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and nightsnake (*Hypsiglena torquata*). The sidewinder (*Crotalus cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 11.1.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Amargosa Valley SEZ. Special status amphibian and reptile species are addressed in Section 11.1.12.

11.1.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2 and through the application of any additional mitigation measures. Section 11.1.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed Amargosa Valley SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area as presented in Section 11.1.11.1.1 following the analysis approach described in Appendix M. Additional National Environmental Policy Act (NEPA) assessments and coordination with state natural resource agencies may be

TABLE 11.1.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Amargosa Valley SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Amphibians				
Red-spotted toad (*Bufo punctatus*)	Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos; desert streams and oases; open grassland; scrubland oaks; and dry woodlands. About 2,871,700 acres[g] of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	123,874 acres of potentially suitable habitat (4.3% of available suitable habitat)	Small overall impact. Avoid wash and playa habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Lizards				
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. About 4,670,500 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	144,180 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Lizards (Cont.)				
Great Basin collared lizard (*Crotaphytus bicinctores*)	Usually inhabits alluvia, lava flows, mountain slopes, canyons, buttes, rock outcrops, washes, and rocky plains. Limiting factors are the presence of large boulders and open/sparse vegetation. About 3,918,000 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	142,436 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered . Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 2,990,700 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	123,934 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Lizards (Cont.)				
Side-blotched lizard (*Uta stansburiana*)	Low to moderate elevations in washes, arroyos, boulder-strewn ravines, rocky cliff bases, and flat shrubby areas in canyon bottoms. Often along sandy washes. Usually in areas with a lot of bare ground. About 3,499,100 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	136,890 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Western fence lizard (*Sceloporus occidentalis*)	Disturbed areas, roadsides, gravel beds, rock quarries, lava flows, outcrops, talus slopes, shrublands, riparian areas, and coniferous woodlands. About 3,620,500 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	134,873 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Lizards (Cont.)				
Western whiptail (*Cnemidophorus tigris*)	Arid and semiarid habitats with sparse plant cover. About 3,235,800 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	125,002 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Zebra-tailed lizard (*Callisaurus draconoides*)	Open, warm-desert habitats, especially dry washes and canyons with fine gravel and sand. About 3,387,000 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	128,153 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Snakes				
Coachwhip (*Masticophis flagellum*)	Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 3,313,900 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	132,315 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Glossy snake (*Arizona elegans*)	Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 2,122,000 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	118,618 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Snakes (Cont.)				
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 3,510,300 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	125,456 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Groundsnake (*Sonora semiannulata*)	Arid and semiarid regions with rocky to sandy soils. River bottoms, desert flats, sand hummocks, and rocky hillsides. About 3,332,500 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	124,809 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Snakes (Cont.)				
Nightsnake *(Hypsiglena torquata)*	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, it seeks refuge underground, in crevices, or under rocks. About 3,029,000 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	132,198 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Sidewinder *(Crotalus cerastes)*	Windblown sand habitats near rodent burrows. Most common in areas of sand hummocks topped with creosote, mesquite, or other desert plants. About 2,403,700 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (1.1% of available potentially suitable habitat) during construction and operations	123,763 acres of potentially suitable habitat (5.1% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimated the amount of suitable habitat in the project area. A maximum of 25,300 acres of direct effects within the SEZ was assumed.

Footnotes continued on next page.

TABLE 11.1.11.1-1 (Cont.)

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[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with the construction and maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 25,300 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[f] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[g] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 11.1.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on amphibians and reptiles summarized in Table 11.1.11.1-1, direct impacts on amphibian and reptile species would be moderate for the glossy snake and sidewinder, as 1.2% and 1.1%, respectively, of potentially suitable habitats identified for these species in the SEZ would be lost. Direct impacts on all other representative amphibian and reptile species would be small, as 0.9% or less of potentially suitable habitats identified for the species in the SEZ region would be lost. Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 5.6% of available habitat for the glossy snake). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.1.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., washes and playas). Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features are best established when considering specific project details, one design feature that can be identified at this time is:

- The Amargosa River should be avoided.

If this SEZ-specific design feature is implemented in addition to the programmatic design features, impacts on amphibian and reptile species could be reduced. However, as potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.1.11.2 Birds

11.1.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Amargosa Valley SEZ. The list of bird species potentially present in the SEZ area was determined from the NNHP (NDCNR 2002) and range maps and habitat information available from the CWHRS (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Ten bird species that could occur on or in the affected area of the SEZ are considered focal species in the *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), phainopepla (*Phainopepla nitens*), and verdin (*Auriparus flaviceps*). Habitats for most of these species are described in Table 11.1.11.2-1. Because of their special species status, the burrowing owl and phainopepla are discussed in Section 11.1.12.

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.6.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state solar study area. However, within the proposed Amargosa Valley SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Playa and wash habitats within the SEZ may attract shorebird species, but the perennial stream, canal, lake, and reservoir habitats within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) is the shorebird species most likely to occur within the SEZ.

Neotropical Migrants

As discussed in Section 4.6.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state solar energy study area. Species expected to occur within the proposed Amargosa Valley SEZ include the ash-throated flycatcher, Bewick's wren (*Thryomanes bewickii*), black-tailed gnatcatcher, black-throated sparrow, common poorwill

(*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker, Le Conte's thrasher, lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), northern mockingbird (*Mimus polyglottos*), rock wren (*Salpinctes obsoletus*), sage sparrow (*Amphispiza belli*), Say's phoebe (*Sayornis saya*), verdin, and western kingbird (*Tyrannus verticalis*) (CDFG 2008; USGS 2007).

Birds of Prey

Section 4.6.2.2.4 gives an overview of the birds of prey (raptors, owls, and vultures) within the six-state solar study area. Raptor species that could occur within the proposed Amargosa Valley SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*) (CDFG 2008; USGS 2007). Several other special status birds of prey are discussed in Section 11.1.12. These include the northern goshawk (*Accipiter gentilis*) and burrowing owl.

Upland Game Birds

Section 4.6.2.2.5 gives an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed Amargosa Valley SEZ include the chukar (*Alectoris chukar*), Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), and white-winged dove (*Zenaida asiatica*) (CDFG 2008; USGS 2007).

Table 11.1.11.2-1 provides habitat information for representative bird species that could occur within the proposed Amargosa Valley SEZ. Special status bird species are discussed in Section 11.1.12.

11.1.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.1.11.2.3 identifies design features of particular relevance to the proposed Amargosa Valley SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 11.1.11.2.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 11.1.11.2.3).

TABLE 11.1.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Amargosa Valley SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Shorebirds				
Killdeer (*Charadrius vociferus*)	Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 208,044 acres[g] of potentially suitable habitat occurs within the SEZ region.	63 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	883 acres of potentially suitable habitat (0.4% of potentially suitable habitat)	Small overall impact. Avoidance of playa and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Neotropical Migrants				
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats, including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 3,369,523 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	124,263 acres of potentially suitable habitat (0.4% of potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Bewick's wren (*Thryomanes bewickii*)	Generally associated with dense, brushy habitats. It is a permanent resident of lowland deserts and pinyon-juniper forests of southern Utah. Breeding occurs in brushy areas of open woodlands and other open habitats. It is a cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 3,343,600 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	131,594 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Black-tailed gnatcatcher (*Polioptila melanura*)	Nests in bushes mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 1,624,900 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (1.6% of available potentially suitable habitat) during construction and operations	116,518 acres of potentially suitable habitat (7.2% of potentially suitable habitat)	Moderate overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Neotropical Migrants (Cont.)				
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 3,035,900 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	126,559 acres of potentially suitable habitat (4.2% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 4,132,700 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	138,253 acres of potentially suitable habitat (3.3% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation also provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 3,619,500 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	126,859 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 2,569,700 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (1.0% of available potentially suitable habitat) during construction and operations	124,187 acres of potentially suitable habitat (4.8% of potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Neotropical Migrants (Cont.)				
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Fairly common in all desert habitats. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,385,200 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	139,391 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 3,253,700 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	125,996 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in Mojave and Colorado Deserts. Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 2,986,500 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	124,193 acres of potentially suitable habitat (4.2% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 2,544,800 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (1.0% of available potentially suitable habitat) during construction and operations	124,010 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water, including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 4,218,500 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	141,997 acres of potentially suitable habitat (3.4% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally, open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 3,652,900 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	126,315 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Northern mockingbird (*Mimus polyglottos*)	Parkland, cultivated lands, second-growth habitats, desert scrub, and riparian areas at low elevations. Forages on ground in short, grassy to nearly barren substrates. About 4,460,000 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	142,096 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Rock wren (*Salpinctes obsoletus*)	Arid and semiarid habitats. It breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices, and the nest entrance is paved with small rocks and stones. About 4,593,300 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	141,884 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Sage sparrow (*Amphispiza belli*)	Prefers shrubland, grassland, and desert habitats. The nest, constructed of twigs and grasses, is located either low in a shrub or on the ground. About 1,717,200 acres of potentially suitable habitat occurs within the SEZ region.	122 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat) during construction and operations	4,807 acres of potentially suitable habitat (0.3% of available potentially suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 3,695.400 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	137,956 acres of potentially suitable habitat (3.7% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Verdin (*Auriparus flaviceps*)	Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 2,422,700 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (1.0% of available potentially suitable habitat) during construction and operations	123,006 acres of potentially suitable habitat (5.1% of potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Western kingbird (*Tyrannus verticalis*)	Occurs in a variety of habitats, including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. It migrates to Central America or the southeastern United States for the winter. About 3,192,500 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	124,879 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Birds of Prey				
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 2,934,500 acres of potentially suitable habitat occurs in the SEZ region.	59 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) during construction and operations	27,143 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	Small overall impact.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Birds of Prey (Cont.)				
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,632,500 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	142,781 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Great horned owl (*Bubo virginianus*)	Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 5,026,500 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	145,051 acres of potentially suitable habitat (2.9% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Birds of Prey (Cont.)				
Long-eared owl (*Asio otus*)	Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush-bursage flats, desert scrub, grasslands, and agricultural fields). About 3,439,900 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	124,889 acres of potentially suitable habitat (3.6% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 1,596,500 acres of potentially suitable habitat occurs in the SEZ region.	59 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat) during construction and operations	10,666 acres of potentially suitable habitat (0.7% of available potentially suitable habitat)	Small overall impact.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 3,664,300 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	137,880 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Upland Game Birds				
Chukar (*Alectoris chukar*)	Steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds during the brooding period found within 0.25 mi (0.4 km) of water. About 3,527,900 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	126,038 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. However, avoidance of the Amargosa River would protect a potential occasional source of water.
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 4,043,800 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	140,185 acres of potentially suitable habitat (3.5% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Upland Game Birds (Cont.)				
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 3,699,100 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	126,511 acres of potentially suitable habitat (3.48% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
White-winged dove (*Zenaida asiatica*)	Nests in low to medium height trees with dense foliage and fairly open ground cover. Feeds on wild seeds, grains and fruit. About 2,593,800 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (1.0% of available potentially suitable habitat) during construction and operations	125,191 acres of potentially suitable habitat (4.8% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

Footnotes continued on next page.

TABLE 11.1.11.2-1 (Cont.)

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimated the amount of suitable habitat in the project area. A maximum of 25,300 acres of direct effects within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with the construction and maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 25,300 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[f] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[g] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), and from disturbance, injury, or mortality to individual birds. Table 11.1.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed Amargosa Valley SEZ. Direct impacts on the black-tailed gnatcatcher would be moderate as SEZ development could cause the loss of 1.6% of its potentially suitable habitat within the SEZ region. For the remaining representative bird species, direct impacts would be small as 1.0% or less of potentially suitable habitat could be lost (Table 11.1.11.2-1). Larger areas of potentially suitable habitat for bird species occur within the area of potential indirect effects (e.g., up to 7.2% of potentially suitable habitat for the black-tailed gnatcatcher). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.1.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds, especially for those species that depend on habitat types that can be avoided (e.g., wash and playa habitats). Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important for reducing impacts on birds are best established when considering specific project details, some design features can be identified at this time:

- For solar energy facilities within the SEZ, the requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed.

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the Nevada Department of Wildlife (NDOW). A permit may be required under the Bald and Golden Eagle Protection Act.

- The Amargosa River should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on bird species could be reduced. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.1.11.3 Mammals

11.1.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Amargosa Valley SEZ. The list of mammal species potentially present in the SEZ area was determined from the NNHP (NDCNR 2002) and range maps and habitat information available from the CWHRS (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

More than 55 species of mammals have ranges that encompass the area of the proposed Amargosa Valley SEZ (NDCNR 2002; USGS 2007); however, suitable habitats for a number of these species are limited or nonexistent within the SEZ (USGS 2007). Similar to the overview of mammals provided for the six-state solar energy study area (Section 4.6.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share important habitats.

Big Game

The big game species that could occur within the vicinity of the proposed Amargosa Valley SEZ are the cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), Nelson's bighorn sheep (*Ovis canadensis nelsoni*), and pronghorn (*Antilocapra americana*) (USGS 2007). Because of its special species status, the Nelson's bighorn sheep is addressed in Section 11.1.12. Among the other big game species, potentially suitable habitat for the cougar and mule deer occur throughout most of the SEZ. No potentially suitable habitat for elk or pronghorn occur within the SEZ, while only limited potentially suitable habitat for these species occurs within the area of indirect effects. Figure 11.1.11.3-1 shows the location of the SEZ relative to mapped elk habitat; Figure 11.1.11.3-2 shows the location of the SEZ relative to the mapped range of mule deer habitat; and Figure 11.1.11.3-3 shows the location of the SEZ relative to mapped pronghorn habitat.

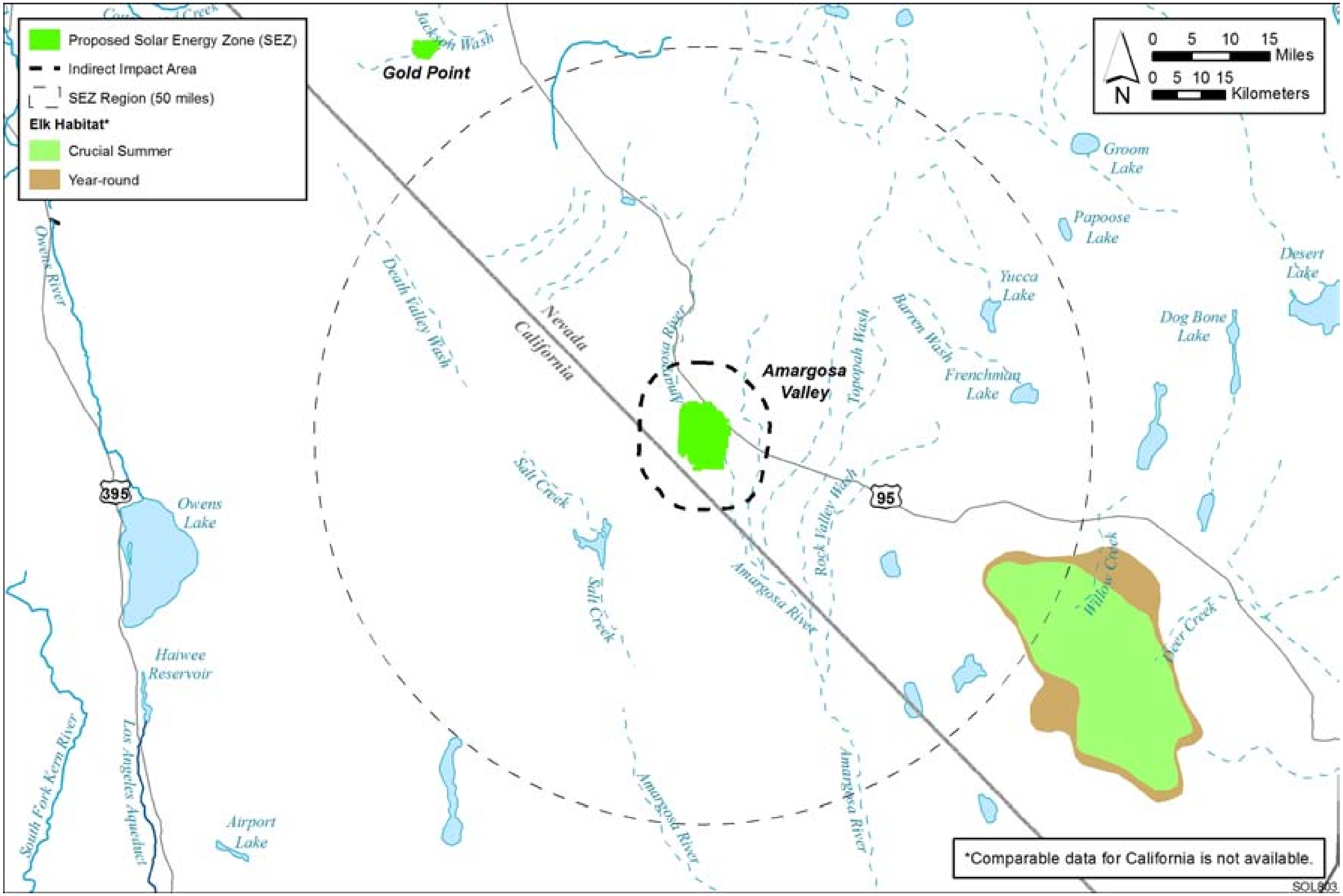

FIGURE 11.1.11.3-1 Location of the Proposed Amargosa Valley SEZ Relative to the Mapped Range of Elk (Source: NDOW 2010)

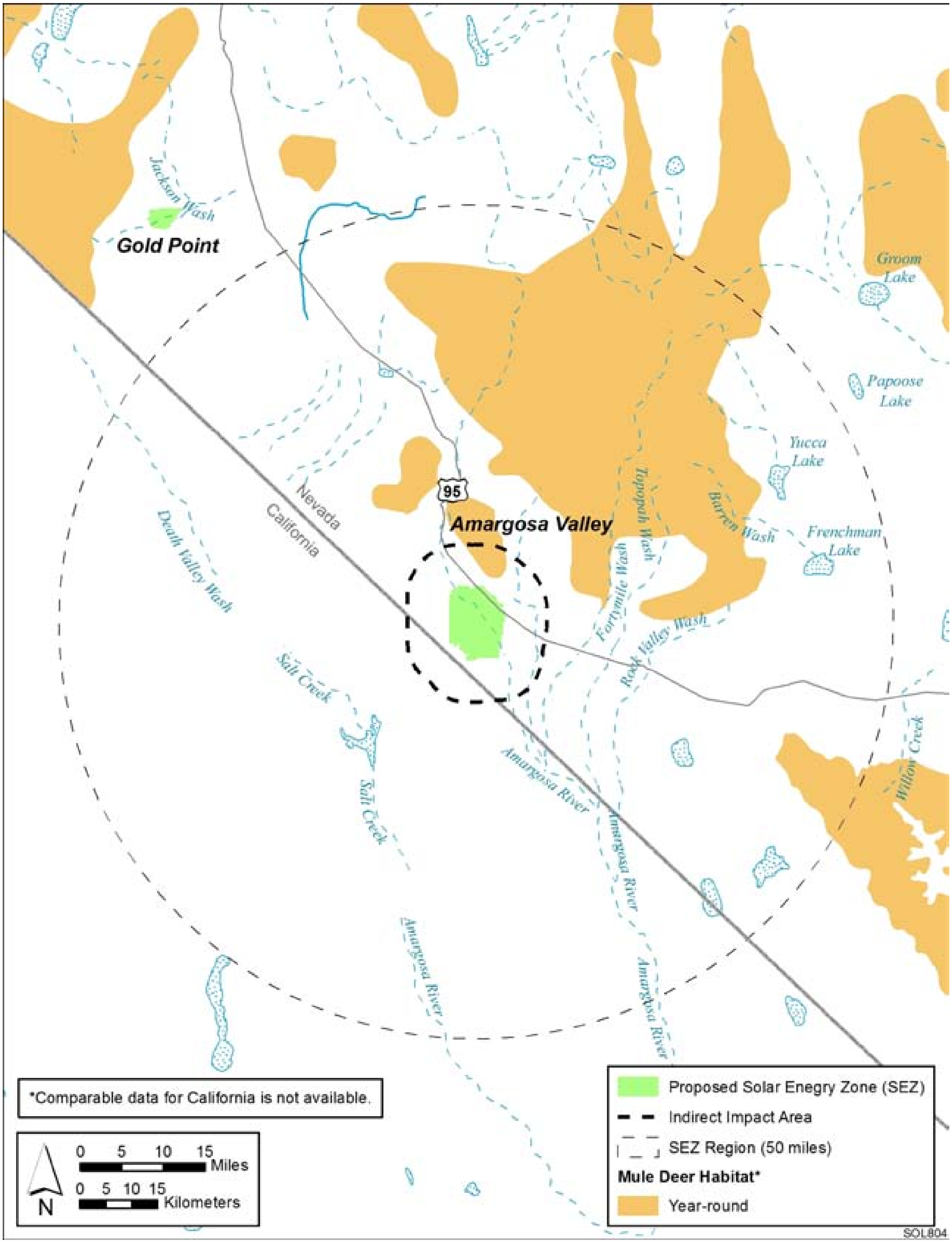

FIGURE 11.1.11.3-2 Location of the Proposed Amargosa Valley SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)

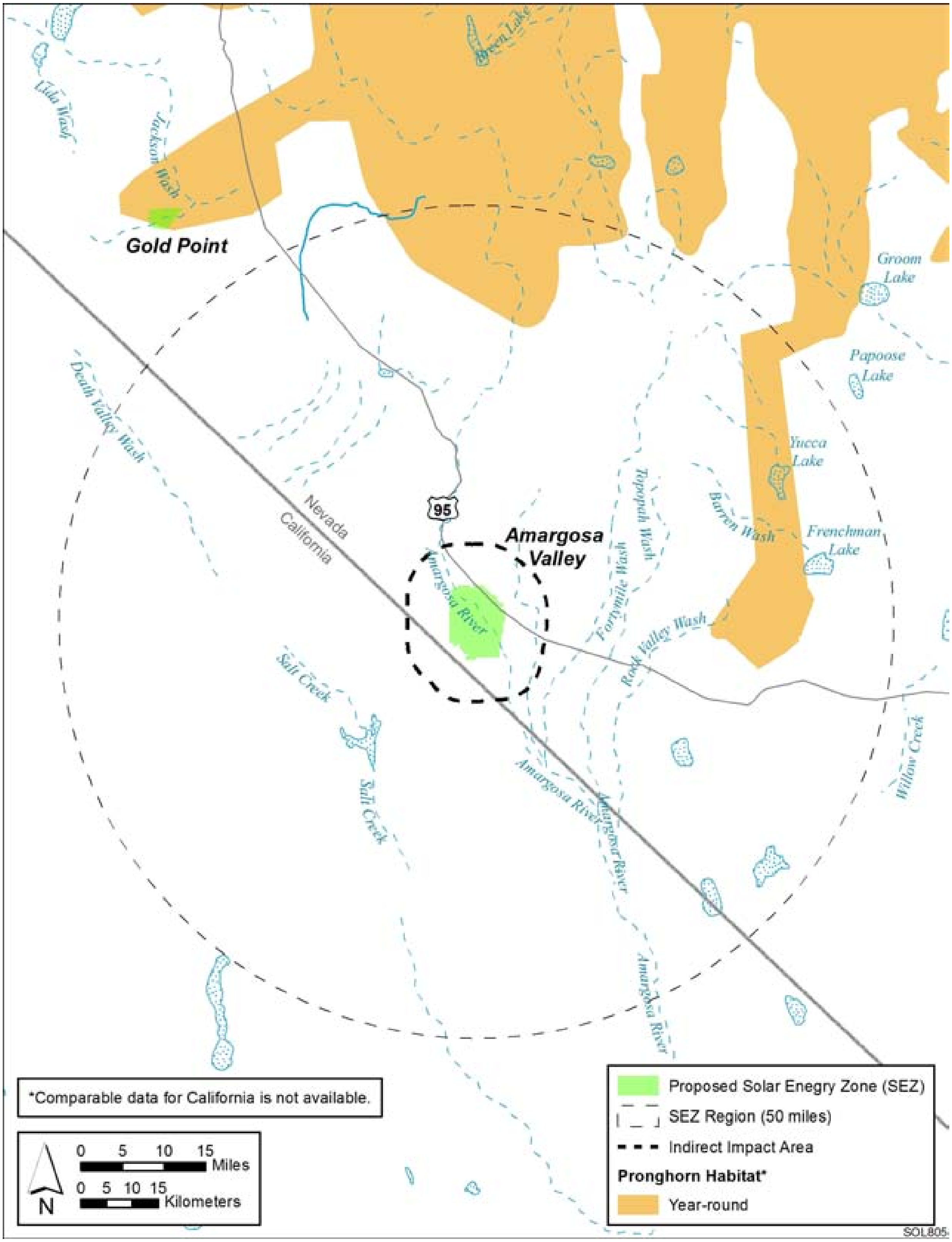

FIGURE 11.1.11.3-3 Location of the Proposed Amargosa Valley SEZ Relative to the Mapped Range of Pronghorn (Source: NDOW 2010)

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Amargosa Valley SEZ. Species that could occur within the area of the SEZ would include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*, common), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and red fox (*Vulpes vulpes*) (USGS 2007).

The nongame (small) mammals include rodents, bats, and shrews. Representative species for which potentially suitable habitat occurs within the proposed Amargosa Valley SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), canyon mouse (*P. crinitis*), deer mouse (*P. maniculatus*), desert kangaroo rat (*Dipodomys deserti*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's pocket mouse (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), southern grasshopper mouse (*O. torridus*), western harvest mouse (*Reithrodontomys megalotis*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), little brown myotis (*M. lucifugus*), long-legged myotis (*M. volans*), silver-haired bat (*Lasionycteris noctivagans*), and western pipistrelle (*Parastrellus hesperus*) (USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ. Several other special status bat species that could occur within the SEZ area are addressed in Section 11.1.12.1.

Table 11.1.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Amargosa Valley SEZ. Special status mammal species are discussed in Section 11.1.12.

11.1.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.1.11.3.3, below, identifies design features of particular relevance to mammals for the proposed Amargosa Valley SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 11.1.11.3.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 11.1.11.3.3).

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TABLE 11.1.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Amargosa Valley SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Big Game				
Cougar (*Puma concolor*)	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,360,800 acres[g] of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	140,008 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Mule deer (*Odocoileus hemionus*)	Most habitats, including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provides abundant browse and cover. About 3,463,200 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	127,124 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Small Game and Furbearers				
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 3,449,600 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	125,678 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions and uses shrubs for cover. About 4,312,100 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	140,126 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Small Game and Furbearers				
Bobcat (*Lynx rufus*)	Most habitats except subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 3,411,300 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	125,886 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Coyote (*Canis latrans*)	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 5,019,000 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	145,015 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Small Game and Furbearers				
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Tickets and patches of shrubs, vines, and brush also used as cover. About 2,666,900 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	117,616 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Gray fox (*Urocyon cinereoargenteus*)	Deserts, open forests and brush. Prefer wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 3,227,500 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	133,431 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Small Game and Furbearers				
Kit fox (*Vulpes macrotis*)	Desert and semidesert areas with relatively open vegetative cover and soft soils. Seek shelter in underground burrows. About 3,579,000 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	127,477 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Red fox (*Vulpes vulpes*)	Most common in open woodlands, pasturelands, riparian areas, and agricultural lands. About 2,523,000 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (1.0% of available potentially suitable habitat) during construction and operations	118,146 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals				
Big brown bat (*Eptesicus fuscus*)	Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 3,006,300 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	131,133 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Botta's pocket gopher (*Thomomys bottae*)	Variety of habitats, including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 2,187,800 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	117,583 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 3,283,300 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	132,606 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Cactus mouse (*Peromyscus eremicus*)	Variety of areas, including desert scrub, semidesert chaparral, desert wash, semidesert grassland, and cliff and canyon habitats. About 3,153,800 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	126,972 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Canyon mouse (*Peromyscus crinitus*)	Associated with rocky substrates in a variety of habitats, including desert scrub, sagebrush shrublands, woodlands, cliffs and canyons, and volcanic rock and cinder lands. Source of free water not required. About 2,993,100 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	126,355 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
California myotis (*Myotis californicus*)	Desertscrub, semidesert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 3,026,300 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	132,377 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Deer mouse (*Peromyscus maniculatus*)	Tundra; alpine and subalpine grasslands; plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran desert scrub habitats. About 4,215,000 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	139,516 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Desert kangaroo rat (*Dipodomys deserti*)	Most arid areas with deep sands such as stabilized sand dunes, sandy patches in salt desert scrub, and bottoms of desert washes. About 82,700 acres of potentially suitable habitat occurs in the SEZ region.	21 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) during construction and operations	1,274 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	Small overall impact. Development within desert wash habitat (Amargosa River) should be avoided to the extent practicable.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Desert shrew (*Notiosorex crawfordi*)	Usually in arid areas with adequate cover such as semiarid grasslands, shortgrass plains, desert scrub, chaparral slopes, shortgrass plains, oak savannas and woodlands, and alluvial fans. About 3,789,500 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	142,024 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,960,600 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	143,222 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Hoary bat (*Lasiurus cinereus*)	Chaparral, shortgrass plains, scrub-grassland, desertscrub, forests and woodlands. Usually roosts in trees, also in caves, rock crevices, and houses. About 2,913,700 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	131,169 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Little pocket mouse (*Perognathus longimembris*)	Mostly sandy and gravelly soils, but also stony soils and rarely rocky sites. About 3,331,400 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	127,215 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Long-legged myotis (*Myotis volans*)	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 3,017,300 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	132,034 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Long-tailed pocket mouse (*Chaetodipus formosus*)	Common in sagebrush, desert scrub, and desert succulent shrub habitats with rocky or stony groundcover. About 4,163,700 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	142,502 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Merriam's kangaroo rat (*Dipodomys merriami*)	Plains grasslands, scrub-grasslands, desertscrub, shortgrass plains, oak and juniper savannahs, mesquite dunes, and creosote flats. About 3,607,500 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	127,621 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Northern grasshopper mouse (*Onychomys leucogaster*)	Occurs in grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 3,319,500 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	125,925 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Silver-haired bat (*Lasionycteris noctivagans*)	Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savannah and desertscrub habitats. Roosts under bark, in hollow trees, caves, and mines. Forages over clearings and open water. About 3,257,900 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	132,096 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Southern grasshopper mouse (*Onychomys torridus*)	Low, arid, shrub and semiscrub vegetation of deserts. About 2,951,100 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	127,185 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Western harvest mouse (Reithrodontomys megalotis)	Various habitats, including scrub-grasslands, temperate swamps and riparian forests, salt marshes, shortgrass plains, oak savannah, dry fields, agricultural areas, deserts, and desert scrub. Grasses are the preferred cover. About 2,181,400 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	117,980 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 2,925,300 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	131,269 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends its nights and other periods of inactivity in underground burrows. About 3,728,900 acres of potentially suitable habitat occurs within the SEZ region.	25,300 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	138,874 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Yuma myotis (*Myotis yumanensis*)	Riparian areas, grasslands, semidesert shrubland, mountain brush, woodlands, and deserts. It occurs where there is open water, regardless of the habitat. Roosts in caves, mines, cliffs, crevices, buildings, and swallow nests. About 3,199,700 acres of potentially suitable habitat occurs in the SEZ region.	25,300 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	133,315 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

Footnotes continued on next page.

TABLE 11.1.11.3-1 (Cont.)

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 25,300 acres of direct effects within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with the construction and maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 25,300 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[f] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[g] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

Table 11.1.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed Amargosa Valley SEZ.

Cougar

Up to 25,300 acres (102 km^2) of potentially suitable cougar habitat could be lost by solar energy development within the proposed Amargosa Valley SEZ. This represents about 0.6% of potentially suitable cougar habitat within the SEZ region. About 140,000 acres (567 km^2) of potentially suitable cougar habitat occurs within the area of indirect effects. Overall, impacts on cougar from solar energy development in the SEZ would be small.

Elk

Based on land cover analyses, potentially suitable elk habitat does not occur within the proposed Amargosa Valley SEZ. Thus, solar energy development would not directly affect elk habitat. About 140 acres (0.6 km^2) of potentially suitable elk habitat occurs within the area of indirect effects. This is only about 0.03% of potentially suitable elk habitat within the SEZ region. Based on mapped ranges, the closest year-round elk habitat is about 36 mi (58 km) from the SEZ, while the closest crucial summer habitat is about 37 mi (59.5 km) from the SEZ (Figure 11.1.11.3-1). Overall, impacts on elk from solar energy development in the SEZ would be small.

Mule Deer

Based on land cover analyses, up to 25,300 acres (102 km^2) of potentially suitable mule deer habitat could be lost by solar energy development within the proposed Amargosa Valley SEZ. This represents about 0.7% of potentially suitable mule deer habitat within the SEZ region. About 127,000 acres (514 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effects. Based on mapped range, the closest year-round mule deer habitat is about 1.3 mi (2.1 km) from the SEZ (Figure 11.1.11.3-2). About 8,685 acres (35.1 km^2) of year-round mule deer habitat occurs within the area of indirect effects. This is about 1.0% of the year-round mule deer habitat within the SEZ region. Overall, impacts on mule deer from solar energy development in the SEZ would be small.

Pronghorn

Based on land cover analyses, potentially suitable pronghorn habitat does not occur within the proposed Amargosa Valley SEZ. Thus, solar energy development would not directly affect pronghorn habitat. About 2,130 acres (8.6 km^2) of potentially suitable pronghorn habitat occurs within the area of indirect effects. This is only about 0.3% of potentially suitable pronghorn habitat within the SEZ region. Based on mapped range, the closest year-round pronghorn habitat to the SEZ is almost 25 mi (40 km) away (Figure 11.1.11.3-3. Overall, impacts on pronghorn from solar energy development in the SEZ would be small.

Other Mammals

Direct impacts on Botta's pocket gopher and western harvest mouse would be moderate, as 1.2% of their potentially suitable habitat within the SEZ region would be lost. Direct impacts on the other representative small game, furbearer, and nongame (small) mammal species would be small, as 1.0% or less of potential habitats identified would be lost (Table 11.1.11.3-1). Larger areas of potentially suitable habitat for these species occur within the area of potential indirect effects (i.e., ranging from 1.5% for the desert kangaroo rat to 5.4% for Botta's pocket gopher and western harvest mouse).

Summary

Overall, direct impacts on mammal species would be small to moderate; 1.2% or less of potentially suitable habitats for the mammal species would be lost (Table 11.1.11.3-1). Larger areas of potentially suitable habitat for mammal species occur within the area of potential indirect effects (e.g., up to 5.4% of potentially suitable habitat for Botta's pocket gopher and western harvest mouse). Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) would be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas.
Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.1.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce reduce the potential for effects on mammals. Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important for reducing impacts on mammals are best established when considering specific project details, design features that can be identified at this time are:

- The fencing around the solar energy development should not block the free movement of mammals, particularly big game species.

- The Amargosa River should be avoided.

If these SEZ-specific design features are implemented in addition to programmatic design features, impacts on mammals could be reduced. However, potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ; therefore, species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.1.11.4 Aquatic Biota

11.1.11.4.1 Affected Environment

This section addresses aquatic habitats and biota known to occur on the proposed Amargosa Valley SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. There are no surface water bodies, wetlands, or perennial streams within the proposed Amargosa Valley SEZ. As described in Section 11.1.9.1.1, 9 mi (14 km) of the intermittent/ephemeral Amargosa River crosses through the SEZ, entering at the northwest corner and exiting from the southwest corner. The portion of the river located in Nevada is typically dry and flows only after precipitation (USGS 1995). Ephemeral washes may also cross the SEZ, but these drainages only contain water following rainfall and typically do not support wetland or aquatic habitat. Given the ephemeral nature of surface water in the SEZ, aquatic communities are expected to be minimal although opportunistic crustaceans and aquatic insect larvae adapted to desert conditions may be present even under dry conditions. More detailed site survey data is needed to characterize the aquatic biota, if present, in the Amargosa Valley SEZ.

There are no surface water bodies, wetlands, or perennial streams located within the area of indirect affects. However, 12 mi (19 km) of the Amargosa River and 18 mi (29 km) of an unnamed intermittent stream that drains into the Amargosa River are present in the area of indirect affects. The intermittent/ephemeral nature of these streams suggests aquatic habitat and biota are not likely to be present although more detailed site survey data would be needed to characterize the aquatic biota, if present.

Outside of the potential indirect effects area but within 50 mi (80 km) of the SEZ there are several dry lakes, the combined areas of which total 28,320 acres (115 km^2). There are 529 mi (851 km) of intermittent stream located within 50 mi (80 km) of the SEZ and 14 mi (22 km) of an unnamed perennial stream that is located approximately 35 mi (56 km) from the SEZ. Within the SEZ and the area of potential indirect effects, intermittent streams are the only surface water features present; they represent approximately 7% of the intermittent streams available within the overall analysis area. In California, spring-fed, perennial reaches of the Amargosa River exist around Shoshone, Tecopa, and Amargosa Canyon, which has been designated an ACEC by the Bureau of Land Management (BLM 2006). Here the Amargosa

River serves as a locally unique water source in the Mojave Desert that supports riparian wetlands and alkali mudflats, as well as the Amargosa pupfish (*Cyprinodon nevadensis amargosae*) and the Amargosa dace (*Rhinichthys osculus* spp.), both of which occur only in the Amargosa River and are listed by the BLM as sensitive species (BLM 2006). In addition to the Amargosa River ACEC, the Ash Meadows NWR is located less than 25 mi (40 km) from the SEZ. Ash Meadows NWR contains more than 22,000 acres (89 km^2) of critical spring-fed wetlands that support three species of endangered pupfish (*Cyprinodon* spp.) and the Ash Meadows speckled dace (*Rhinichthys osculus nevadensis* [USFWS 2010b]).

11.1.11.4.2 Impacts

The types of impacts that could occur on aquatic habitats and biota from development of utility-scale solar energy facilities are discussed in detail in Section 5.10.3..Effects particularly relevant to aquatic habitats and communities are water withdrawal and changes in water, sediment, and contaminant inputs associated with runoff.

No permanent water bodies, wetlands, or streams are present within the boundaries of the proposed Amargosa Valley SEZ or the area of indirect effects, and the nearest permanent surface water is approximately 20 mi (32 km) from the SEZ boundary. Therefore, no direct impacts on permanent surface water features are expected. Ground disturbance for solar energy development within the SEZ could result in air- and waterborne sediment deposition into the Amargosa River and springs in the Ash Meadows National Wildlife Refuge such as Devils Hole. The Amargosa River is typically dry near the SEZ and aquatic habitat is not likely to be present, although more detailed site surveys for biota would be necessary to determine whether solar energy development activities would result in direct or indirect impacts to aquatic biota. The deposition of airborne sediments into the springs and wetlands of the Ash Meadows NWR could reduce light penetration and subsequently autochthonous primary production. For example, Wilson and Blinn (2007) found that autochthonous primary production in Devils Hole contributed 40% of the total available energy in the system and suggested that dust generated from natural or anthropogenic activities could reduce the amount of basal resources available to fish and invertebrates at higher trophic levels. One species potentially affected would be the Devils Hole pupfish (*C. diabolis*), which relies on filamentous cyanobacteria in the summer (Wilson and Blinn 2007). During periods of atypically heavy runoff, flow from the Nevada headwaters of the Amargosa River may connect to portions of the river flowing through California. This suggests that runoff from the SEZ that enters the Amargosa River may potentially reach California and impact the Amargosa River ACEC (USGS 1995). However, the distance from the SEZ to the Amargosa River ACEC (>25 mi [48 km]) and the infrequency of flooding of sufficient magnitude reduces the chance for sediment to reach the ACEC. The implementation of commonly used engineering practices to avoid or minimize sediment deposition into the Amargosa River would further reduce the potential for impacts on aquatic organisms.

As identified in Section 5.10.3, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning for a solar energy facility. There is a potential for contaminants within the SEZ to enter the Amargosa River, especially if heavy machinery is used in or near the channel. In addition, these contaminants may to be transported to perennial reaches of the Amargosa River during exceptionally high flow periods (USGS 1995). However, the relatively large distance from solar development activities to these areas (minimum of approximately 25 mi [40 km]) and the low hydrologic connectivity reduces the potential for introducing biologically significant contaminant loads to perennial reaches of the Amargosa River.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Withdrawal of ground water for power plant cooling water, mirror washing, or other needs could affect water levels in surface water features outside of the SEZ and area of indirect effects, and, as a consequence, potentially reduce habitat size, connectivity, and create more adverse environmental conditions for aquatic organisms in those habitats. Water withdrawals are particularly important given the proximity of the SEZ to the Amargosa River ACEC and the Ash Meadows NWR, both of which contain spring-fed aquatic habitat of national significance. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). Obtaining cooling water from other perennial surface water features in the region could affect water levels and, as a consequence, aquatic organisms in those water bodies. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

11.1.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for effects on aquatic biota and aquatic habitats from development and operation of solar energy facilities. While some SEZ-specific design features are best established when specific project details are being considered, design features that can be identified at this time include the following:

- Appropriate engineering controls should be implemented to minimize the amount of sediment and contaminants entering the Amargosa River.

- If groundwater is used, the amount withdrawn should not affect aquatic habitat in the Amargosa River ACEC and the Ash Meadows NWR.

If these SEZ-specific design features are implemented in addition to programmatic design features and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the proposed Amargosa Valley SEZ would be negligible.

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11.1.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Amargosa Valley SEZ. Special status species include the following types of species[4]:

- Species listed as threatened or endangered under the Endangered Species Act (ESA);

- Species that are proposed for listing, under review, or are candidates for listing under the ESA;

- Species that are listed by the BLM as sensitive;

- Species that are listed by the state or states in the affected area5; and

- Species that have been ranked by the states of California or Nevada as S1 or S2, or species of concern by the states of California or Nevada or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the proposed Amargosa Valley SEZ (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the Nevada Natural Heritage Program (NNHP) (NDCNR 2004, 2009a,b; Miskow 2009), California Natural Diversity Database (CNDDB) (CDFG 2010), the Southwest Regional Gap Analysis Project (SWReGAP) (USGS 2004, 2005a, 2007), the California Regional Gap Analysis Project (CAReGAP) (Davis et al. 1998; USGS 2010d), and the USFWS Environmental Conservation Online System (ECOS) (USFWS 2010a). Information reviewed consisted of county-level occurrences as determined from NatureServe, element occurrences provided by the NNHP and CNDDB, and modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from SWReGAP and CAReGAP. The 50-mi (80-km) SEZ region intersects Clark, Esmeralda, Lincoln, and Nye Counties, Nevada, as well as Inyo County, California. However, the SEZ intersects only Nye County, Nevada. The SEZ affected area intersects Nye County, Nevada and Inyo County, California. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

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[4] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[5] State listed species for the state of Nevada are those protected under NRS 501.110 (animals) or NRS 527 (plants); state listed species for the state of California are those protected under the California Endangered Species Act (*California Department of Fish & Game Code* §§2050).

11.1.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the proposed Amargosa Valley SEZ, the area of direct effects was limited to the SEZ itself. Due to the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ due to the proximity of an existing federal highway (see Section 11.1.1.2 for a discussion of development assumptions for this SEZ).The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary land cover habitat type within the affected area is Sonora-Mojave creosotebush–white bursage desert scrub (see Section 11.1.10). Potentially unique habitats in the affected area in which special status species may reside include desert dunes, cliffs and rock outcrops, washes, and playa habitats. Aquatic habitats that occur in the SEZ and the area of indirect effects include the Amargosa River, which flows northwest to southeast within the SEZ and the area of indirect effects. This feature is one of two intermittent streams known to occur within the affected area. The other intermittent stream is an unnamed wash east of the SEZ in the area of indirect effects (Figure 11.1.12.1-1).

In its scoping comments on the proposed Amargosa Valley SEZ (Stout 2009), the USFWS expressed concern that groundwater withdrawals associated with solar energy development on the SEZ may reduce the groundwater supply from the Amargosa Basin, which supports wet meadows, seeps, and springs in the SEZ region, including the Ash Meadows region. The Ash Meadows NWR, located about 20 mi (32 km) southeast of the proposed Amargosa Valley SEZ contains a complex of spring-fed wetlands that supports a highly endemic plant and animal community that includes a number of special status species. There are other spring-fed habitats in the Oasis Valley north of the SEZ and along the Amargosa River that support aquatic, wetland, and riparian habitat for a number of special status species. Although these areas are outside the above-defined affected area, they are considered in the assessment here.

All special status species that are known to occur within the proposed Amargosa Valley SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats, in Appendix J. Of these species, there are 52 that could be affected by solar energy development on the SEZ (including those dependent on

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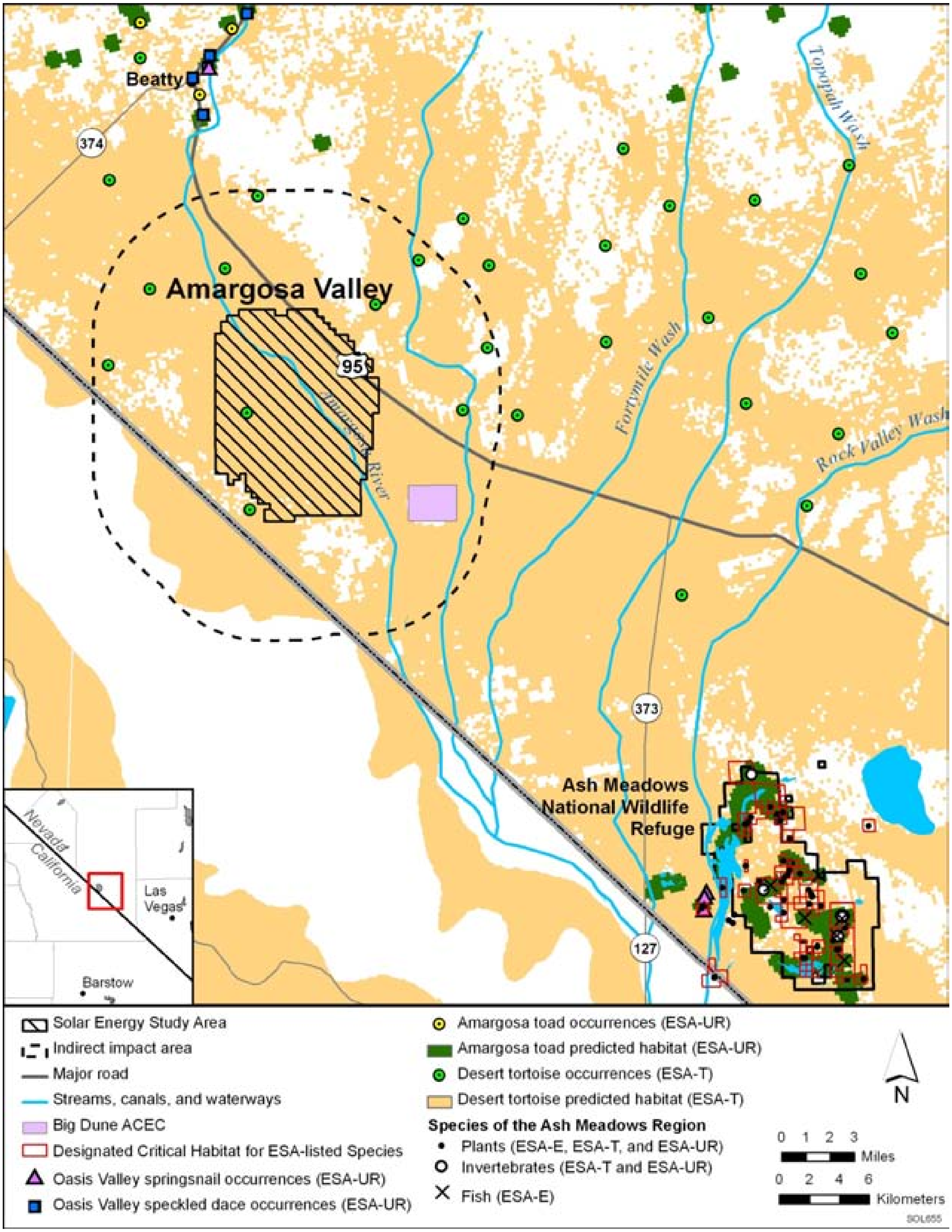

2 **FIGURE 11.1.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or**
3 **Threatened under the ESA or Species under Review for ESA Listing in the Affected Area of the**
4 **Proposed Amargosa Valley SEZ (Sources: Miskow 2009; USFWS 2010a; USGS 2007)**

groundwater discharge in the region), on the basis of recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 11.1.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped SWReGAP and CAReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 km) away from the SEZ.

Based on NNHP records, there are seven special status species known to occur within the affected area of the proposed Amargosa Valley SEZ: Ash Meadows buckwheat, Big Dune miloderes weevil, an endemic ant (*Neivamyrex nyensis*), Giulianis's dune scarab, large aegilian scarab, desert tortoise, and Nelson's bighorn sheep. Of these species, the desert tortoise is listed as threatened under the ESA and the Giuliani's dune scarab and large aegialian scarab are under review for listing under the ESA. The Big Dune miloderes weevil and Nelson's bighorn sheep are BLM-designated sensitive species. The Ash Meadows buckwheat and the ant, *Neivamyrmex nyensis*, are considered rare species. In addition to these species, there are 25 groundwater-dependent species known to occur within the Ash Meadows NWR and other portions of the SEZ region that utilize groundwater from the Amargosa Basin. These species include Amargosa niterwort, Ash Meadows blazingstar, Ash Meadows gumplant, Ash Meadows ivesia, Ash Meadows sunray, spring-loving centaury, Amargosa naucorid, Amargosa tryonia, Ash Meadows naucorid, Ash Meadows pebblesnail, Crystal springsnail, distal gland springsnail, elongate gland springsnail, Fairbanks springsnail, median gland springsnail, minute tryonia, Oasis Valley springsnail, Point of Rocks tryonia, sporting goods tryonia, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, Devils Hole pupfish, Oasis Valley speckled dace, Warm Springs Amargosa pupfish, and Amargosa toad.

11.1.12.1.1 Species Listed under the Endangered Species Act That Could Occur in the Affected Area

In its scoping comments on the proposed Amargosa Valley SEZ, the USFWS expressed concern about impacts of project development within the Amargosa Valley SEZ on the Mojave population of the desert tortoise—a species listed as threatened under the ESA in the SEZ region—and the Devils Hole pupfish—a fish species listed as endangered under the ESA (Stout 2009). The USFWS also expressed concern that groundwater withdrawals from the Amargosa Basin to serve development on the SEZ may reduce the groundwater supply that supports wet meadows, seeps, and springs in the Ash Meadows region. For this reason, the following ESA-listed species that may occur outside the area of indirect effects but that could be affected by projects within the SEZ are considered: Amargosa niterwort (endangered), Ash Meadows Amargosa pupfish (endangered), Ash Meadows blazingstar (threatened), Ash Meadows gumplant (threatened), Ash Meadows ivesia (threatened), Ash Meadows naucorid (threatened), Ash Meadows speckled dace (endangered), Ash Meadows sunray (threatened), spring-loving centaury (threatened), and Warm Springs Amargosa pupfish (endangered). All of these species are known to occur within the affected area. These species are discussed below and

TABLE 11.1.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Amargosa Valley SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants						
Amargosa niterwort	*Nitrophila mohavensis*	ESA-E; CA-E; NV-P; NV-S1	Endemic to the Amargosa Valley in Inyo County, California, and Nye County, Nevada. It inhabits playas and alkaline wetlands near the Ash Meadows region. Nearest occurrences are from the Ash Meadows NWR, approximately 25 mi[h] southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined, but 1,215 acres[i] of designated critical habitat occurs in the Ash Meadows region.	0 acres	1,215 acres of designated critical habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. The impact of cooling water withdrawal on the regional groundwater system that supports aquatic and mesic habitat in the Amargosa Valley would depend on the volume of water withdrawn to support construction and operations. Avoiding or limiting withdrawals from this regional groundwater system could reduce impacts on this species to negligible levels. Note that these potential impact magnitudes and mitigation measures apply to all groundwater-dependent special status species that may occur in the SEZ region.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Ash Meadows blazingstar	*Mentzelia leucophylla*	ESA-T; NV-P; NV-S1	Endemic to the Ash Meadows region in Nye County, Nevada, where it is narrowly confined to spring-fed desert wetlands. Nearest occurrences are from the Ash Meadows NWR, approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined, but 1,240 acres of designated critical habitat occurs in the Ash Meadows NWR.	0 acres	1,240 acres of designated critical habitat in the Ash Meadows NWR could be affected by groundwater withdrawals	Small to large overall impact. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Ash Meadows buckwheat[j]	***Eriogonum contiguum***	CA-S2; NV-S1	Known from the Mojave Desert of Inyo County, California, and Clark and Nye Counties, Nevada. Occurs on sandy to gravelly flats and slopes in association with creosote scrub and mesquite communities at elevations below 3,280 ft.[k] Occurs in the area of indirect effects. Nearest recorded occurrence is from the Funeral Mountains, approximately 4 mi southwest of the SEZ. About 1,771,500 acres of potentially suitable habitat occurs within the SEZ region.	30,400 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat)	99,150 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effects, translocation of individuals from areas of direct effects, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Ash Meadows gumplant	*Grindelia fraxinopratensis*	ESA-T; NV-P; NV-S2	Endemic to the Ash Meadows region in Nye County, Nevada, where it is confined to saltgrass meadows along spring-fed desert wetlands. Nearest occurrences are from the Ash Meadows NWR, approximately 22 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined, but 2,098 acres of designated critical habitat occurs in the Ash Meadows region.	0 acres	2,098 acres of designated critical habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Ash Meadows ivesia	*Ivesia kingii eremica*	ESA-T; NV-P; NV-S2	Endemic to the Ash Meadows region in Nye County, Nevada, where it is confined to a single spring-fed wetland area with saline soils. Nearest occurrence is from the Ash Meadows NWR, approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined, but 880 acres of designated critical habitat occurs in the Ash Meadows NWR.	0 acres	880 acres of designated critical habitat in the Ash Meadows NWR could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Ash Meadows sunray	*Enceliopsis nudicaulis corrugata*	ESA-T; NV-P; NV-S2	Endemic to the Ash Meadows region in Nye County, Nevada, where it is confined to a single spring-fed wetland area with saline soils. Nearest occurrence is from the Ash Meadows NWR, approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined, but 880 acres of designated critical habitat occurs in the Ash Meadows NWR.	0 acres	880 acres of designated critical habitat in the Ash Meadows NWR could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Black milkvetch	*Astragalus funereus*	BLM-S; FWS-SC; CA-S2; NV-S2	Known only from the Death Valley region of California and southern Nevada. There are only five occurrences of this species currently known. It inhabits gravelly clay ridges and ledges on limestone or volcanic substrates at elevations between 4,200 and 6,900 ft. Nearest recorded occurrence is approximately 8 mi north of the SEZ. About 831,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	15,800 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Bullfrog Hills sweetpea	*Lathyrus hitchcockianus*	CA-S1; NV-S2	Open, dry to slightly moist gravels of rocky drainage bottoms in canyons and on upper alluvial slopes, often at bases of boulders or canyon walls and climbing up through shrubs, in areas of volcanic tuff or carbonate rocks in the mixed-shrub, sagebrush, and pinyon-juniper zones. Nearest recorded occurrence is approximately 12 mi north of the SEZ. About 883,700 acres of potentially suitable habitat occurs within the SEZ region.	20 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	16,000 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash habitats on the SEZ could reduce impacts. See Ash Meadows buckwheat for a list of other potential mitigation measures.
Death Valley beardtongue	*Penstemon fruticiformis* ssp. *amargosae*	BLM-S; FWS-SC; CA-S2; NV-S2	Known only from the Death Valley region of California and southern Nevada. It inhabits Mojave desert scrub communities at elevations between 2,800 and 4,600 ft. Nearest recorded occurrence is approximately 13 mi east of the SEZ. About 2,424,000 acres of potentially suitable habitat occurs within the SEZ region.	30,490 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat)	16,000 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Moderate overall impact. See Ash Meadows buckwheat for a list of other potential mitigation measures.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Holmgren lupine	*Lupinus holmgrenianus*	BLM-S; CA-S2; NV-S2	Known only from the Death Valley region of California and southern Nevada. It inhabits dry desert slopes, washes, and valleys on volcanic substrates, sometimes in association with pinyon-juniper woodlands. The species occurs at elevations between 4,600 and 8,200 ft. Nearest recorded occurrence is from the Death Valley NP, approximately 15 mi northwest of the SEZ. About 132,350 acres of potentially suitable habitat occurs within the SEZ region.	20 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,500 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash habitats on the SEZ could reduce impacts See Ash Meadows buckwheat for a list of other potential mitigation measures.
Panamint Mountains bedstraw	*Galium hilendiae* ssp. *carneum*	CA-S2; NV-S1	Endemic to the Mojave Desert region of Inyo County, California, and Nye County, Nevada. Inhabits creosote scrub and pinyon-juniper woodland communities. Nearest recorded occurrence is from the Death Valley NP, approximately 22 mi northwest of the SEZ. About 1,742,100 acres of potentially suitable habitat occurs within the SEZ region.	30,400 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat)	105,800 acres of potentially suitable habitat (6.1% of available potentially suitable habitat)	Moderate overall impact. See Ash Meadows buckwheat for a list of other potential mitigation measures.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Rock purpusia	*Ivesia arizonica* var. *saxosa*	BLM-S; CA-S1; NV-S1	Endemic to the Upper Amargosa watershed of California and southern Nevada. It inhabits crevices of cliffs and boulders on volcanic substrates in pinyon-juniper communities at elevations between 4,900 and 6,900 ft. Nearest recorded occurrence is from the DOE Nevada Test Site, approximately 21 mi northeast of the SEZ. About 1,086,400 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	15,800 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Spring-loving centaury	*Centaurium namophilum*	ESA-T; NV-P; NV-S2	Endemic to the Ash Meadows region in Nye County, Nevada, where it is restricted to moist clay soils along the banks of seeps and streams. Nearest occurrence is from the Ash Meadows NWR, approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined, but 1,840 acres of designated critical habitat occurs in the Ash Meadows NWR.	0 acres	1,840 acres of designated critical habitat in the Ash Meadows NWR could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Weasel phacelia	*Phacelia mustelina*	CA-S1; NV-S2	Mojave desert scrub, pinyon-juniper woodlands on volcanic or gravelly substrates at elevations between 5,000 and 5,500 ft. Nearest recorded occurrence is from the Death Valley NP, approximately 18 mi northwest of the SEZ. About 2,766,600 acres of potentially suitable habitat occurs within the SEZ region.	30,490 acres of potentially suitable habitat lost (1.1% of available potentially suitable habitat)	116,500 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Moderate overall impact. See Ash Meadows buckwheat for a list of other potential mitigation measures.
White bearpoppy	*Arctomecon merriamii*	BLM-S; CA-S2	Endemic to the Death Valley region of California and Nevada. It inhabits barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft. Nearest recorded occurrence is from the Ash Meadows NWR, approximately 20 mi southeast of the SEZ. About 831,300 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	15,800 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
White-margined beardtongue	*Penstemon albomarginatus*	BLM-S; FWS-SC; CA-S1; NV-S2	Inhabits desert sand dune habitats and Mojavean desert scrub communities at elevations below 3,600 ft. Nearest recorded occurrence is approximately 17 mi east of the SEZ. About 2,464,200 acres of potentially suitable habitat occurs within the SEZ region.	30,490 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat)	115,200 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Moderate overall impact. See Ash Meadows buckwheat for a list of other potential mitigations measures.
Invertebrates						
Amargosa naucorid	*Pelocoris shoshone amargosa*	ESA-UR; CA-S1; NV-S1	Endemic to the Amargosa Valley in Inyo County, California, and Nye County, Nevada. Inhabits spring-fed aquatic habitats where it prefers quiet waters among vegetation. Known to occur in the vicinity of the Ash Meadows NWR, approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat elsewhere in the Amargosa Valley could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Amargosa tryonia	*Tryonia variegata*	ESA-UR; BLM-S; NV-S2	Endemic to the Amargosa Valley in Nye County, Nevada. Inhabits spring-fed aquatic habitats where there is an abundance of detritus or aquatic macrophytes. Nearest recorded occurrence is from the Ash Meadows ACEC, approximately 22 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat elsewhere in the Amargosa Valley could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Ash Meadows naucorid	*Ambrysus amargosus*	ESA-T; NV-S1	Endemic to the Ash Meadows NWR, where it is restricted to Point of Rocks and Kings Springs. Nearest recorded occurrence is approximately 25 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Ash Meadows pebblesnail	*Pyrgulopsis erythropoma*	ESA-UR; NV-S1	Endemic to the Ash Meadows NWR, where it is known from six spring systems. Nearest recorded occurrence is approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Big Dune miloderes weevil	*Miloderes rulieni*	BLM-S; NV-S1	Endemic to the Big Dune area of Nye County, Nevada, where the species is known to be dependent upon deep sand habitats. Occurs in the area of indirect effects. Known from the Big Dune ACEC, approximately 3 mi east of the SEZ. About 1,600 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	1,000 acres of potentially suitable habitat (62.2% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Crystal springsnail	*Pyrgulopsis crystalis*	ESA-UR; NV-S1	Endemic to the Ash Meadows NWR, where it is known only from Crystal Spring. Nearest recorded occurrence is approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Distal gland springsnail	*Pyrgulopsis nanus*	ESA-UR; NV-S1	Endemic to the Ash Meadows NWR, where it is known from only four spring systems. Nearest recorded occurrence is approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Elongate gland springsnail	*Pyrgulopsis isolata*	ESA-UR; NV-S1	Endemic to the Ash Meadows NWR, where it is known only from the spring at Clay Pits. Nearest recorded occurrence approximately 22 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Endemic ant	*Neivamyrmex nyensis*	NV-S1	Known from only one location in very rocky terrain south of Beatty, Nevada. Occurs in the area of indirect effects. Nearest recorded occurrence is approximately 4 mi north of the SEZ. About 57,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	8,100 acres of potentially suitable habitat (14.2% of available potentially suitable habitat)	Small overall impact; no direct affect. No species-specific mitigation is warranted.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Fairbanks springsnail	*Pyrgulopsis fairbanksensis*	ESA-UR; NV-S1	Endemic to the Ash Meadows NWR, where it is known only from Fairbanks Spring. Nearest recorded occurrence is approximately 25 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Giuliani's dune scarab beetle	*Pseudocotalpa giulianii*	ESA-UR; BLM-S; NV-S1	Endemic to the Big Dune and Lava Dune regions of Nye County, Nevada, where the species is known to be dependent upon deep sand habitats. Occurs in the area of indirect effects. Known from the Big Dune ACEC, approximately 3 mi east of the SEZ. About 1,600 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	1,000 acres of potentially suitable habitat (62.2% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Large aegialian scarab beetle	*Aegialia magnifica*	ESA-UR; BLM-S; NV-S1	Endemic to the Big Dune and Lava Dune regions of Nye County, Nevada, where the species is known to be dependent upon deep sand habitats. Occurs in the area of indirect effects. Known from the Big Dune ACEC, approximately 3 mi east of the SEZ. About 1,600 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	1,000 acres of potentially suitable habitat (62.2% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Median gland springsnail	*Pyrgulopsis pisteri*	ESA-UR; NV-S1	Endemic to the Ash Meadows NWR, where it is known from only three spring-fed habitats. Nearest recorded occurrence is approximately 25 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Minute tryonia	*Tryonia ericae*	ESA-UR; NV-S1	Endemic to the Ash Meadows NWR, where it is known from less than four spring-fed habitats. Nearest recorded occurrence is approximately 25 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Oasis Valley springsnail	*Pyrgulopsis micrococcus*	ESA-UR; BLM-S; NV-S2	Endemic to the Amargosa River drainage and the Death, Panamint, and Saline Valleys in Inyo County, California, and Nye County, Nevada. Inhabits small springs and stream outflows on stone, travertine, and detritus. Nearest recorded occurrence is approximately 10 mi north of the SEZ in the vicinity of Beatty, Nevada. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat elsewhere in the Amargosa Valley could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Point of Rocks tryonia	*Tryonia elata*	ESA-UR; NV-S1	Endemic to the Ash Meadows NWR, where it is known only from Point of Rocks Springs. Nearest recorded occurrence is approximately 22 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Sporting goods tryronia	*Tryonia angulata*	ESA-UR; NV-S1	Endemic to the Ash Meadows NWR, where it is known from only three spring systems. Nearest recorded occurrence is approximately 22 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Fish						
Ash Meadows Amargosa pupfish	*Cyprinodon nevadensis mionectes*	ESA-E; NV-P; NV-S2	Endemic to the Ash Meadows NWR, where it is known from the outflows of spring-fed systems. Nearest recorded occurrence is approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined, but 5,123 acres of designated critical habitat occurs in the Ash Meadows region.	0 acres	5,123 acres of designated critical habitat in the Ash Meadows NWR could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Ash Meadows speckled dace	*Rhinichthys osculus nevadensis*	ESA-E; NV-P; NV-S1	Endemic to the Ash Meadows NWR, where it is known from the outflows of spring-fed systems. Nearest recorded occurrence is approximately 20 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined, but 1,971 acres of designated critical habitat occurs in the Ash Meadows region.	0 acres	1,971 acres of designated critical habitat in the Ash Meadows NWR could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Fish (Cont.)						
Devils Hole pupfish	*Cyprinodon diabolis*	ESA-E; NV-P; NV-S1	Endemic to the Ash Meadows region, where it is known only from Devils Hole. Nearest recorded occurrence is approximately 24 mi southeast of the SEZ. Approximately 40 acres of occupied habitat occurs within the SEZ region.	0 acres	All 40 acres of Devils Hole could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Oasis Valley speckled dace	*Rhinichthys osculus* ssp.	ESA-UR; BLM-S; NV-P; FWS-SC; NV-S1	Endemic to the Amargosa and Oasis Valleys in Nye County, Nevada, where it is restricted to spring-fed habitats. Nearest recorded occurrence is approximately 8 mi north of the SEZ in the vicinity of Beatty, Nevada. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat elsewhere in the Amargosa Valley could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Fish (Cont.)						
Warm Springs Amargosa pupfish	*Cyprinodon nevadensis pectoralis*	ESA-E; NV-P; NV-S1	Endemic to the Ash Meadows NWR, where it is known from the outflows of spring-fed systems. Nearest recorded occurrence is approximately 22 mi southeast of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat elsewhere in the Ash Meadows region could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.
Amphibians						
Amargosa toad	*Bufo nelsoni*	ESA-UR; BLM-S; NV-P; NV-S2	Endemic to the Amargosa Valley in Nye County, Nevada, where it is confined to isolated riparian and spring-fed habitats along the Amargosa River. Usually observed near water at the outflow of warm springs. Nearest recorded occurrence is approximately 8 mi north of the SEZ in the vicinity of Beatty, Nevada. About 24,600 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but about 24,600 acres of potentially suitable habitat elsewhere in the Amargosa Valley could be affected by groundwater withdrawals	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Amargosa niterwort for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles						
Desert tortoise	***Gopherus agassizii***	ESA-T; CA-T; NV-P; CA-S2; NV-S2	Mojave and Sonoran desert creosotebush communities on firm soils for digging burrows. Often found along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Known to occur on the SEZ. About 2,717,800 acres of potentially suitable habitat occurs within the SEZ region.	31,583 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat)	106,400 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ, translocation of individuals from areas of direct effects, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and NDOW.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds						
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident in the SEZ region. Forages in grasslands, shrublands, agricultural lands, and the periphery of pinyon-juniper forests. Known to occur in Nye County, Nevada. About 1,239,000 acres of potentially suitable habitat occurs within the SEZ region.	43 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	24,000 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Northern goshawk	*Accipiter gentilis*	BLM-S; NV-P; CA-SC; NV-S2	Winter resident in the SEZ region. Primarily known from mature mountain forests and riparian habitats. Forages in both heavily forested and relatively open shrubland habitats. About 202,500 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	300 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small overall impact; no direct affect. No species-specific mitigation is warranted.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Phainopepla	*Phainopepla nitens*	BLM-S; NV-P; FWS-SC; NV-S2	Desert scrub, mesquite, and pinyon-juniper woodland communities. Also occurs in desert riparian areas and orchards. Nests in trees or shrubs in riparian habitats from 3 to 45 ft above the ground. About 1,369,100 acres of potentially suitable habitat occurs within the SEZ region.	43 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	23,000 acres of potentially suitable habitat (1.7% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effects (particularly within riparian areas along the Amargosa River); or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Prairie falcon	*Falco mexicanus*	BLM-S	Year-round resident in the SEZ region, primarily in open habitats in mountainous areas, steppe, grasslands, or cultivated areas. Typically nests in well-sheltered ledges of rocky cliffs and outcrops. About 2,338,500 acres of potentially suitable habitat occurs within the SEZ region.	31,583 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat)	120,400 acres of potentially suitable habitat (5.1% of available potentially suitable habitat)	Moderate overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Swainson's hawk	*Buteo swainsoni*	BLM-S; NV-P; CA-S2; NV-S2	Savanna, open pine-oak woodlands, grasslands, and cultivated lands. Nests typically in solitary trees, bushes, or small groves; sometimes nests near urban areas. About 1,226,900 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	5,900 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; FWS-SC; CA-SC; CA-S2	Open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports. Nests in burrows constructed by mammals (prairie dog, badger, etc.). About 4,559,600 acres of potentially suitable habitat occurs within the SEZ region.	31,600 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat)	112,600 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]		Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
				Within SEZ (Direct Effects)[d]	Indirect Effects (Outside SEZ)[e]	
Mammals						
Fringed myotis	*Myotis thysanodes*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in the SEZ region in a wide range of habitats including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roosts in buildings and caves. Nearest recorded occurrence is from the DOE Nevada Test Site, approximately 13 mi east of the SEZ. About 3,348,000 acres of potentially suitable habitat occurs within the SEZ region.	31,500 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat)	124,700 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave Desert. Rarely uses desert lowlands, but may use them as corridors for travel between mountain ranges. Nearest recorded occurrence is from the Funeral Mountains, approximately 2 mi southwest of the SEZ. About 2,343,300 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	33,400 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	Small overall impact; no direct affect. Impacts on the Nelson's bighorn sheep could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to important movement corridors within the area of direct effects.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Pallid bat	*Antrozous pallidus*	BLM-S; NV-P; FWS-SC; CA-SC	Year-round resident in the SEZ region in low elevation desert communities, including grasslands, shrublands, and woodlands. Roosts in caves, crevices, and mines. Nearest recorded occurrence is from the DOE Nevada Test Site, approximately 13 mi east of the SEZ. About 3,500,600 acres of potentially suitable habitat occurs within the SEZ region.	31,500 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat)	129,100 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Spotted bat	*Euderma maculatum*	BLM-S; NV-P; FWS-SC; CA-SC; CA-S2; NV-S2	Year-round resident in the SEZ region near forests and shrubland habitats throughout the SEZ region. Roosts and hibernates in caves and rock crevices. About 2,955,200 acres of potentially suitable habitat occurs within the SEZ region.	31,500 acres of potentially suitable habitat lost (1.1% of available potentially suitable habitat)	122,500 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; NV-P; CA-SC; CA-S2; NV-S2	Year-round resident in the SEZ region in all but subalpine and alpine habitats, and may be found at any season throughout its range. Roosts in caves, mines, tunnels, buildings, or other human-made structures. Nearest recorded occurrence is approximately 12 mi north of the SEZ. About 3,739,000 acres of potentially suitable habitat occurs within the SEZ region.	31,500 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat)	130,500 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Western small-footed myotis	*Myotis ciliolabrum*	BLM-S; FWS-SC; CA-S2	Year-round resident in the SEZ region in a variety of woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Nearest recorded occurrence is from the DOE Nevada Test Site, approximately 13 mi east of the SEZ. About 4,194,700 acres of potentially suitable habitat occurs within the SEZ region.	31,500 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat)	108,000 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

Footnotes on next page.

TABLE 11.1.12.1-1 (Cont.)

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[a] BLM-S = listed as a sensitive species by the BLM; CA-E = listed as endangered in the state of California; CA-S1 = ranked as S1 in the state of California; CA-S2 = ranked as S2 in the state of California; CA-SC = a state species of concern within the state of California; CA-T = listed as threatened in the state of California; ESA-E = listed as endangered under the ESA; ESA-T = listed as threatened under the ESA; ESA-UR = under review for listing under the ESA; FWS-SC = USFWS species of concern; NV-P = protected in the state of Nevada under NRS 501.110 (animals) or NRS 527 (plants); NV-S1 = ranked as S1 in the state of Nevada; NV-S2 = ranked as S2 in the state of Nevada.

[b] For plant species, potentially suitable habitat was determined by using SWReGAP and CAReGAP land cover types. For terrestrial vertebrate species, potentially suitable habitat was determined by using SWReGAP and CAReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portions of the road and transmission corridors where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from project development. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. Indirect effects on groundwater-dependent species were considered outside these defined areas.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1% but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert mi to km, multiply by 1.609.

[i] To convert acres to km^2, multiply by 0.004047.

[j] Species in bold text have been recorded or have designated critical habitat within 5 mi (8 km) of the SEZ boundary.

[k] To convert ft to m, multiply by 0.3048.

information on their habitats is presented in Table 11.1.12.1-1; additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

Desert Tortoise

The Mojave population of desert tortoise (north and west of the Colorado River) is listed as threatened under the ESA and is widespread in Mojave desert scrub communities where firm soils are present for digging burrows. This species has the potential to occur within the SEZ on the basis of observed occurrences on and near the SEZ and the presence of potentially suitable habitat in the SEZ (Figure 11.1.12.1-1; Table 11.1.12.1-1). Designated critical habitat for this species does not occur in the SEZ region.

The desert tortoise is known to occur throughout the SEZ affected area. According to the USFWS (Stout 2009), specific information on the density of tortoises in the vicinity of the proposed Amargosa Valley SEZ is currently not available. However, tortoises have been observed along U.S. 95, which intersects the northeast boundary of the SEZ; tortoises have also been observed within the SEZ and throughout the area of indirect effects east and west of the SEZ (Figure 11.1.12.1-1). In addition, the USGS desert tortoise model (Nussear et al. 2009) identifies the proposed Amargosa Valley SEZ as highly suitable potential desert tortoise habitat (modeled suitability value ≥0.8 out of 1.0).

Groundwater-Dependent Species

There are 11 ESA-listed species that are dependent on the groundwater supply that supports wet meadows, seeps, and springs in the Ash Meadows region (see Section 11.1.9 for a discussion of the groundwater basin). Although none of these species occur within 5 mi (8 km) of the SEZ their habitats could be affected by groundwater withdrawals to serve solar energy development on the SEZ. These species are discussed in this section.

Amargosa Niterwort. The Amargosa niterwort is a perennial forb that is listed as endangered under the ESA and is known only from the Amargosa Valley in Inyo County, California, and Nye County, Nevada. The nearest known occurrences are approximately 25 mi (40 km) southeast of the SEZ in the Ash Meadows NWR, where it occurs in playas and alkaline wetlands. Designated critical habitat for this species occurs within an area of 1,215 acres (5 km^2) to the southwest of the Ash Meadows NWR in Inyo County, California, approximately 25 mi (40 km) southeast of the SEZ.

Ash Meadows Blazingstar. The Ash Meadows blazingstar is an annual forb that is listed as threatened under the ESA and is known only from the Ash Meadows region in Nye County, Nevada. It is narrowly confined to spring-fed desert wetlands. The nearest known occurrences are approximately 20 mi (32 km) southeast of the SEZ. Designated critical habitat for this species occurs in various spring habitats within an area of 1,240 acres (5 km^2) in the Ash Meadows NWR, about 25 mi (40 km) southeast of the SEZ.

Ash Meadows Gumplant. The Ash Meadows gumplant is a perennial forb that is listed as threatened under the ESA and is known only from the Ash Meadows region of Inyo County, California, and Nye County, Nevada. It is restricted to saltgrass meadows along spring-fed streams and pools, where it is dependent upon a constant water supply. The nearest known occurrences are from the Ash Meadows NWR, approximately 22 mi (35 km) southeast of the SEZ. Designated critical habitat for this species occurs in various spring-fed habitats encompassing a total area of 2,098 acres (8.5 km^2) within the Ash Meadows NWR and in other portions of the Ash Meadows region in Inyo County, California, and Nye County, Nevada, as near as 23 mi southeast of the SEZ.

Ash Meadows Ivesia. The Ash Meadows ivesia is a perennial forb that is listed as threatened under the ESA and is known only from the Ash Meadows region in Nye County, Nevada. The species is narrowly endemic to a single spring-fed wetland area with extremely saline soils where only nine extant occurrences are known. The nearest known occurrence is from the Ash Meadows NWR, approximately 20 mi (32 km) southeast of the SEZ. Designated critical habitat for this species occurs in various habitats within a total area of 880 acres (3.5 km^2) in the Ash Meadows NWR, between 20 and 25 mi (32 and 40 km) southeast of the SEZ.

Ash Meadows Sunray. The Ash Meadows sunray is a perennial forb that is listed as threatened under the ESA and is narrowly endemic to saline soils near springs and dry washes in the Ash Meadows region. The nearest known occurrence is from the Ash Meadows NWR, approximately 20 mi (32 km) southeast of the SEZ. Designated critical habitat for this species occurs in various habitats within a total area of 1,760 acres (7 km^2) in the Ash Meadows NWR, between 20 and 25 mi (32 and 40 km) southeast of the SEZ.

Spring-Loving Centaury. The spring-loving centaury is an annual forb that is listed as threatened under the ESA and is restricted to moist clay soils along the banks of streams and seeps in the Ash Meadows region. The nearest known occurrence of this species is from the Ash Meadows NWR, approximately 20 mi (32 km) southeast of the SEZ. Designated critical habitat for this species occurs in various habitats within a total area of 1,840 acres (7.5 km^2) in the Ash Meadows NWR, between 20 and 25 mi (32 and 40 km) southeast of the SEZ.

Ash Meadows Naucorid. The Ash Meadows naucorid is a small aquatic insect that is listed as threatened under the ESA and is restricted to Point of Rocks and Kings Springs in the Ash Meadows NWR, where it inhabits gravel bottoms of the swift-flowing hot springs. The nearest known occurrences of this species are approximately 25 mi (40 km) southeast of the SEZ. Designated critical habitat for this species occurs in various habitats within a total area of

650 acres (2.5 km^2) in the Ash Meadows NWR, approximately 25 mi (40 km) southeast of the SEZ.

Ash Meadows Amargosa Pupfish. The Ash Meadows Amargosa pupfish is a small fish species that is listed as endangered under the ESA and is endemic to the outflow of warm springs in the Ash Meadows region. The nearest known occurrences are from the Ash Meadows NWR, approximately 20 mi (32 km) southeast of the SEZ. Designated critical habitat for this species occurs in various spring habitats within an area of 5,123 acres (21 km^2) in the Ash Meadows NWR, approximately 25 mi (40 km) southeast of the SEZ.

Ash Meadows Speckled Dace. The Ash Meadows speckled dace is a small fish species that is listed as endangered under the ESA and is endemic to the outflow of warm springs in the Ash Meadows region. The nearest known occurrences are from the Ash Meadows NWR, approximately 20 mi (32 km) southeast of the SEZ. Designated critical habitat for this species occurs in various spring habitats within an area of 1,971 acres (8 km^2) in the Ash Meadows NWR, approximately 25 mi (40 km) southeast of the SEZ.

Devils Hole Pupfish. The Devils Hole pupfish is a small fish species that is listed as endangered under the ESA and is endemic to Devils Hole, a cavernous aquifer-fed pool in the Ash Meadows NWR The single natural occurrence of this species is approximately 24 mi (38 km) southeast of the proposed Amargosa Valley SEZ. Critical habitat has not been designated for this species, but the only known occurrence in Devils Hole is protected and access to the site is limited.

Warm Springs Amargosa Pupfish. The Warm Springs Amargosa pupfish is a small fish species that is listed as endangered under the ESA and is endemic to the outflow of Lovell's Spring and at five additional spring flows within 1 mi (1.6 km) of Lovell's Spring in the Ash Meadows NWR. The nearest known occurrences are approximately 22 mi (35 km) southeast of the SEZ. Critical habitat has not been designated for this species, but the only known occurrences for this species are located in the Ash Meadows NWR.

11.1.12.1.2 Species That Are under Review for Listing under the ESA

In its scoping comments on the proposed Amargosa Valley SEZ, the USFWS identified 10 invertebrate and 1 amphibian species (Amargosa toad) that may be directly or indirectly affected by solar energy development within the SEZ (Stout 2009). The 10 invertebrates under review include the following springsnails: Amargosa tryonia, Ash Meadows pebblesnail, crystal springsnail, distal gland springsnail, elongate gland springsnail, Fairbanks springsnail, median gland springsnail, minute tryonia, Point of Rocks springsnail, and sporting goods springsnail (Center for Biological Diversity 2009). In addition to these species, several other invertebrate species not mentioned in the USFWS scoping letter are considered here to address potential effects. These species include the Amargosa naucorid, Giuliani's dune scarab beetle, large aegialian scarab beetle, Oasis Valley speckled dace, and Oasis Valley springsnail (Figure 11.1.12.1-1; Table 11.1.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of these species. General information on each species is provided below.

Giuliani's Dune Scarab Beetle

The Giuliani's dune scarab beetle is an insect that is endemic to the Big Dune and Lava Dune in Nye County, Nevada. Within these habitats, the species primarily lives beneath the sand surface; adults are active aboveground for short periods near sunset. Adults breed on creosotebush and on sand surfaces; larvae develop beneath the sand surface, where they apparently feed on plant roots. The species is known to occur in the Big Dune ACEC, approximately 3 mi (5 km) east of the SEZ (Figure 11.1.12.1-1; Table 11.1.12.1-1). Suitable habitat does not occur on the SEZ, but potentially suitable dune habitats occur in other portions of the affected area.

Large Aegialian Scarab Beetle

The large aegialian scarab beetle is an insect that is endemic to the Big Dune and Lava Dune in Nye County, Nevada. Little information is known on the ecology of this species. The species is known to occur in the Big Dune ACEC, approximately 3 mi (5 km) east of the SEZ (Figure 11.1.12.1-1; Table 11.1.12.1-1). Suitable dune habitat does not occur on the SEZ, but potentially suitable dune habitats occur in other portions of the affected area.

Groundwater-Dependent Species

There are 14 species under review for listing under the ESA that are dependent on the groundwater supply that supports wet meadows, seeps, and springs in the Ash Meadows region (see Section 11.1.9 for a discussion of the groundwater basin). Although none of these species occur within 5 mi (8 km) of the SEZ their habitats could be affected by groundwater withdrawals to serve solar energy development on the SEZ. These species are discussed in this section.

Amargosa Naucorid. The Amargosa naucorid is an aquatic insect known from the Amargosa Valley in Inyo County, California, and Nye County, Nevada. It inhabits spring-fed aquatic habitats where it prefers quiet waters among vegetation. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Amargosa Tryonia. The Amargosa tryonia is a freshwater mollusk endemic to the Amargosa Valley, where it is known from at least 21 sites. Within this range, it is considered locally abundant in warm spring-fed aquatic habitats where there is an abundance of detritus or aquatic macrophytes. The species is primarily known from the Ash Meadows region. The species is not known to occur in the 5-mi (8-km) area surrounding the SEZ, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Ash Meadows Pebblesnail. The Ash Meadows pebblesnail is a freshwater mollusk endemic to the Ash Meadows region of Nye County, Nevada, where it occurs in six springs. All six springs are within 0.3 mi (0.5 km) of each other. The species inhabits rocky substrates in flowing thermal water. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Crystal Springsnail. The crystal springsnail is a freshwater mollusk endemic to the Ash Meadows region of Nye County, Nevada, where it is known only from Crystal Spring. Within this spring, this species is found clinging to the walls of deep orifices. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Distal Gland Springsnail. The distal gland springsnail is a freshwater mollusk endemic to the Ash Meadows region of Nye County, Nevada. It is found at four small spring-fed habitats within 6 mi (10 km) of each other. Within these habitats, the species occurs on soft substrates in warmer waters. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Elongate Gland Springsnail. The elongate gland springsnail is a freshwater mollusk endemic to the Ash Meadows region of Nye County, Nevada. It is found only in the spring at Clay Pits. Within this habitat, the species occurs on soft substrates in thermal waters near the spring outflow. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Fairbanks Springsnail. The Fairbanks springsnail is a freshwater mollusk endemic to the Ash Meadows region of Nye County, Nevada. It is found only in Fairbanks Spring. Within this habitat, the species occurs on soft substrates in thermal waters. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Median Gland Springsnail. The median gland springsnail is a freshwater mollusk endemic to the Ash Meadows region of Nye County, Nevada. It is found in only three spring-fed habitats, all within 1 mi (1.6 km) of each other. Within these habitats, the species is found in the outflows of the springs on travertine, aquatic macrophytes, or soft substrates. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Minute Tryonia. The minute tryonia is a freshwater mollusk endemic to the Ash Meadows region of Nye County, Nevada. It is known from fewer than four spring-fed habitats globally. Within these habitats, the species is found on macrophytes in thermal outflow waters. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Oasis Valley Springsnail. The Oasis Valley springsnail is a freshwater mollusk endemic to the Amargosa River drainage and the Death, Panamint, and Saline Valleys in Inyo County, California, and Nye County, Nevada. The species occurs in small springs and stream outflows, where it is typically found on stone, travertine, and detritus. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1). The nearest known occurrence is in the Ash Meadows region, approximately 21 mi (34 km) southeast of the SEZ.

Point of Rocks Tryonia. The Point of Rocks tryonia is a freshwater mollusk endemic to the Ash Meadows region of Nye County, Nevada. It is found at only two localities at Point of Rocks Springs. Within these habitats, the species is found on travertine mounds near spring outflows. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Sporting Goods Tryonia. The sporting goods tryonia is a freshwater mollusk endemic to the Ash Meadows region of Nye County, Nevada, where it is known from only three springs. Within these habitats, the species is found on soft substrates in thermal waters. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1).

Oasis Valley Speckled Dace. The Oasis Valley speckled dace is a small fish species that is restricted to spring-fed habitats in the Oasis Valley, Nye County, Nevada. This species does not occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1). The nearest known occurrences are from isolated springs near Beatty, Nevada, approximately 8 mi (13 km) north of the SEZ (Figure 11.1.12.1-1).

Amargosa Toad. The Amargosa toad is a small toad that is endemic to a very small range (<40 mi^2 [100 km^2]) in the Amargosa Valley in Nye County, Nevada. The species is confined to isolated riparian and spring-fed habitats along the Amargosa River. It is usually observed near water at the outflow of warm springs. The species is not known to occur within 5 mi (8 km) of the SEZ boundary, but it does occur in areas dependent on groundwater discharge from the Amargosa Basin, from which groundwater could be withdrawn to serve construction and operations of solar energy facilities (Figure 11.1.12.1-1). The nearest known occurrences are from the vicinity of Beatty, Nevada, approximately 8 mi (13 km) north of the SEZ (Figure 11.1.12.1-1).

11.1.12.1.3 BLM-Designated Sensitive Species

There are 25 BLM-designated sensitive species that may occur in the affected area of the Amargosa Valley SEZ or that may be affected by solar energy development on the SEZ (Table 11.1.12.1-1). These BLM-designated sensitive species include the following (1) plants: black milkvetch, Death Valley beardtongue, Holmgren lupine, rock purpusia, white bearpoppy, and white-margined beardtongue; (2) invertebrates: Amargosa naucorid, Amargosa tryonia, Big Dune miloderes weevil, Giuliani’s dune scarab beetle, large aegialian scarab beetle, and Oasis Valley springsnail; (3) amphibian: Amargosa toad; (4) birds: ferruginous hawk, northern goshawk, phainopepla, prairie falcon, Swainson’s hawk, and western burrowing owl; and (5) mammals: fringed myotis, Nelson’s bighorn sheep, pallid bat, spotted bat, Townsend’s big-eared bat, and western small-footed bat. The Amargosa naucorid, Amargosa tryonia, Giuliani’s dune scarab beetle, large aegialian scarab beetle, Oasis Valley springsnail, and Amargosa toad were discussed in Section 11.1.12.1.2 because they are undergoing status review for listing under the ESA. Of the BLM-designated sensitive species with potentially suitable habitat in the affected area, only the Big Dune miloderes weevil, Giuliani’s dune scarab beetle, large aegialian scarab beetle, and Nelson’s bighorn sheep have been recorded within 5 mi (8 km) of the SEZ boundary. Habitats in which BLM-designated sensitive species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are presented in Table 11.1.12.1-1.

All of the BLM-designated sensitive species that could occur in the affected area have the potential to occur in the area of direct effects. These species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Black Milkvetch

The black milkvetch is a perennial forb that is known only from the Death Valley region of California and southern Nevada. There are only five occurrences of this species currently known. It inhabits gravelly-clay ridges and ledges on limestone or volcanic substrates at elevations between 4,200 and 6,900 ft (1,280 and 2,100 m). The species is known to occur about 8 mi (13 km) north of the SEZ. Potentially suitable habitat for the species does not occur on the proposed Amargosa Valley SEZ, but potentially suitable habitat may occur in the area of indirect effects outside of the SEZ (Table 11.1.12.1-1).

Death Valley Beardtongue

The Death Valley beardtongue is a perennial shrub that is known only from the Death Valley region of California and southern Nevada. It inhabits Mojave desert scrub communities at elevations between 2,800 and 4,600 ft (850 and 1,400 m). The nearest known occurrences are 13 mi (21 km) east of the proposed Amargosa Valley SEZ. Potentially suitable habitat for the species occurs on the SEZ and other portions of the affected area (Table 11.1.12.1-1).

Holmgren Lupine

The Holmgren lupine is a perennial forb that is known only from the Death Valley region of California and southern Nevada. It inhabits dry desert slopes, washes, and valleys on volcanic substrates, sometimes in association with pinyon-juniper woodlands. The species occurs at elevations between 4,600 and 8,200 ft (1,400 and 2,500 m). The nearest known occurrences are from Death Valley NP, approximately 15 mi (24 km) northwest of the proposed Amargosa Valley SEZ. Potentially suitable habitat for the species occurs on the SEZ and other portions of the affected area (Table 11.1.12.1-1).

Rock Purpusia

The rock purpusia is a perennial forb that is endemic to the Upper Amargosa River watershed of southern Nevada. It inhabits crevices of cliffs and boulders on volcanic substrates in pinyon-juniper communities at elevations between 4,900 and 6,900 ft (1,500 and 2,100 m). The nearest known occurrences are from the DOE Nevada Test Site, approximately 21 mi (34 km) northeast of the proposed Amargosa Valley SEZ. Potentially suitable habitat for the species does not occur on the proposed Amargosa Valley SEZ, but potentially suitable habitat may occur in the area of indirect effects outside of the SEZ (Table 11.1.12.1-1).

White Bearpoppy

The white bearpoppy is a perennial forb that is endemic to the Death Valley region of California and Nevada. It inhabits barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft (600 and 1,800 m). The nearest known occurrences are from the Ash Meadows NWR, approximately 20 mi (32 km) southeast of the proposed Amargosa Valley SEZ. Potentially suitable habitat for the species does not occur on the proposed Amargosa Valley SEZ, but potentially suitable habitat may occur in the area of indirect effects outside of the SEZ (Table 11.1.12.1-1).

White-Margined Beardtongue

The white-margined beardtongue is a perennial forb that occurs in the deserts of Arizona, California, and Nevada. It inhabits desert dunes and desert scrub communities of the Mojave Desert at elevations between 2,000 and 3,600 ft (600 and 1,100 m). The nearest known occurrences are approximately 17 mi (27 km) east of the proposed Amargosa Valley SEZ. Potentially suitable habitat for the species occurs on the SEZ and other portions of the affected area (Table 11.1.12.1-1).

Big Dune Miloderes Weevil

The Big Dune miloderes weevil is an insect that is endemic to the Big Dune area in Nye County, Nevada. Little information is available on the ecology of this species, but it is known to be dependent upon deep sand habitats. Suitable dune habitat does not occur on the SEZ, but potentially suitable dune habitats occur in other portions of the affected area. The species is known to occur in the Big Dune ACEC, approximately 3 mi (5 km) east of the SEZ (Table 11.1.12.1-1).

Ferruginous Hawk

The ferruginous hawk is a winter resident in the Amargosa Valley SEZ region. The species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. This species occurs in Nye County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.1.12.1-1).

Northern Goshawk

The northern goshawk is a winter resident in the Amargosa Valley SEZ region. The species is known to forage in montane forests and valley shrubland habitats. This species is occurs in Nye County, Nevada. Suitable foraging habitat is not expected to occur on the SEZ, but potentially suitable foraging habitat may occur in other portions of the affected area (Table 11.1.12.1-1).

Phainopepla

The phainopepla occurs in the southwestern United States and Mexico, where it breeds in suitable habitats throughout much of the Amargosa Valley SEZ region. The species occurs in desert scrub, mesquite, and pinyon-juniper woodland communities, as well as desert riparian areas and orchards. Nests are typically constructed in trees and shrubs from 3 to 45 ft (1 to 15 m) above the ground. This species occurs in Nye County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.1.12.1-1). The availability of suitable nesting habitat on the SEZ and in the area of indirect effects has not been determined.

Prairie Falcon

The prairie falcon occurs throughout the western United States. It is a year-round resident within the Amargosa Valley SEZ region. The species occurs in open habitats in mountainous areas, sagebrush-steppe, grasslands, or cultivated areas. Nests are typically constructed in well-sheltered ledges of rocky cliffs and outcrops. This species occurs in Nye County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, potentially suitable nesting habitat (cliffs and rock outcrops) does not occur on the SEZ or within the area of indirect effects.

Swainson's Hawk

The Swainson's hawk occurs throughout the southwestern United States. The breeding range for this species occurs throughout the Amargosa Valley SEZ region. It inhabits desert, savanna, open pine-oak woodland, grassland, and cultivated habitats. Nests are typically constructed in solitary trees, bushes, or small groves; sometimes nests near urban areas. This species occurs in Nye County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, potentially suitable nesting habitat (woodlands) does not occur on the SEZ; however, approximately 70 acres (0.3 km^2) of woodland habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Western Burrowing Owl

The western burrowing owl is a summer (breeding) resident of open, dry grasslands and desert habitats in the Amargosa Valley SEZ region. The species occurs locally in open areas with sparse vegetation, where it forages in grasslands, shrublands, and open disturbed areas. This species typically nests in burrows constructed by mammals. The species occurs in Nye County, Nevada, and potentially suitable summer breeding habitat is expected to occur in the SEZ and in other portions of the affected area (Table 11.1.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Fringed Myotis

The fringed myotis is a year-round resident in the Amargosa Valley SEZ region, where it occurs in a variety of habitats including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. The species roosts in buildings and caves. The nearest recorded occurrence is from the DOE Nevada Test Site, approximately 13 mi (21 km) east of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, there apparently is no suitable roosting habitat (rocky cliffs and outcrops) within the SEZ or within the area of indirect effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep (also called the desert bighorn sheep) is a subspecies of bighorn sheep known to occur in the Amargosa Valley SEZ region. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats, and may utilize desert valleys as corridors for travel between range habitats. The species is known to occur in the affected area of the proposed Amargosa Valley SEZ. Nearest recorded occurrences are from Inyo County, California, within the Funeral Mountains, approximately 2 mi (3 km) southwest of the SEZ. Suitable habitat does not occur on the SEZ, but portions of the affected area may provide important range and migratory habitat for the Nelson's bighorn sheep (Table 11.1.12.1-1).

Pallid Bat

The pallid bat is a large pale bat with large ears that is locally common in desert grasslands and shrublands in the southwestern United States. It roosts in caves, crevices, and mines. The species is a year-round resident throughout southern Nevada. The nearest recorded occurrence is from the DOE Nevada Test Site, approximately 13 mi (21 km) east of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, there apparently is no suitable roosting habitat (rocky cliffs and outcrops) within the SEZ or within the area of indirect effects.

Spotted Bat

The spotted bat is considered to be a year-round resident in the Amargosa Valley SEZ region, where it occurs in a variety of forested and shrubland habitats. It roosts in caves and rock crevices. The species occurs in Nye County, Nevada, and potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, there apparently is no suitable roosting habitat (rocky cliffs and outcrops) within the SEZ or within the area of indirect effects.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. In southern Nevada, the species forages year-round in a wide variety of desert and nondesert habitats. The species roosts in caves, mines, tunnels, buildings, and other manmade structures. The nearest recorded occurrences are approximately 12 mi (19 km) north of the proposed Amargosa Valley SEZ. Potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, there apparently is no suitable roosting habitat (rocky cliffs and outcrops) within the SEZ or within the area of indirect effects.

Western Small-Footed Bat

The western small-footed bat is widely distributed throughout the western United States. The species is considered a year-round resident in southern Nevada, where it occupies a wide variety of desert and non-desert habitats including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, tunnels, buildings, and other manmade structures, and beneath boulders or loose bark. The nearest recorded occurrence is from the DOE Nevada Test Site, approximately 13 mi (21 km) east of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, there apparently is no suitable roosting habitat (rocky cliffs and outcrops) within the SEZ or within the area of indirect effects.

11.1.12.1.4 State-Listed Species

There are 19 species listed by the states of California or Nevada that may occur in the Amargosa Valley SEZ affected area or that may be affected by solar energy development on the SEZ (Table 11.1.12.1-1). These state-listed species include the following (1) plants: Amargosa niterwort, Ash Meadows blazingstar, Ash Meadows gumplant, Ash Meadows ivesia, Ash Meadows sunray, and spring-loving centaury; (2) fish: Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, Devils Hole pupfish, Oasis Valley speckled dace, and Warm Springs Amargosa pupfish; (3) amphibian: Amargosa toad; (4) reptile: desert tortoise; (5) birds: northern goshawk and Swainson's hawk; and (6) mammals: fringed myotis, pallid bat, spotted bat, and Townsend's big-eared bat. All of these species are protected in the state of Nevada under NRS 501.110 (animals) or NRS 527 (plants). Each of these species has been previously discussed because of its known or review status under the ESA (Sections 11.1.12.1.1 or 11.1.12.1.2) or the BLM (Section 11.1.12.1.3). Additional life history information for these species is provided in Appendix J.

11.1.12.1.5 Rare Species

There are 49 rare species (i.e., state rank of S1 or S2 in California or Nevada or a species of concern by the states of California or Nevada or USFWS) that may be affected by solar energy development on the proposed Amargosa Valley SEZ (Table 11.1.12.1-1). Of these species, there are five that have not been discussed as ESA-listed species (Section 11.1.12.1.1), under review for ESA listing (Section 11.1.12.1.2), or BLM-designated sensitive (Section 11.1.12.1.3). These include the following: Ash Meadows buckwheat, Bullfrog Hills sweetpea, Panamint Mountains bedstraw, weasel phacelia, and the endemic ant *Neivamyrmex nyensis*. The following rare species are known to occur within 5 mi (8 km) of the proposed Amargosa Valley SEZ: Ash Meadows buckwheat, Big Dune miloderes weevil, the ant *Neivamyrmex nyensis*, and Nelson's bighorn sheep (Table 11.1.12.1-1).

11.1.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Amargosa Valley SEZ is presented in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 11.1.12.1 following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 11.1.12.3).

Solar energy development within the proposed Amargosa Valley SEZ could affect a variety of habitats (see Sections 11.1.9 and 11.1.10). These impacts on habitats could in turn affect special status species that are dependent on those habitats. Based on NNHP and CNDDB records, there are seven special status species known to occur within 5 mi (8 km) of the Amargosa Valley SEZ boundary: Ash Meadows buckwheat, Big Dune miloderes weevil, the endemic ant *Neivamyrmex nyensis*, Giuliani's dune scarab beetle, large aegialian scarab beetle, desert tortoise, and Nelson's bighorn sheep. These species are listed in bold in Table 11.1.12.1-1. In addition, there are 25 groundwater-dependent special status species that occur more than 5 mi (8 km) from the SEZ boundary, but that could be affected by the withdrawal of groundwater to serve solar energy development on the SEZ. Other special status species may occur on the SEZ or within the affected area on the basis of the presence of potentially suitable habitat. As discussed in Section 11.1.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 11.1.1.2, impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ where ground-disturbing activities are expected to occur. Indirect impacts could result from depletions of groundwater resources, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project development are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., rock outcrops and desert riparian habitats). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce groundwater consumption, runoff, sedimentation, spills, and fugitive dust.

11.1.12.2.1 Impacts on Species Listed under the ESA

Impacts on the 12 ESA-listed species that may occur in the proposed Amargosa Valley SEZ affected area, or that may be affected by solar energy development on the SEZ, are discussed below. These assessments are based on the best information available, but discussions of potential impacts and mitigation options should be held in consultation with the USFWS. Formal consultation with the USFWS under Section 7 of the ESA is required for any federal action that may adversely affect an ESA-listed species.

Desert Tortoise

The desert tortoise is listed as a threatened species under the ESA throughout the entire Amargosa Valley SEZ region. It is widespread in Mojave desert scrub communities where firm soils are present for digging burrows. The desert tortoise has the potential to occur within the SEZ on the basis of observed occurrences on and near the SEZ and the presence of apparently suitable habitat in the SEZ (Figure 11.1.12.1-1; Table 11.1.12.1-1). According to habitat suitability models, approximately 31,583 acres (128 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations of solar energy development on the SEZ (Table 11.1.12.1-1). This direct effects area represents about 1.2% of available suitable habitat of the desert tortoise in the region. Much of this habitat within the SEZ is considered to be highly suitable (modeled suitability value ≥0.8 out of 1.0) according to the USGS desert tortoise habitat suitability model (Nussear et al. 2009). About 106,400 acres (430 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.9% of the available suitable habitat in the region (Table 11.1.12.1-1).

The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to reduce these impacts to negligible levels. Avoidance of potentially suitable habitats for this species is not a feasible means of mitigating impacts because these habitats (desert scrub) are widespread throughout the area of direct effects. Preconstruction surveys to determine the abundance of desert tortoises on the SEZ and the implementation of a desert tortoise translocation plan and compensation plan could further reduce direct impacts.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions) for the desert tortoise, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, translocation actions, and compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. These consultations may be used to authorize incidental take statements per Section 10 of the ESA (if necessary). Consultation with the NDOW should also occur to determine any state mitigation requirements.

There are inherent dangers to tortoises associated with their capture, handling, and translocation from the SEZ. These actions, if done improperly, can result in injury or death. To minimize these risks, and as stated above, the desert tortoise translocation plan should be developed in consultation with the USFWS, and follow the *Guidelines for Handling Desert Tortoises During Construction Projects* (Desert Tortoise Council 1994) and other current translocation guidance provided by the USFWS. Consultation will identify potentially suitable recipient locations, density thresholds for tortoise populations in recipient locations, and procedures for pre-disturbance clearance surveys and tortoise handling, as well as disease testing and post-translocation monitoring and reporting requirements. Despite some risk of mortality or decreased fitness, translocation is widely accepted as a useful strategy for the conservation of the desert tortoise (Field et al. 2007).

To offset impacts of solar development on the SEZ, compensatory mitigation may be needed to balance the acreage of habitat lost with acquisition of lands that would be improved and protected for desert tortoise populations (USFWS 1994). Compensation can be accomplished by improving the carrying capacity for the desert tortoise on the acquired lands. Other mitigation actions may include funding for the habitat enhancement of the desert tortoise on existing federal lands. Consultation with the USFWS and NDOW would be necessary to determine the appropriate mitigation ratio to acquire, enhance, and preserve desert tortoise compensation lands.

Groundwater-Dependent Species

There are 11 species listed as threatened or endangered under the ESA that do not occur within 5 mi (8 km) of the SEZ boundary but that do occur in areas dependent on groundwater discharge from the regional Amargosa Desert groundwater system. These species include the following (1) plants: Ash Meadows blazingstar (threatened), Ash Meadows gumplant (threatened), Ash Meadows ivesia (threatened), Amargosa niterwort (endangered), Ash Meadows sunray (threatened), and spring-loving centaury (threatened); (2) invertebrates: Ash Meadows naucorid (threatened); and (3) fish: Ash Meadows Amargosa pupfish (endangered), Ash Meadows speckled dace (endangered), Devils Hole pupfish (threatened), and Warm Springs Amargosa pupfish (endangered). Groundwater withdrawn from the Amargosa Desert groundwater basin to serve construction and operations of solar energy facilities on the SEZ could affect aquatic and riparian habitats for the ESA-listed species that are dependent on groundwater. Such impacts would result from the lowering of the water table and alteration of hydrologic processes.

Impacts of groundwater depletion from solar energy development in the Amargosa Valley SEZ cannot be quantified without identification of the cumulative amount of groundwater withdrawals needed to support development on the SEZ. Consequently, the overall impact on these species could range from small to large, and would depend in part on the solar energy technology deployed, the scale of development within the SEZ, the type of cooling system used, and the degree of influence water withdrawals in the SEZ would have on drawdown and surface water discharges in habitats supporting these species (Table 11.1.12.1-1).

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system would reduce impacts on the groundwater-dependent species to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified and through application of a regional groundwater model.

11.1.12.2.2 Impacts on Species That Are under Review for Listing under the ESA

Impacts on the 16 species currently under review for ESA listing that may occur in the proposed Amargosa Valley SEZ affected area, or that may be affected by solar energy development on the SEZ, are discussed below. For all of these species, potential impacts and mitigation options should be discussed with the USFWS prior to project development.

Giuliani's Dune Scarab Beetle

The Giuliani's dune scarab beetle is endemic to the Big Dune and Lava Dune, and is known to occur in the affected area of the proposed Amargosa Valley SEZ, approximately 3 mi (5 km) east of the SEZ. Suitable habitat for this species does not occur on the SEZ. However, approximately 1,000 acres (4 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 62.2% of the available suitable habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the Giuliani's dune scarab beetle from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to reduce indirect impacts on this species to negligible levels in the area of indirect impacts. However, given the location of this species and its habitat immediately adjacent to the SEZ boundary, a review of mitigation effectiveness to avoid indirect effects (e.g., site runoff and erosion) on this species should be conducted during the project design phase.

Large Aegialian Scarab Beetle

The large aegialian scarab beetle is endemic to the Big Dune and Lava Dune, and is known to occur in the affected area of the proposed Amargosa Valley SEZ, approximately 3 mi (5 km) east of the SEZ. Suitable habitat for this species does not occur on the SEZ. However, approximately 1,000 acres (4 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 62.2% of the available suitable habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the large aegialian scarab beetle from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to reduce indirect impacts on this species to negligible levels in the area of indirect impacts. However, given the location of this species and its habitat immediately adjacent to the SEZ boundary, a review of mitigation effectiveness to avoid indirect effects (e.g., site runoff and erosion) on this species should be conducted during the project design phase.

Groundwater-Dependent Species

There are 14 species currently under review for listing under the ESA that do not occur within 5 mi (8 km) of the SEZ boundary but that do occur in areas dependent on groundwater discharge from the regional Amargosa Desert groundwater system. These species include the following: (1) invertebrates: Amargosa naucorid, Amargosa tryonia, Ash Meadows pebblesnail, crystal springsnail, distal gland springsnail, elongate gland springsnail, Fairbanks springsnail, median gland springsnail, minute tryonia, Oasis Valley springsnail, Point of Rocks tryonia, and sporting goods tryonia; (2) fish: Oasis Valley speckled dace; and (3) amphibians: Amargosa toad. Groundwater withdrawn from the Amargosa Desert groundwater basin to serve construction and operations of solar energy facilities on the SEZ could affect aquatic and riparian habitats for these species. Such impacts would result from the lowering of the water table and alteration of hydrologic processes.

Impacts of groundwater depletion from solar energy development in the Amargosa Valley SEZ cannot be quantified without identification of the cumulative amount of groundwater withdrawals needed to support development on the SEZ. Consequently, the overall impact on these species could range from small to large, and would depend in part on the solar energy technology deployed, the scale of development within the SEZ, the type of cooling system used, and the degree of influence water withdrawals in the SEZ would have on drawdown and surface water discharges in habitats supporting these species (Table 11.1.12.1-1).

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system would reduce impacts on the groundwater-dependent species to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified and through application of a regional groundwater model.

11.1.12.2.3 Impacts on BLM-Designated Sensitive Species

BLM-designated sensitive species that may be affected by solar energy development on the proposed Amargosa Valley SEZ and are not previously discussed as ESA-listed or under review for ESA listing in Sections 11.1.12.2.1 and 11.1.12.2.2, respectively, are discussed below.

Black Milkvetch

The black milkvetch is not known to occur in the affected area of the proposed Amargosa Valley SEZ and suitable habitat for the species does not occur on the site. However, approximately 15,800 acres (64 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.9% of the available suitable habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the black milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Death Valley Beardtongue

The Death Valley beardtongue is not known to occur in the affected area of the proposed Amargosa Valley SEZ; however, approximately 30,490 acres (123 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents about 1.3% of potentially suitable habitat in the SEZ region.

About 114,100 acres (462 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 4.7% of the available suitable habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the Death Valley beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible means to mitigate impacts on the Death Valley beardtongue because potentially suitable desert scrub habitat is widespread throughout the area of direct effects. Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ. If avoidance or minimization is not a feasible option, plants could be translocated from areas of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Holmgren Lupine

The Holmgren lupine is not known to occur in the affected area of the proposed Amargosa Valley SEZ; however, approximately 20 acres (0.1 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 2,500 acres (10 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.9% of the available suitable habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the Holmgren lupine from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features and avoiding or minimizing disturbance to desert wash habitats may be sufficient to reduce indirect and direct impacts to negligible levels. If avoidance or minimization is not possible, impacts could be reduced by implementing the mitigation options described previously for the Death Valley beardtongue. The need for mitigation, other than programmatic design features, should be determined by conducting pre-construction surveys for the species and its habitat on the SEZ.

Rock Purpusia

The rock purpusia is not known to occur in the affected area of the proposed Amargosa Valley SEZ, and potentially suitable habitat for the species does not occur on the site. However, approximately 15,800 acres (64 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.5% of the potentially suitable habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the rock purpusia from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

White Bearpoppy

The white bearpoppy is not known to occur in the affected area of the proposed Amargosa Valley SEZ, and potentially suitable habitat for the species does not occur on the site. However, approximately 15,800 acres (64 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.9% of the available potentially suitable habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the white bearpoppy from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

White-Margined Beardtongue

The white-margined beardtongue is not known to occur in the affected area of the proposed Amargosa Valley SEZ; however, approximately 30,490 acres (123 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents about 1.2% of potentially suitable habitat in the SEZ region. About 115,200 acres (466 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 4.7% of the potentially suitable habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the white-margined beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the white-margined beardtongue because potentially suitable desert scrub habitat is widespread throughout the area of direct effects. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the Death Valley beardtongue. The need for mitigation, other than programmatic design features, should be determined by conducting pre-construction surveys for the species and its habitat on the SEZ.

Big Dune Miloderes Weevil

The Big Dune miloderes weevil is endemic to the Big Dune area and is known to occur in the affected area of the proposed Amargosa Valley SEZ, approximately 3 mi (5 km) east of the SEZ. Suitable habitat for this species does not occur on the SEZ. However, approximately 1,000 acres (4 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 62.2% of the available suitable habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the Big Dune miloderes weevil from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels. No mitigation of direct effects is warranted, other than programmatic design features, because suitable habitat does not occur anywhere in the area of direct effects. The implementation of programmatic design features is expected to reduce indirect impacts on this species to negligible levels in the area of indirect impacts. However, given the location of this species and its habitat immediately adjacent to the SEZ boundary, a review of mitigation effectiveness to avoid indirect effects (e.g., site runoff and erosion) on this species should be conducted during the project design phase.

Ferruginous Hawk

The ferruginous hawk is a winter resident within the proposed Amargosa Valley SEZ region and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 43 acres (0.2 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 24,000 acres (97 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 1.9% of the available suitable foraging habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of direct impacts on all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the ferruginous hawk because potentially suitable shrubland is widespread throughout the area of direct effects and readily available in other portions of the affected area.

Northern Goshawk

The northern goshawk is considered a winter resident within the proposed Amargosa Valley SEZ region and potentially suitable foraging habitat is expected to occur in the affected area. Suitable habitat for this species does not occur on the SEZ. However, about 300 acres (1 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 0.2% of the potentially suitable foraging habitat in the SEZ region (Table 11.1.12.1-1).

The overall impact on the northern goshawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels.

Phainopepla

The phainopepla breeds in suitable riparian habitats throughout much of the proposed Amargosa Valley SEZ region, and potentially suitable habitat is expected to occur in the affected area. The availability of suitable nesting habitat (riparian habitats) on the SEZ and in the area of indirect effects has not been determined, although potentially suitable riparian habitats may occur within the SEZ along the Amargosa River.

Approximately 43 acres (0.2 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 23,000 acres (93 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.7% of the potentially suitable habitat in the SEZ region (Table 11.1.12.1-1). The overall impact on the phainopepla from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats to mitigate direct effects is not feasible because potentially suitable habitat (desert scrub) is widespread in the area of direct effects and readily available in other portions of the SEZ region. However, avoiding or minimizing disturbance to riparian areas could be a feasible method to mitigate impacts on nesting habitats. In conjunction with the implementation of programmatic design features, pre-disturbance surveys and avoiding or minimizing disturbance to occupied nesting habitats in the area of direct effects could reduce impacts. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied nest sites. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Prairie Falcon

The prairie falcon is a year-round resident within the proposed Amargosa Valley SEZ region and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 31,583 acres (128 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents 1.3% of potentially suitable habitat in the SEZ region. About 120,400 acres (487 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5.1% of the potentially suitable habitat in the SEZ region (Table 11.1.12.1-1). Most of this area could serve as foraging habitat (open shrublands). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, potentially suitable nesting habitat (cliffs and rock outcrops) does not occur on the SEZ or within the area of indirect effects.

The overall impact on the prairie falcon from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered moderate because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats to mitigate impacts on the prairie falcon is not feasible because potentially suitable foraging habitats are widespread throughout the area of direct effects and readily available in other portions of the affected area.

Swainson's Hawk

The Swainson's hawk breeds in suitable habitats throughout much of the proposed Amargosa Valley SEZ region, and potentially suitable habitat is expected to occur in the affected area. About 5,900 acres (24 km^2) of potentially suitable foraging habitat (open shrublands) occurs in the area of indirect effects; this area represents about 0.5% of the available suitable foraging habitat in the SEZ region (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, potentially suitable nesting habitat (woodlands) does not occur on the SEZ; however, approximately 70 acres (0.3 km^2) of woodland habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the Swainson's hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Western Burrowing Owl

The western burrowing owl breeds in suitable habitats throughout much of the proposed Amargosa Valley SEZ region, and potentially suitable habitat is expected to occur in the affected area. Approximately 31,600 acres (128 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents 0.7% of potentially suitable habitat in the SEZ region. About 112,600 acres (456 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.5% of the potentially suitable habitat in the SEZ region (Table 11.1.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the western burrowing owl because potentially suitable desert scrub habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. Impacts on the western burrowing owl could be reduced to negligible levels through the implementation of programmatic design features and by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows on the SEZ. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-construction surveys for the species and its habitat on the SEZ.

Fringed Myotis

The fringed myotis is a year-round resident within the proposed Amargosa Valley SEZ region. Suitable roosting habitats (caves and buildings) are not expected to occur on the SEZ, but the availability of suitable roosting sites in the area of indirect effects has not been determined.

Approximately 31,500 acres (127 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents about 0.9% of potentially suitable foraging habitat in the region. About 124,700 acres (505 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 3.7% of the available suitable foraging habitat in the region (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, no suitable roosting habitat (rocky cliffs and outcrops) exists within the SEZ or within the area of indirect effects.

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts because potentially suitable foraging habitat is widespread throughout the area of direct effects and is readily available in other portions of the SEZ region.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is known to occur in the affected area from the Funeral Mountains in Inyo County, California, about 2 mi (3 km) southwest of the proposed Amargosa Valley SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not exist on the SEZ. However, approximately 33,400 acres (135 km^2) of potentially suitable habitat occurs within the area of indirect effects; this area represents about 1.4% of the potentially suitable habitat in the region (Table 11.1.12.1-1).

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because no potentially suitable habitat for this species has been identified in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Impacts on the Nelson's bighorn sheep could be further reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to important movement corridors within the area of direct effects.

Pallid Bat

The pallid bat is a year-round resident within the proposed Amargosa Valley SEZ region. Suitable roosting habitats (caves and buildings) are not expected to occur on the SEZ, but the availability of suitable roosting sites in the area of indirect effects has not been determined. Approximately 31,500 acres (127 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents about 0.9% of potentially suitable foraging habitat in the region. About 129,100 acres (522 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 3.7% of the potentially suitable foraging habitat in the region (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, no suitable roosting habitat (rocky cliffs and outcrops) exists within the SEZ or within the area of indirect effects.

The overall impact on the pallid bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts because potentially suitable foraging habitat is widespread throughout the area of direct effects and is readily available in other portions of the SEZ region.

Spotted Bat

The spotted bat is a year-round resident within the proposed Amargosa Valley SEZ region. Suitable roosting habitats (caves and rock outcrops) are not expected to occur on the SEZ, but the availability of suitable roosting sites in the area of indirect effects has not been determined. Approximately 31,500 acres (127 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents about 1.1% of potentially suitable foraging habitat in the region. About 122,500 acres (496 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 4.1% of the potentially suitable foraging habitat in the region (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, no suitable roosting habitat (rocky cliffs and outcrops) exists within the SEZ or within the area of indirect effects.

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered moderate because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts because potentially suitable foraging habitat is widespread throughout the area of direct effects and is readily available in other portions of the SEZ region.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident within the proposed Amargosa Valley SEZ region. Suitable roosting habitats (caves and buildings) are not expected to occur on the SEZ, but the availability of suitable roosting sites in the area of indirect effects has not been determined. Approximately 31,500 acres (127 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents about 0.8% of potentially suitable foraging habitat in the region. About 130,500 acres (528 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 3.5% of the potentially suitable foraging habitat in the region (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, no suitable roosting habitat (rocky cliffs and outcrops) exists within the SEZ or within the area of indirect effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts because potentially suitable foraging habitat is widespread throughout the area of direct effects and is readily available in other portions of the SEZ region.

Western Small-Footed Bat

The western small-footed bat is a year-round resident within the proposed Amargosa Valley SEZ region. Suitable roosting habitats (caves, rock outcrops, and buildings) are not expected to occur on the SEZ, but the availability of suitable roosting sites in the area of indirect effects has not been determined. Approximately 31,500 acres (127 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.1.12.1-1). This direct impact area represents about 0.8% of potentially suitable foraging habitat in the region. About 108,000 acres (437 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 2.6% of the potentially suitable foraging habitat in the region (Table 11.1.12.1-1). On the basis of an evaluation of SWReGAP and CAReGAP land cover types, no suitable roosting habitat (rocky cliffs and outcrops) exists within the SEZ or within the area of indirect effects.

The overall impact on the western small-footed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Amargosa Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts because potentially suitable foraging habitat is widespread throughout the area of direct effects and is readily available in other portions of the SEZ region.

11.1.12.2.4 Impacts on State-Listed Species

There are 19 species listed by the states of California or Nevada that may occur in the proposed Amargosa Valley SEZ affected area or that may be affected by solar energy development on the SEZ (Table 11.1.12.1-1). Impacts on each of these species have been previously discussed because of their known or pending status under the ESA (Sections 11.1.12.2.1 or 11.1.12.2.2) or their designation by the BLM as sensitive species (Section 11.1.12.2.3).

11.1.12.2.5 Impacts on Rare Species

There are 49 rare species (state rank of S1 or S2 in California or Nevada or a species of concern by the states of California or Nevada or USFWS) that may be affected by solar energy development on the proposed Amargosa Valley SEZ. Impacts have been previously discussed for 44 of these species that are also listed under the ESA (Section 11.1.12.2.1), under review for ESA listing (Section 11.1.12.2.2), BLM-designated sensitive (Section 11.1.12.2.3), or state-listed (Section 11.1.12.2.4). Of the rare species that could occur in the affected area, only the Ash Meadows buckwheat, Bullfrog Hills sweetpea, Panamint Mountains bedstraw, weasel phacelia, and the ant *Neivamyrmex nyensis* were not discussed elsewhere. Impacts on these species are presented in Table 11.1.12.1-1. Rare species that are known to occur within 5 mi (8 km) of the proposed Amargosa Valley SEZ include Ash Meadows buckwheat, Big Dune miloderes weevil, the ant *Neivamyrmex nyensis*, and Nelson's bighorn sheep.

11.1.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when specific project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 11.1.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible, translocation of individuals from areas of direct effects, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Avoiding or minimizing disturbance to desert wash or riparian habitats on the SEZ could reduce impacts on the Bullfrog Hills sweetpea, Holmgren lupine, and phainopepla.

- Avoiding or limiting groundwater withdrawals from the Amargosa Desert Basin to serve solar energy development on the SEZ would reduce or prevent impacts on the following 25 groundwater-dependent special status species that may occur more the 5 mi (8 km) from the SEZ boundary: Amargosa niterwort, Ash Meadows blazingstar, Ash Meadows gumplant, Ash Meadows ivesia, Ash Meadows sunray, spring-loving centaury, Amargosa tryonia, Ash Meadows pebblesnail, crystal springsnail, distal gland springsnail, elongate gland springsnail, Fairbanks springsnail, median gland springsnail, minute tryonia, Oasis Valley springsnail, Point of Rocks tryonia, sporting goods tryonia, Amargosa naucorid, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, Devils Hole pupfish, Oasis Valley speckled dace, Warm Springs Amargosa pupfish, and Amargosa toad.

- Consultation with the USFWS and NDOW should be conducted to address the potential for impacts on the following 12 species listed as threatened or endangered under the ESA that may be affected by solar energy development on the SEZ: Amargosa niterwort, Ash Meadows blazingstar, Ash Meadows gumplant, Ash Meadows ivesia, Ash Meadows sunray, spring-loving centaury, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, Devils Hole pupfish, Warm Springs Amargosa pupfish, and desert tortoise. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Coordination with the USFWS and NDOW should be conducted for the following 16 species under review for listing under the ESA that may be affected by solar energy development on the SEZ: Amargosa tryonia, Ash Meadows pebblesnail, crystal springsnail, distal gland springsnail, elongate gland springsnail, Fairbanks springsnail, median gland springsnail, minute tryonia, Oasis Valley springsnail, Point of Rocks tryonia, sporting goods tryonia, Amargosa naucorid, Oasis Valley speckled dace, and Amargosa toad. Coordination would identify an appropriate survey protocol, and mitigation requirements, which may include avoidance, minimization, translocation, or compensation.

- Coordination with the USFWS and NDOW should be conducted to address potential indirect impacts (e.g. site runoff and erosion) and the effectiveness of design features for the following special status species that are endemic to the Big Dune system: Big Dune meloderes weevil, Giuliani's dune scarab beetle, and large aegialian scarab beetle.

- Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species could be reduced.

11.1.13 Air Quality and Climate

11.1.13.1 Affected Environment

11.1.13.1.1 Climate

The proposed Amargosa Valley SEZ is located in south–central Nevada, in the southern portion of Nye County. Nevada lies on the eastern lee side of the Sierra Nevada Range, which markedly influences the climate of the state under the prevailing westerlies (NCDC 2010a). In addition, the mountains east and north of Nevada act as a barrier to the cold arctic air masses, and thus long periods of extremely cold weather are uncommon. The SEZ with an average elevation of about 2,660 ft (810 m) lies in the northern portion of the Mojave Desert, which has an extremely arid climate marked by mild winters and hot summers, large daily temperature swings due to dry air, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Mercury/Desert Rock Airport, about 33 mi (53 km) east of the Amargosa Valley SEZ boundary, and Amargosa Farms Garey, about 10 mi (16 km) southeast, are summarized below.

A wind rose from the Mercury/Desert Rock Airport, Nevada, for the 5-year period 2005 to 2009, taken at a level of 33 ft (10 m), is presented in Figure 11.1.13.1-1 (NCDC 2010b). During this period, the annual average wind speed at the airport was about 8.8 mph (3.9 m/s), with a prevailing wind direction from the southwest (about 11.2% of the time) and secondarily from the northeast and south–southwest (about 10.2% of the time each). Higher southwesterly components (about 21.4% in wind directions from the southwest and south–southwest) are comparable to northeast wind components (about 19.5% in wind directions from the northeast and north–northeast). Wind directions alternated between southwest and northeast throughout the year. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 17.5% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were relatively uniform: the highest in summer and winter at 9.0 mph (4.0 m/s); lower in fall at 8.8 mph (3.9 m/s); and lowest in spring at 8.6 mph (3.8 m/s).

For the 1965 to 2009 period, the annual average temperature at Amargosa Farms Garey was 64.9°F (18.3°C) (WRCC 2010e). December was the coldest month, with an average minimum temperature of 30.2°F (–1.0°C), and July was the warmest month with an average maximum of 103.9°F (39.9°C). In summer, daytime maximum temperatures were frequently in the 100s, and minimums were in the 60s. The minimum temperatures recorded were below freezing (≤32°F [0°C]) during the colder months (mostly from November through February), but subzero temperatures were never recorded. During the same period, the highest temperature, 117°F (47.2°C), was reached in July 2002, and the lowest, 6°F (–14.4°C), in December 1990. In a typical year, about 138 days had a maximum temperature of greater than or equal to 90°F (32.2°C), while about 59 days had minimum temperatures at or below freezing.

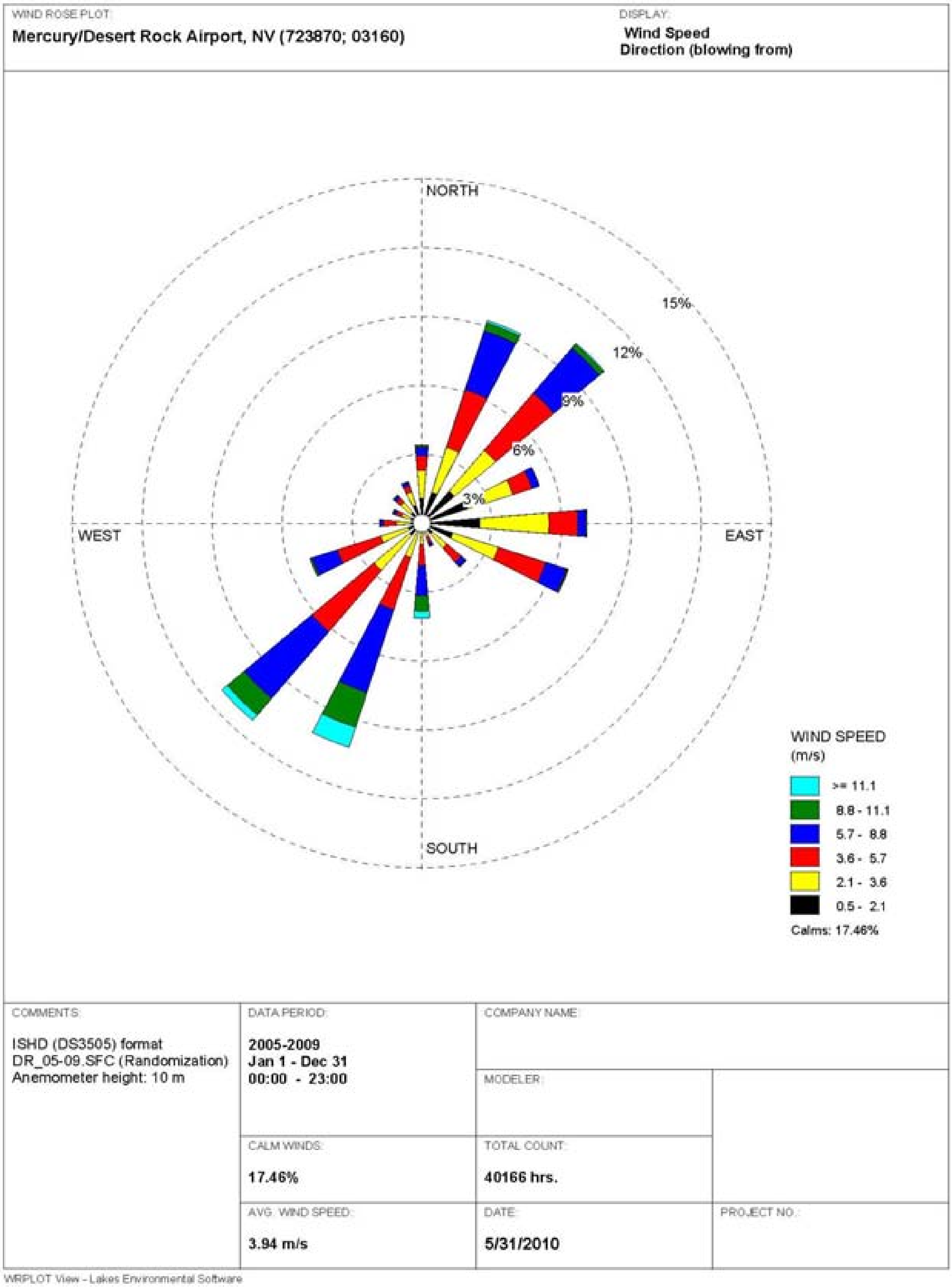

FIGURE 11.1.13.1-1 Wind Rose at 33 ft (10 m) at Mercury/Desert Rock Airport, Nevada, 2005 to 2009 (Source: NCDC 2010b)

Along with prevailing westerlies, Pacific air masses lose most of their moisture on the windward side of the Sierra Nevada Range parallel to Nevada's western boundary with California. Thus, leeward areas like the Amargosa Valley SEZ area experience a lack of precipitation. For the 1965 to 2009 period, annual precipitation at Amargosa Farms Garey averaged about 4.43 in. (11.3 cm) (WRCC 2010e). On average, there are 23 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). About 43% of the annual precipitation occurs during winter months, and the remaining precipitation is relatively evenly distributed over the other seasons. Snowfall is uncommon and mostly limited to winter months from December to April. The annual average snowfall is about 0.2 in. (0.5 cm); the highest monthly snowfall recorded was 3.5 in. (8.9 cm) in April 1967.

Because the area surrounding the proposed Amargosa Valley SEZ is far from major water bodies (more than 210 mi [338 km]) and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as thunderstorms and tornadoes, are rare.

In Nevada, flooding could occur from melting of heavy snowpack. On occasion, heavy summer thunderstorms also cause flooding of local streams, usually in sparsely populated mountainous areas, but they are seldom destructive (NCDC 2010a). Since 1995, 15 floods (14 flash floods and 1 urban stream flood) were reported in Nye County, most of which occurred in the Pahrump area and some of which caused property damage. In March 1995, the flash flood accompanying a 3-in. (7.6-cm) rain swept down the Fortymile Wash, which runs to the southeast of the SEZ, and temporarily closed U.S. 95 between Beatty and Lathrop Wells.

In Nye County, four hail storms have been reported since 1988, one of which caused minor property damage (NCDC 2010c). Hail measuring 1.5 in (3.8 cm) in diameter was reported in 1993. In Nye County, 104 high-wind events have been reported since 1994, which caused one injury and some property and crop damage. Such events, with up to a maximum wind speed of 127 mph (57 m/s), have occurred any time of the year with a peak during spring months. In addition, 23 thunderstorm wind events have been reported since 1959. Thunderstorm winds, with a maximum wind speed of 87 mph (39 m/s). occurred mostly during summer months on occasion, two of which cause minor property damage.

In Nye County, only one dust storm event was reported in 2002 (NCDC 2010c). The ground surface of the SEZ is covered primarily with bare gravel and widely spaced creosotebushes and some smaller shrubs; thus dust storm potential is relatively low compared with other typical arid regions. On occasion, high winds and dry soil conditions result in blowing dust in Nye County. Dust storms can deteriorate air quality and visibility and have adverse effects on health.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes never hit Nevada. Historically, one tropical depression has passed within 100 mi (160 km) of the proposed Amargosa Valley SEZ (CSC 2010). Tornadoes in Nye County, which encompasses the proposed Amargosa Valley SEZ, occur infrequently. In the period 1950 to July 2010, a total of three tornadoes (0.1 per year) were reported in Nye County (NCDC 2010c). However, all tornadoes occurring in Nye County were relatively weak (i.e., F0 on the Fujita tornado scale). None of these tornadoes caused property damage, injuries, or deaths. Two tornadoes in Nye County were reported far from the proposed Amargosa Valley SEZ, but one tornado occurred near U.S. 95, about 7 mi (11 km) east–southeast of the SEZ.

11.1.13.1.2 Existing Air Emissions

Nye County, which encompasses proposed Amargosa Valley SEZ, is the third-largest county in terms of area in the 48 conterminous states. Nye County has many industrial emission sources scattered all over the county. Several source emissions related to minerals and mining are located around the proposed Amargosa Valley SEZ, but their emissions are relatively small. Because of the sparse population, only a handful of major roads, such as U.S. 6 and 95 and several state routes, exist in Nye County. Thus, onroad mobile source emissions are not substantial. Data on annual emissions of criteria pollutants and volatile organic compounds (VOCs) in Nye County are presented in Table 11.1.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, point sources were major contributors to total sulfur dioxide (SO_2) emissions (about 54%). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions primarily contributed to NO_x and CO emissions (about 56% and 70%, respectively) and accounted for most of VOC emissions (about 99%). Area sources accounted for about 84% of PM_{10} and 63% of $PM_{2.5}$ and were secondary contributors to total SO_2 emissions (about 40%). Onroad sources were secondary contributors to NO_x and CO emissions (about 30% and 23%, respectively), while fire sources were secondary contributors to $PM_{2.5}$ emissions. In Nye County, nonroad sources were minor contributors to criteria pollutants and VOCs.

TABLE 11.1.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Nye County, Nevada, Encompassing the Proposed Amargosa Valley SEZ, 2002[a]

Pollutant	Emissions (tons/yr)
SO_2	247
NO_x	2,932
CO	47,494
VOCs	219,514
PM_{10}	1,765
$PM_{2.5}$	626

a Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

b Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

Source: WRAP (2009).

In 2005, Nevada produced about 56.3 MMt of *gross*[6] carbon dioxide equivalent (CO_2e)[7] emissions, which is about 0.8% of total U.S. greenhouse gas (GHG) emissions in that year

6 Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

7 A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

(NDEP 2008). Gross GHG emissions in Nevada increased by about 65% from 1990 to 2005 because of Nevada's rapid population growth, compared to 16.3% growth in U.S. GHG emissions during the same period. In 2005, electrical generation (48%) and transportation (30%) were the primary contributors to gross GHG emission sources in Nevada. Fuel use in the residential, commercial, and industrial (RCI) sectors combined accounted for about 12% of total state emissions. Nevada's *net* emissions were about 51.3 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in Nevada. Its estimate of CO_2 emissions from fossil fuel combustion was 49.6 MMt, which was comparable to the state's estimate. Electric power generation and transportation accounted for about 52.7% and 33.6% of the CO_2 emissions total, respectively, while the RCI sectors accounted for the remainder (about 13.7%).

11.1.13.1.3 Air Quality

The U.S. Environmental Protection Agency (EPA) set National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (EPA 2010a): sulfur dioxide (SO_2,) nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). Nevada has its own State Ambient Air Quality Standards (SAAQS), which are similar to the NAAQS with some differences (NAC 445B.22097). In addition, Nevada has set standards for 1-hour hydrogen sulfide (H_2S), which are not addressed by the NAAQS. The NAAQS and Nevada SAAQS for criteria pollutants are presented in Table 11.1.13.1-2.

Nye County is located administratively within the Nevada Intrastate Air Quality Control Region (AQCR), along with 10 other remaining counties in Nevada, except Las Vegas Intrastate AQCR, including Clark County only, which encompasses Las Vegas, and Northwest Nevada Intrastate AQCR, including five northwest counties, which encompasses Reno. Currently, the area surrounding the proposed SEZ is designated as being in unclassifiable/attainment of NAAQS for all criteria pollutants (Title 40, Part 81, Section 329 of the *Code of Federal Regulations* [40 CFR 81.329]).

Because of Nye County's low population density, it has no significant emission sources of its own and only minor mobile emissions along major highways. Accordingly, ambient air quality in Nye County is relatively good. There are no ambient air-monitoring stations in Nye County, except four PM_{10}-monitoring stations in Pahrump. Although Pahrump has PM_{10} monitors nearest to the SEZ (about 45 mi [72 km]), PM_{10} concentrations at these monitors, which result primarily from major housing development due to recent population growth, are not representative of the proposed Amargosa Valley SEZ. To characterize ambient air quality around the SEZ, one monitoring station in Clark County was chosen: Jean, about 94 mi (151 km) to the southeast of the SEZ. The Jean Station, which is located upwind of the Las Vegas area, can be considered representative of the proposed SEZ, although its air quality is, to some extent, influenced by the transport of air pollutants from the South Coast Air Basin, which includes Los Angeles, along with prevailing westerlies. Ambient concentrations of NO_2, O_3, PM_{10}, and $PM_{2.5}$ are recorded at Jean. The East Sahara Avenue Station, which is on the outskirts of Las Vegas, has only one SO_2 monitor in the area. CO concentrations at the East Tonopah Avenue Station in Las Vegas, which is the farthest downwind of Las Vegas among the

TABLE 11.1.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed Amargosa Valley SEZ in Nye County, Nevada, 2004 to 2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	SAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	75 ppb[d]	–[e]	–	–
	3-hour	0.5 ppm	0.5 ppm	0.009 ppm (1.8%)	Las Vegas, Clark County, 2005
	24-hour	0.14 ppm	0.14 ppm	0.008 ppm (5.7%)	Las Vegas, Clark County, 2005
	Annual	0.030 ppm	0.030 ppm	0.006 ppm (20%)	Las Vegas, Clark County, 2005
NO_2	1-hour	100 ppb[f]	–	–	–
	Annual	0.053 ppm	0.053 ppm	0.004 ppm (7.5%)	Jean Station, Clark County, 2007
CO	1-hour	35 ppm	35 ppm	5.7 ppm (16%)	Las Vegas, Clark County, 2004
	8-hour	9 ppm	9 ppm[g]	3.9 ppm (43%)	Las Vegas, Clark County, 2005
O_3	1-hour	0.12 ppm[h]	0.12 ppm[i]	0.098 ppm (82%)	Jean Station, Clark County, 2005
	8-hour	0.075 ppm	–	0.083 ppm (111%)	Jean Station, Clark County, 2007
PM_{10}	24-hour	150 $\mu g/m^3$	150 $\mu g/m^3$	66 $\mu g/m^3$ (44%)	Jean Station, Clark County, 2008
	Annual	–	50 $\mu g/m^3$	17 $\mu g/m^3$ (34%)	Jean Station, Clark County, 2005
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	–	12.9 $\mu g/m^3$ (37%)	Jean Station, Clark County, 2008
	Annual	15.0 $\mu g/m^3$	–	4.93 $\mu g/m^3$ (33%)	Jean Station, Clark County, 2008
Pb	30-day	–	1.5 $\mu g/m^3$	–	–
	Calendar quarter	1.5 $\mu g/m^3$	–	–	–
	Rolling 3-month	0.15 $\mu g/m^3$ [j]	–	–	–

[a] Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

[b] Monitored concentrations are the second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5}$; and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

[c] Values in parentheses are background concentration levels as a percentage of NAAQS or SAAQS. Calculation of 1-hour SO_2 and NO_2 to NAAQS was not made, because no measurement data based on new NAAQS are available.

[d] Effective August 23, 2010.

[e] A hyphen denotes not applicable or not available.

[f] Effective April 12, 2010.

[g] CO standard for the area less than 5,000 ft (1,524 m) above mean sea level. CO standard for the area at or greater than 5,000 ft (1,524 m) above mean sea level is 6 ppm.

[h] The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

[i] O_3 standard for the Lake Tahoe Basin, #90, is 0.10 ppm.

[j] Effective January 12, 2009.

Sources: EPA (2010a,b); NAC 445B.22097.

CO monitoring stations, were presented. No Pb measurements have been made in the state of Nevada because of low Pb concentration levels after the phase-out of leaded gasoline. The background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 11.1.13.1-2 (EPA 2010b). Monitored concentration levels at either station were lower than their respective standards (up to 44%), except O_3, which approaches the 1-hour NAAQS/SAAQS and exceeds the 8-hour NAAQS. However, ambient concentrations around the SEZ are anticipated to be lower than those presented in the table, except PM_{10} and $PM_{2.5}$, which can be either higher or lower.

The Prevention of Significant Deterioration (PSD) regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. There are several Class I areas around the Amargosa Valley SEZ, none of which is situated within 62-mi (100-km) distance in Nevada and California. The nearest Class I area is the John Muir WA in California (40 CFR 81.405), about 78 mi (126 km) west of the Amargosa Valley SEZ. This Class I area is not located downwind of prevailing winds at the Amargosa Valley SEZ (Figure 11.1.13.1-1). The next nearest Class I areas are Sequoia NP, Kings Canyon NP, and Dome Land WA, which are about 84 mi (135 km) west, 88 mi (141 km) west, and 90 mi (145 km) west–southwest of the Amargosa Valley SEZ, respectively.

11.1.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using heat transfer fluids [HTFs], fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities would displace air emissions that would otherwise be released from fossil fuel power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Amargosa Valley SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures Section 11.1.13.3 below identifies SEZ-specific design features of particular relevance to the Amargosa Valley SEZ.

11.1.13.2.1 Construction

The Amargosa Valley SEZ has a relatively flat terrain; thus only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[8] However, no receptors were modeled for PSD analysis at the nearest Class I area, John Muir WA in California, because it is about 78 mi (126 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the John Muir WA were selected as surrogates for the PSD analysis. For the Amargosa Valley SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions of 3,000 acres (12.1 km^2) each and 9,000 acres (36.4 km^2) in total, in the southern portion of the SEZ, close to the nearest residence and the town of Amargosa Valley,

- Surface hourly meteorological data[9] and upper air sounding data from the Mercury/Desert Rock Airport for the 2005 to 2009 period, and

- A regularly spaced receptor grid over a modeling domain of 62 mi × 62 mi (100 km × 100 km) centered on the proposed SEZ, and additional discrete receptors at the SEZ boundaries.

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8 To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/SAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

9 The number of missing hours at the Mercury/Desert Rock Airport amounts to about 19.2% of the total hours, which may not be acceptable for regulatory applications because that percentage exceeds the 10% limit defined by the EPA. However, because the wind patterns at Mercury/Desert Rock Airport are more representative of wind at the Amargosa Valley SEZ than the wind patterns at other airports (which have more complete data but are located in different topographic features), the former values were used for the screening analysis.

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 11.1.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 524 μg/m^3, which far exceeds the relevant standard level of 150 μg/m^3. Total 24-hour PM_{10} concentrations of 590 μg/m^3 would also exceed the standard level at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 60 to 100 μg/m^3 at the Big Dune (about 1.7 mi [2.7 km] to the east from the southeast corner of the SEZ); less than 60 μg/m^3 at the nearest residence (about 4.5 mi [7.2 km] south of the SEZ boundary); about 10 μg/m^3 at the truck stop on the crossroad of U.S. 95 and State Route 373; about 5 to 20 μg/m^3 at the Ash Meadows NWR; and about 2.5 μg/m^3 at Beatty. Annual average modeled PM_{10} concentration increments and total concentration (increment plus background) at the SEZ boundary would be about 90.6 μg/m^3 and 108 μg/m^3, respectively, which are much higher than the SAAQS level of 50 μg/m^3. Annual PM_{10} increments would be much lower, about 1 to 2 μg/m^3 at Big Dune, about 1.2 μg/m^3 at the nearest residence, and lower than 0.5 μg/m^3 for the aforementioned other receptors. Total 24-hour $PM_{2.5}$ concentrations would be 49 μg/m^3 at the SEZ boundary, which is higher than the NAAQS level of 35 μg/m^3; modeled increments contribute about three times more than background concentration to this total. The total annual average $PM_{2.5}$ concentration

TABLE 11.1.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Amargosa Valley SEZ

			Concentration (μg/m3)				Percentage of NAAQS/SAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ SAAQS	Increment	Total
PM_{10}	24 hours	H6H	524	66	590	150	349	393
	Annual	–[d]	90.6	17	108	50	181	215
$PM_{2.5}$	24 hours	H8H	36.3	12.9	49.2	35	104	140
	Annual	–	9.1	4.9	14.0	15.0	60	93

a PM2.5 = particulate matter with a diameter of ≤2.5 μm; PM10 = particulate matter with a diameter of ≤10 μm.

b Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

c See Table 11.1.13.1-2.

d A dash indicates not applicable.

would be 14.0 μg/m^3, which is below the NAAQS level of 15.0 μg/m^3. At the nearest residence, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 2 and 0.1 μg/m^3, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—John Muir WA in California—would be about 25.1 and 0.43 μg/m^3, or 314% and 11% of the PSD increments for Class I area, respectively. These surrogate receptors are more than 50 mi (80 km) from the John Muir WA, and thus predicted concentrations in John Muir WA would be lower than the above values (about 110% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Predicted total concentrations for annual $PM_{2.5}$ would be below the respective standard level. Modeling indicates that emissions from construction activities are anticipated to be slightly higher than Class I PSD PM_{10} increments at the nearest federal Class I area. Construction activities are not subject to the PSD program, and the comparison provides only a screen for gauging the size of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on air-quality-related values (AQRVs) (e.g., visibility and acid deposition) at the nearby federal Class I areas. SO_x emissions from engine exhaust would be very low, because programmatic design features would require ultra-low-sulfur fuel with a sulfur content of 15 ppm. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 138-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

11.1.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology if wet cooling was implemented (drift comprises low-level PM emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Appendix M.13.4.

Potential air emissions displaced by the solar project development at the Amargosa Valley SEZ are presented in Table 11.1.13.2-2. Total power generation capacity ranging from 2,811 to 5,060 MW is estimated for the Amargosa Valley SEZ for various solar technologies (see Section 11.1.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). If the Amargosa Valley SEZ were fully developed, it is expected that emissions avoided would be substantial. Development of solar power in the SEZ would result in

TABLE 11.1.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Amargosa Valley SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
31,625	2,811–5,060	4,925–8,865	6,949–12,508	5,960–10,728	0.040–0.071	3,825–6,885
Percentage of total emissions from electric power systems in Nevada[d]			13–23%	13–23%	13–23%	13–23%
Percentage of total emissions from all source categories in Nevada[e]			11–19%	4.0–7.1%	–[f]	7.0–13%
Percentage of total emissions from electric power systems in the six-state study area[d]			2.8–5.0%	1.6–2.9%	1.4–2.4%	1.5–2.6%
Percentage of total emissions from all source categories in the six-state study area[e]			1.5–2.7%	0.22–0.40%	–	0.46–0.83%

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and photovoltaic technologies) would be required.

[b] Assumed a capacity factor of 20%.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.82, 2.42, 1.6×10^{-5}, and 1,553 lb/MWh, respectively, were used for the state of Nevada.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] A dash indicates not estimated.

Sources: EPA (2009a,c); WRAP (2009).

avoided air emissions ranging from 13 to 23% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada (EPA 2009c). Avoided emissions would be up to 5.0% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities would displace up to 19% of SO_2, 7.1% of NO_x, and 13% of CO_2 emissions in the state of Nevada (EPA 2009a; WRAP 2009). These emissions would be up to 2.7% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for about 93% of the total electric power generated in Nevada for which contribution of natural gas and coal combustion is comparable. Thus, solar facilities to be built in the Amargosa Valley SEZ could be more important than those built in other states in terms of reducing fuel combustion–related emissions.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for high-voltage lines during rain or very humid conditions. Since the Amargosa Valley SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

11.1.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but are on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

11.1.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Amargosa Valley SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

11.1.14 Visual Resources

11.1.14.1 Affected Environment

The proposed Amargosa Valley SEZ is located in Nye County in southwestern Nevada. The southwestern border of the SEZ is 0.9 mi (1.5 km) northeast of the California border and Death Valley NP. The SEZ occupies 31,625 acres (128 km^2) and extends approximately 7 mi (11.3 km) east to west and nearly 9 mi (14.5 km) north to south. The SEZ is within the Mojave basin and range physiographic province, typified by small, north–south trending rocky mountain ranges, alternating with talus slopes and desert floor. Flat basins form broad, flat expanses of barren plains, generally with low scrub vegetation and expansive views. Amargosa Valley SEZ is located within the EPA's Amargosa Desert Level IV ecoregion. The SEZ ranges in elevation from 2,800 ft (853 m) in the northern portion to 2,580 ft (786 m) in the southern portion.

The SEZ lies within the Amargosa Desert, closely bounded by mountain ranges to the north and southwest, with open views to the east, northwest, and southeast. The Funeral Mountains and the Amargosa Range rise just southwest of the SEZ, in California, with Death Valley on the other side of the range. Bare Mountain begins to rise about 1.5 mi (2.4 km) north of the northeastern portion of the SEZ. These mountains include peaks generally between 3,000 and 4,000 ft (914 and 1,219 m) in elevation, but with some peaks higher than 5,000 ft (1,524 m). From the northwest to the southeast, the broad Amargosa Desert extends more than 45 mi (72 km) and is about 10 mi (16 km) wide. Crater Flat, with an elevation of about 2,800 ft (854 m), is located east northeast of the SEZ.

The SEZ is located within the flat, treeless plain of the Amargosa Desert floor, with the strong horizon line and surrounding mountain ranges being the dominant visual features. The intermittent Amargosa River runs through the SEZ in a northwest to southeast direction. The surrounding mountains are generally brown in color, but with some mountains nearly white. In contrast, gray gravels dominate the desert floor, which is sparsely dotted with the olive-green of creosotebush, and light greens, grays, and tans of burrobush and shadscale in some areas. The location of the SEZ and surrounding mountain ranges are shown in Figure 11.1.14.1-1.

Vegetation is generally sparse in much of the SEZ, with widely spaced shrubs growing on more or less barren gravel flats. Vegetation within the SEZ is predominantly scrubland, with creosotebush, white bursage, and other low shrubs dominating the Amargosa Desert floor within the SEZ. During an August 2009 site visit, the vegetation presented a limited range of greens (mostly olive green of creosotebushes) with some grays and tans (from lower shrubs), with medium to coarse textures, and generally low visual interest.

No permanent surface water is present within the SEZ; however, the intermittent Amargosa River bisects the SEZ, extending from northwest to southeast. There are large drainage areas within the SEZ that have some slight topographic relief. They contain light-colored tan soils mixed with gray gravel, rocks, and boulders.

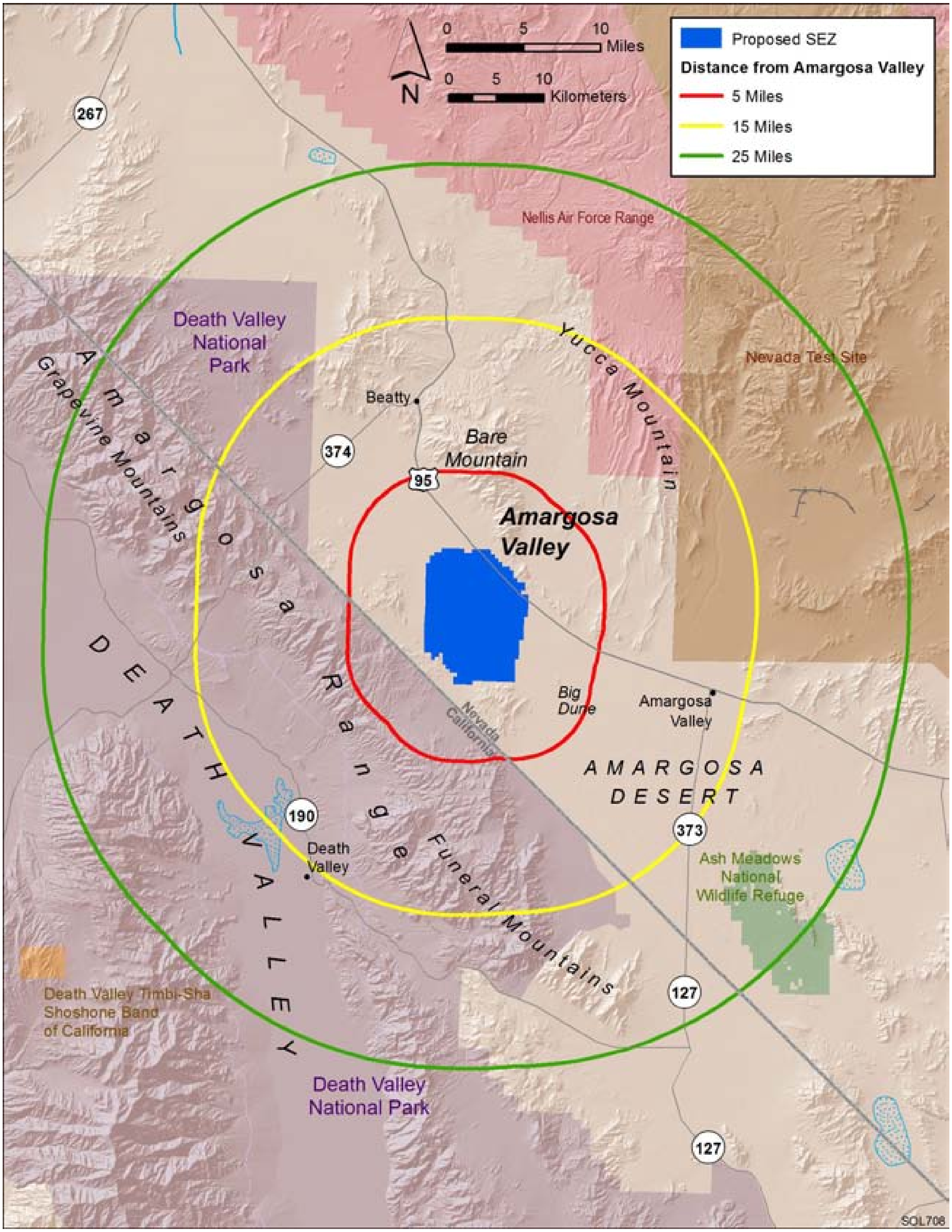

FIGURE 11.1.14.1-1 Proposed Amargosa Valley SEZ and Surrounding Lands

Cultural disturbances visible within the SEZ include U.S. 95, a two-lane highway that passes through the northeast portion of the SEZ. While traffic volume on U.S. 95 is light, any traffic on the highway would be visible from much of the SEZ. Existing transmission lines and roads are visible in parts of the SEZ. Some areas have severe visible tracking from OHVs. These cultural modifications generally detract from the scenic quality of the SEZ; however, the SEZ is large enough that from many locations within the SEZ, these features are either not visible or are so distant as to have minimal effect on views. From most locations within the SEZ, the landscape is generally natural in appearance, with little disturbance visible. The lack of cultural disturbances, the general remoteness of the area, lack of humidity, and the exceptional air quality contribute to unusually dark night skies in the Amargosa Valley and nearby Death Valley National Park, which has some of the darkest night skies in the country (NPS 2010a). The dark night skies are considered an important resource locally (Amargosa Valley Area Plan Committee 2009) and to the national park visitor experience.

The general lack of topographic relief, water, and physical variety results in low scenic value within the SEZ itself; however, because of the flatness of the landscape, the lack of trees, and the breadth of the Amargosa Desert, the SEZ presents a vast panoramic landscape with sweeping views of the surrounding mountains that add significantly to the scenic values within the SEZ viewshed. In general, the mountains appear to be devoid of vegetation, and their varied and irregular forms, and brown to white colors, provide visual contrasts to the strong horizontal line, green vegetation, and gray gravels of the valley floor, particularly when viewed from nearby locations within the SEZ. Panoramic views of the SEZ are shown in Figures 11.1.14.1-2, 11.1.14.1-3, and 11.1.14.1-4.

The mountain slopes and peaks surrounding the SEZ generally are visually pristine. The Big Dune SRMA and Big Dune ACEC, within view about 0.5 mi (0.8 km) east of the southern boundary of the SEZ, respectively, receive thousands of visitors on some weekends, primarily for OHV recreation. The boundary of the Death Valley NP and WA is 0.7 mi (1.1 km) southwest of the SEZ, and mountains within the NP and WA are visible from the SEZ. More distant views from the SEZ include the Funeral Mountains WA, located about 18 mi (29 km) south of the SEZ, and Ash Meadows NWR about 16.4 mi (26.4 km) southeast of the SEZ. The California Desert Conservation Area, encompassing all California lands within the 25-mi (41-km) viewshed of the SEZ, is 0.9 mi (1.5 km) southwest of the SEZ.

The BLM conducted a visual resource inventory (VRI) for the SEZ and surrounding lands in 2007 (BLM 2009f). The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or key observation points (KOPs). Based on these three factors, BLM-administered lands are placed into one of four Visual Resource Inventory Classes, which represent the relative value of the visual resources. Class I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is presented in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

FIGURE 11.1.14.1-2 Approximately 120° Panoramic View of the Proposed Amargosa Valley SEZ from Western SEZ Boundary Facing Northeast

FIGURE 11.1.14.1-3 Approximately 180° Panoramic View of the Proposed Amargosa Valley SEZ from U.S. 95 Facing Southwest, Including Amargosa Range in Center Background

FIGURE 11.1.14.1-4 Approximately 120° Panoramic View of the Proposed Amargosa Valley SEZ from Central Portion of SEZ Facing Southwest, Including Amargosa Range in Center

The VRI values for the SEZ and immediate surroundings are VRI Class IV, indicating low visual values. The inventory indicates low scenic quality for the SEZ and its immediate surroundings. Positive scenic quality attributes included adjacent scenery. The inventory indicates low sensitivity for the SEZ and its immediate surroundings. The inventory indicates a moderate level of use and a moderate level of public interest, due to the proximity to Death Valley NP and Big Dune ACEC.

The *Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement* (BLM 1998) indicates that the SEZ is managed as visual resource management (VRM) Classes III and IV. VRM Class III objectives include partial retention of landscape character and permit moderate modification of the existing character of the landscape. VRM Class IV permits major modification of the existing character of the landscape. The VRM map for the SEZ and surrounding lands is shown in Figure 11.1.14.1-5. More information about the BLM VRM program is presented in Section 5.12 and in *Visual Resource Management,* BLM Manual Handbook 8400 (BLM 1984).

11.1.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Amargosa Valley SEZ and surrounding lands, as well as the impacts of related projects (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project, a relatively complete and accurate description of its major components, and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment used in this PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables and is not possible given the scope of this PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could

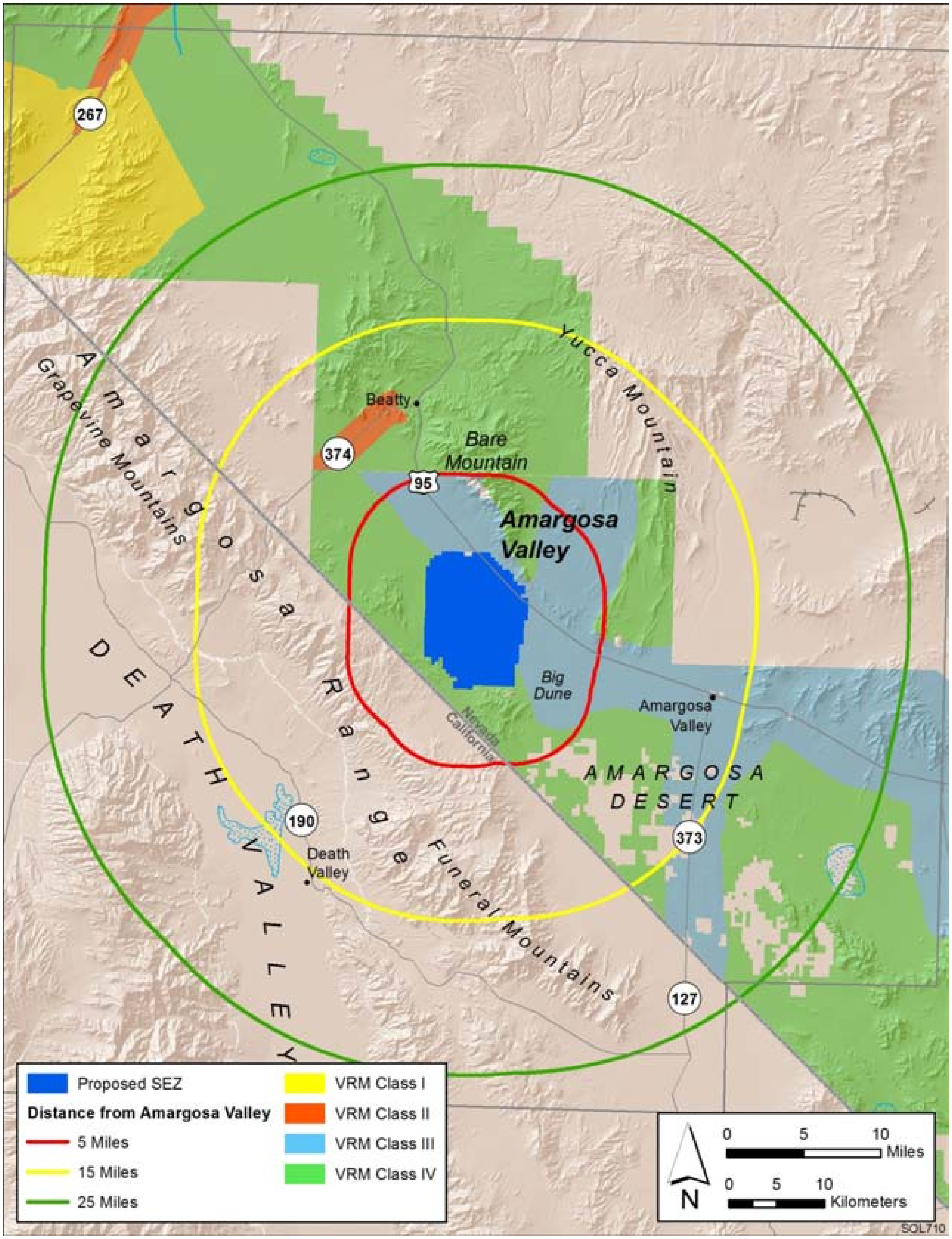

FIGURE 11.1.14.1-5 Visual Resource Management Classes for the Proposed Amargosa Valley SEZ and Surrounding Lands

potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

11.1.14.2.1 Impacts on the Proposed Amargosa Valley SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities utilizing highly reflective surfaces or major light-emitting components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby. Additional, and potentially large impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands. Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV as seen from nearby KOPs. More information about impact determination using the BLM VRM program is presented in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features(described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

11.1.14.2.2 Impacts on Lands Surrounding the Proposed Amargosa Valley SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ are visible from the SEZ (see Appendix M for information on the assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are presented in Appendix N.

Figure 11.1.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in the PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]), and transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 11.1.14.2-2 shows the results of a GIS analysis that overlays selected federal, state, and BLM-designated sensitive visual resource areas onto the combined tall solar power

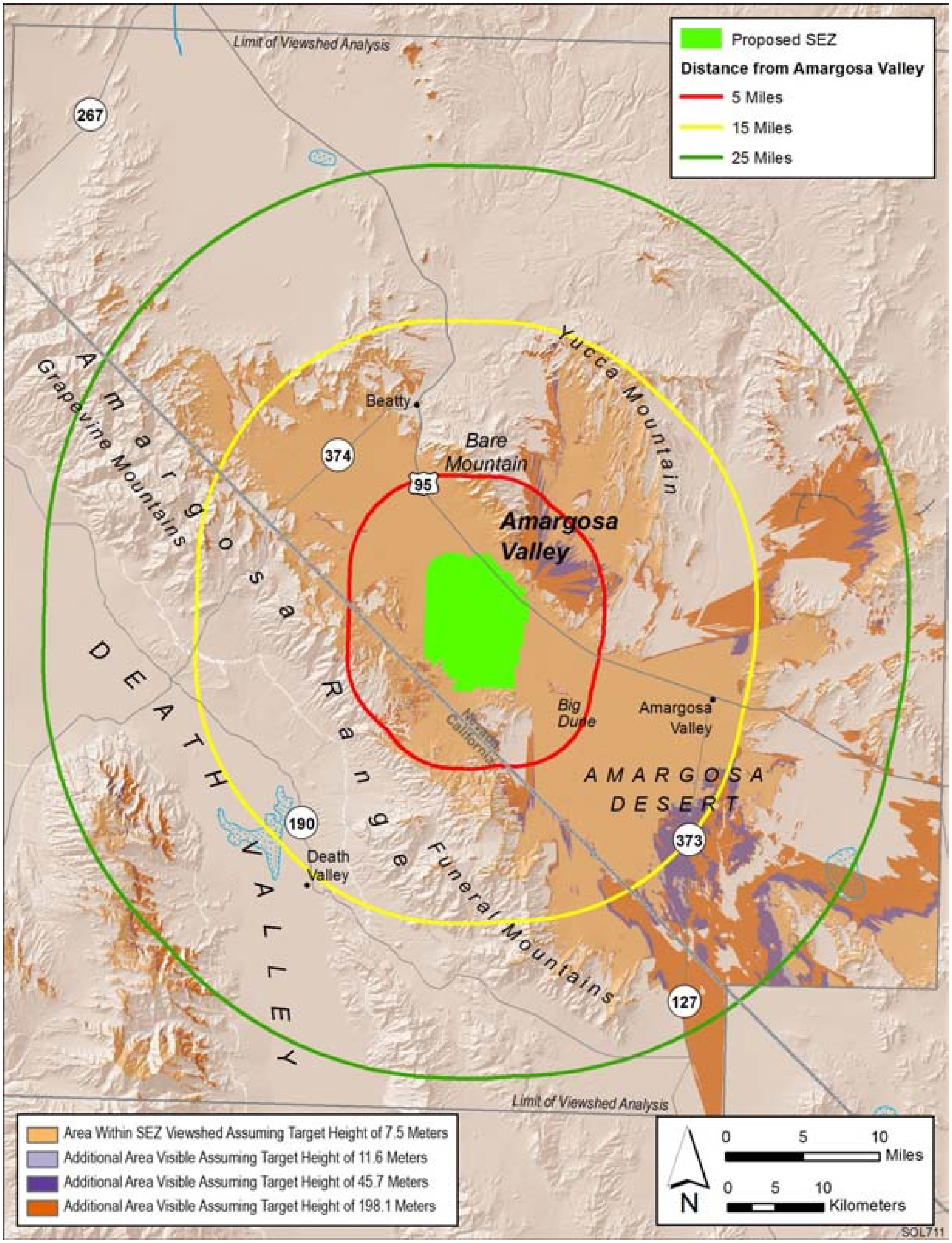

FIGURE 11.1.14.2-1 Viewshed Analyses for the Proposed Amargosa Valley SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

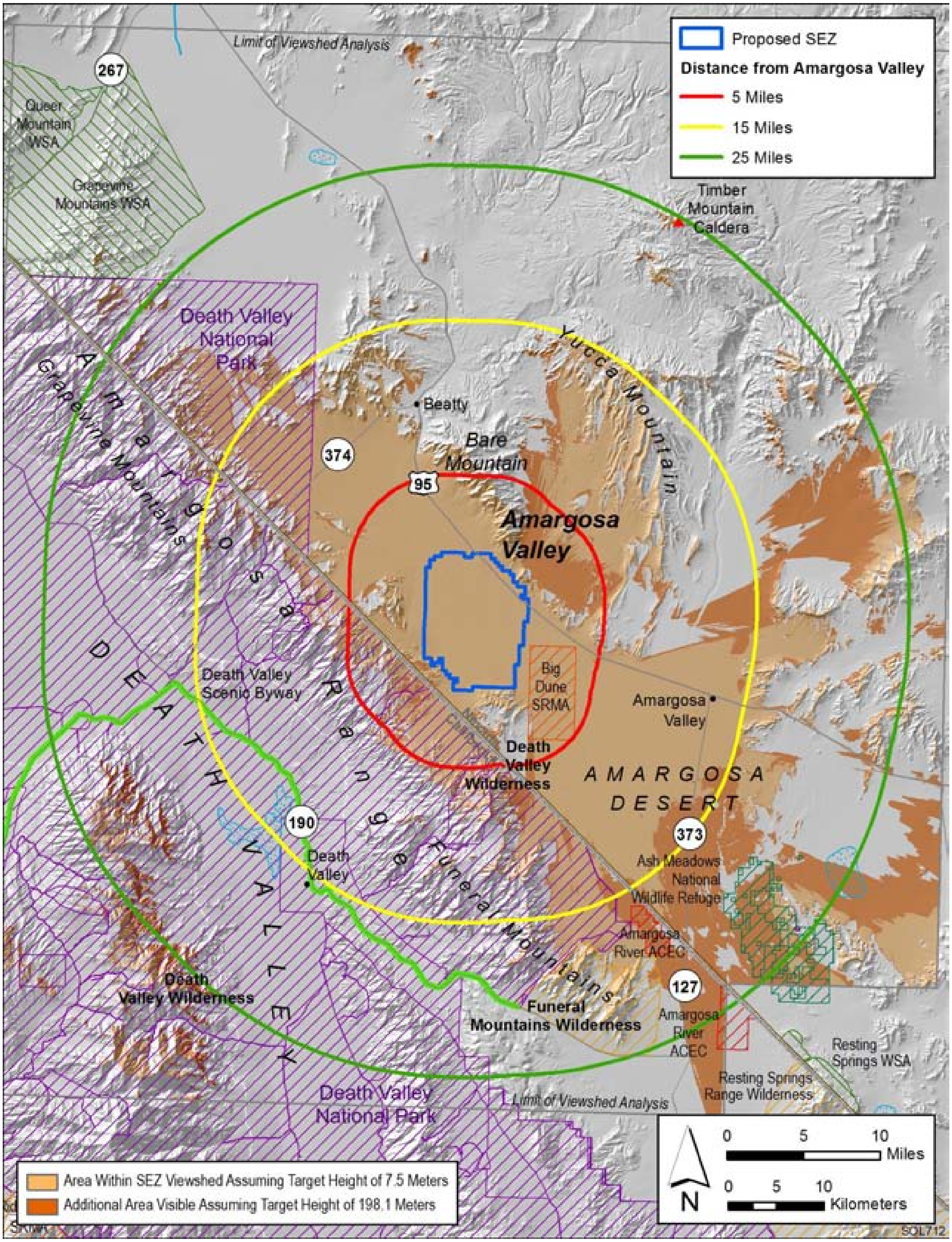

FIGURE 11.1.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Amargosa Valley SEZ

tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds in order to illustrate which of these sensitive visual resource areas would have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analyses were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;
- Congressionally authorized Wilderness Areas;
- Wilderness Study Areas;
- National Wild and Scenic Rivers;
- Congressionally authorized Wild and Scenic Study Rivers;
- National Scenic Trails and National Historic Trails;
- National Historic Landmarks and National Natural Landmarks;
- All-American Roads, National Scenic Byways, State Scenic Highways; and BLM- and USFS-designated scenic highways/byways;
- BLM-designated Special Recreation Management Areas; and
- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Amargosa Valley SEZ are discussed below. The results of this analysis are also summarized in Table 11.1.14.2-1. Further discussion of impacts on these areas is presented in Sections 11.1.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 11.1.17 (Cultural Resources) of the PEIS.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the seen landscape, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their

TABLE 11.1.14.2-1 Selected Potentially Affected Sensitive Visual Resources within the 25-mi (40-km) Viewshed of the Proposed Amargosa Valley SEZ, Assuming a Target Height of 650 ft (198.1 m)[a]

		Feature Area or Linear Distance[b]		
			Visible between	
Feature Type	Feature Name and Total Acreage	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Parks	Death Valley (3,397,062 acres)	19,406 acres (0.6%)	53,176 acres (2%)	32,937 acres (1%)
WAs	Death Valley (3,074,256 acres)	18,638 acres (0.6%)	30,371 acres (1%)	18,935 acres (0.6%)
	Funeral Mountains (27,567 acres)	0	0	3,876 (14%)
Wildlife Refuge	Ash Meadows (24,193 acres)	0	0	11,731 acres (49%)
SRMA	Big Dune (11,572 acres)	11,181 acres (97%)	0	0
ACECs designated for outstanding scenic values	Amargosa River (27,797 acres)	0	0	2,919 acres (11%)
National Conservation Areas	California Desert (25,919,319 acres)	19,699 acres (0.08%)	34,626 acres (0.1%)	40,160 acres (0.2%)

a Assuming solar power technology with a height of 650 ft (198.1 m).

b To convert acres to km^2, multiply by 0.004047. To convert mi to km, multiply by 1.609.

characteristics and expectations; specific locations where the project might be viewed from; and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

National Parks

- *Death Valley*—Death Valley NP is located in California, about 0.7 mi (1.1 km) southwest to west of the SEZ at the point of closest approach, and encompasses about 3,397,062 acres (13,747.42 km^2). The vast Death Valley NP is a popular winter hiking area. The Death Valley NP contains paved roads popular for scenic driving and biking, several miles of hiking trails, and four-wheel drive roads. There are campgrounds, and backcountry camping is

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

allowed. Stargazing is popular year round, as are bird watching and viewing spring wildflowers. Most of the park's services and facilities, as well as most recreational use, are in the central and northeastern portion of the park.

As shown in Figure 11.1.14.2-2, within the Death Valley NP, visibility of solar facilities within the SEZ would be limited to two general areas: the peaks and eastern slopes of the Amargosa Range on both sides of the California–Nevada border, and, farther west in the Death Valley NP, some peaks and eastern slopes of the Tucki Mountains and the Panamint Range above 2,400 ft (730 m) in elevation. These areas include about 105,519 acres (427.020 km^2) in the 650-ft (198.1-m) viewshed, or 3% of the total NP acreage, and 61,851 acres (250.30 km^2) in the 24.6-ft (7.5-m) viewshed, or 0.2% of the total Death Valley NP acreage. The area of Death Valley NP with potential visibility of solar facilities in the SEZ extends beyond 25 mi (40 km) from the southwestern boundary of the SEZ.

Figure 11.1.14.2-3 is a Google Earth visualization of the SEZ as seen from State Route 374 at the entrance to Death Valley NP in Nevada, about 9.3 mi (15 km) from the northwest corner of the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility.

The receiver towers depicted in the visualization are properly scaled models of a 459-ft (140-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing about 100 MW of electric generating capacity. One group of four models was placed in the SEZ for this and other visualizations shown in this section of the PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

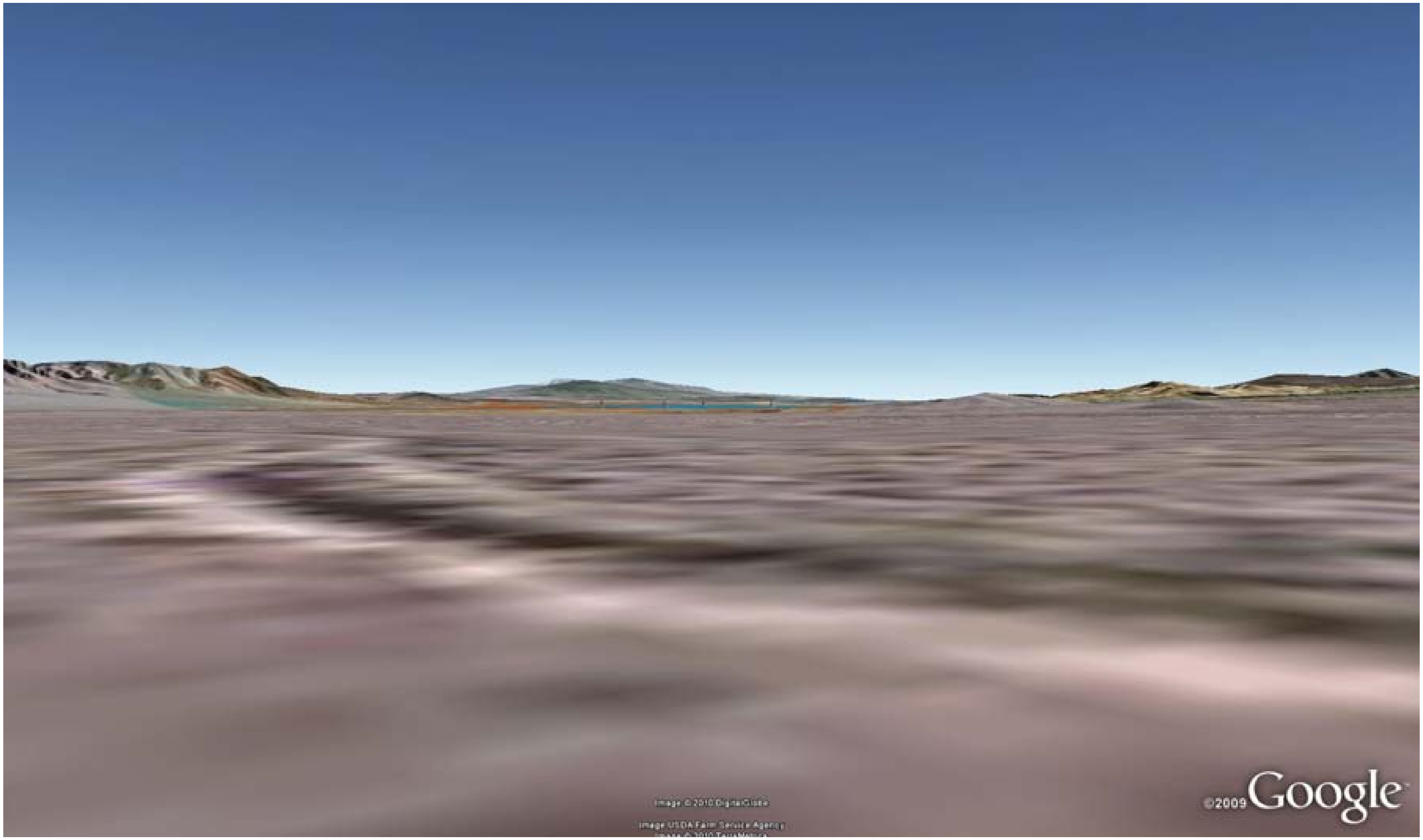

FIGURE 11.1.14.2-3 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on State Route 374, at Entrance to Death Valley NP

The viewpoint in the visualization is about 800 ft (244 m) higher in elevation than the SEZ. From this location, the collector/reflector arrays of solar facilities within the SEZ would be seen nearly edge-on, which would reduce their apparent size, make their strong regular geometry less apparent, and make them appear to repeat the strong line of the horizon, which would tend to reduce visual contrast. However, the SEZ is close enough that it would occupy a moderate amount of the horizontal field of view.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) could be visible projecting above the collector/reflector arrays. Their more vertical and irregular geometries and forms could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

If power towers were present within the SEZ, when operating, the receivers would likely appear as bright points of light atop discernable tower structures. At night, if more than 200 ft (61 m) tall, power towers could have flashing red or hazard navigation lights or red or white strobe lights that would likely be visible from this location, and could be conspicuous in the area's dark night skies. Other lighting associated with solar facilities could be visible as well.

Visual contrasts associated with solar facilities within the SEZ would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other visibility factors. Under the 80% development scenario analyzed in the PEIS, weak to moderate visual contrasts could be expected at this location.

Figure 11.1.14.2-4 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from Bullfrog Mountain in the northeastern portion of the Death Valley NP, on the park border in Nevada and about 13 mi (21 km) from the northwest corner of the SEZ. The viewpoint is elevated about 2,100 ft (640 m) above the nearest point in the SEZ. The upper slopes and peak of the mountain are barren, with little opportunity for screening.

The visualization suggests that from this elevated viewpoint, the tops of collector/reflector arrays within the SEZ might be visible, but the angle of view would be low because of the 13-mi (21-km) distance to the SEZ. The SEZ and solar facilities within it would be seen as a thin band below the southwest horizon, and the facilities would tend to repeat the line of the horizon, reducing visual contrast somewhat. Taller solar facility components, such as transmission towers, could be visible, depending on lighting, but might not be noticed by casual observers.

If power towers were present within the SEZ, they would be visible as bright star-like points of light against a backdrop of the Amargosa Valley floor. At night, if more than 200 ft (61 m) tall, power towers would have navigation

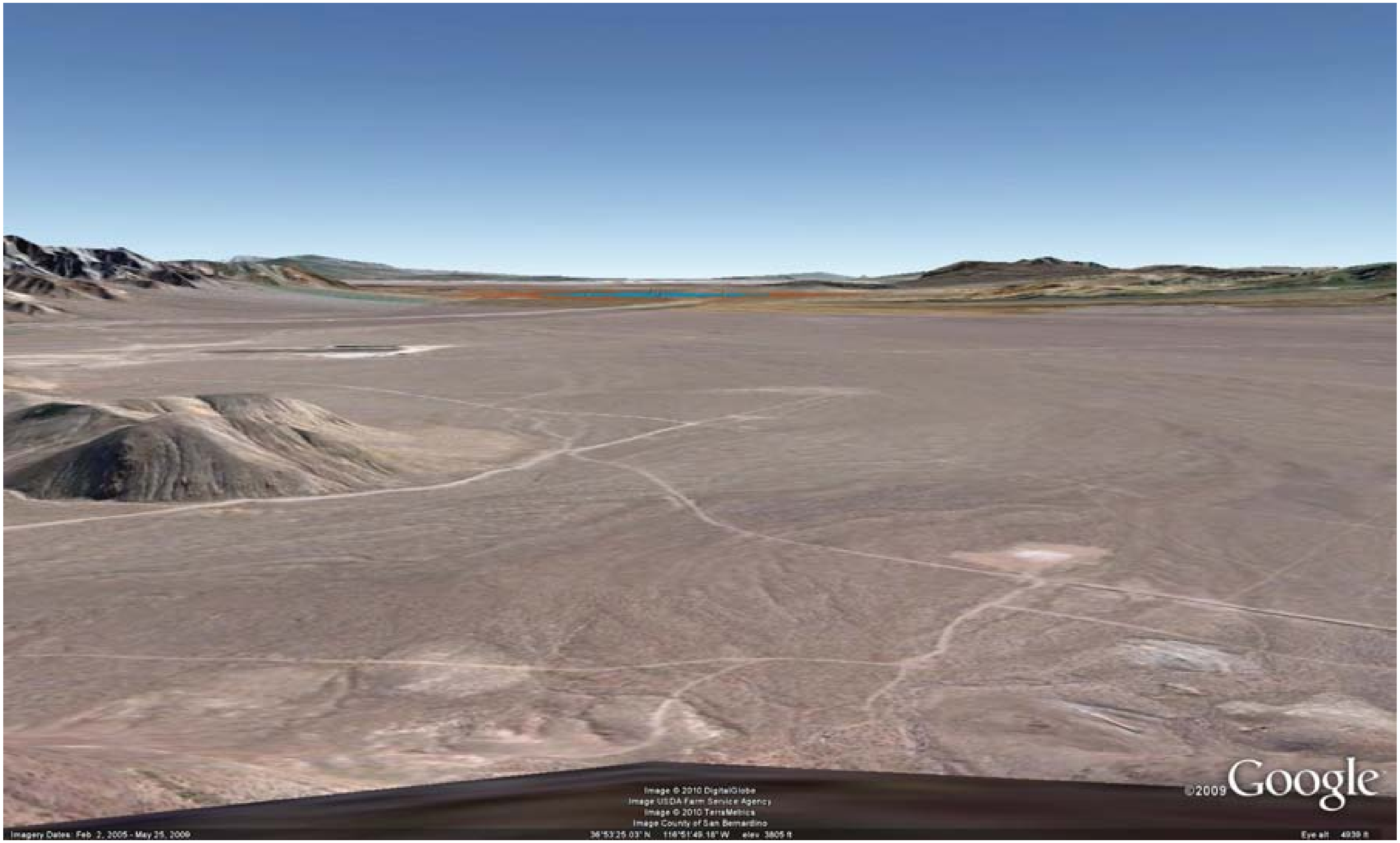

FIGURE 11.1.14.2-4 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on Bullfrog Mountain within Death Valley NP

warning lights that could potentially be visible from this location. Other lighting associated with solar facilities could potentially be visible as well.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak to moderate visual contrasts from solar energy development within the SEZ could be expected at this location.

Figure 11.1.14.2-5 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the Amargosa Range in the northeastern portion of the NP near the California-Nevada border in California, and approximately 21 mi (34 km) from the northwest corner of the SEZ. The viewpoint is elevated about 3,800 ft (1,160 m) above the nearest point in the SEZ.

The visualization suggests that from this elevated viewpoint, the SEZ would be visible in a gap between mountains located southeast of the viewpoint. Despite the large elevation difference between the viewpoint and the SEZ, the angle of view would be low because of the 21-mi (34-km) distance to the SEZ. The SEZ and solar facilities within it would be seen as a thin band between the southeast horizon and the mountains of the Amargosa Range to the southeast of the viewpoint. Solar facilities located in the SEZ would tend to repeat the line of the horizon, reducing visual contrast somewhat. If power towers were present within the SEZ, they would be visible as star-like points of light against a backdrop of the Amargosa Valley floor. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location. Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ would be expected at this location.

Figure 11.1.14.2-6 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the Amargosa Range directly west of the southernmost portion of the SEZ in California and about 6.5 mi (10.4 km) from the western border of the SEZ. The viewpoint is elevated about 2,500 ft (760 m) above the nearest point in the SEZ.

The visualization suggests that from this elevated viewpoint, the SEZ would occupy a substantial portion of the viewer's field of view to the east. Because of the large elevation difference between the viewpoint and the SEZ and the relatively short distance to the SEZ, the tops of solar facilities within the SEZ would be visible, which would increase their apparent size and make the strong regular geometry of the collector/reflector array more apparent.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting

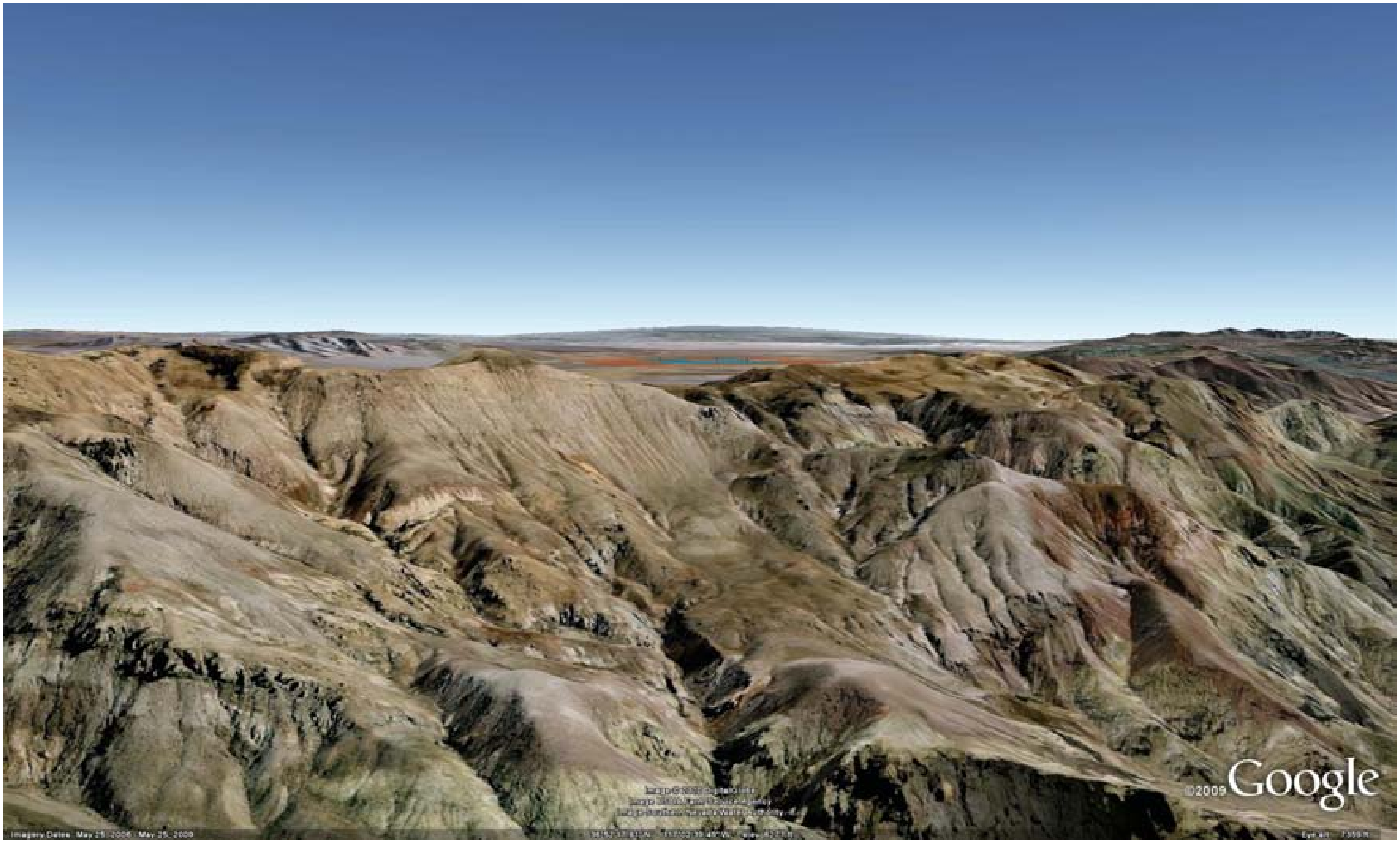

FIGURE 11.1.14.2-5 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Northern Portion of the Amargosa Range in Death Valley NP

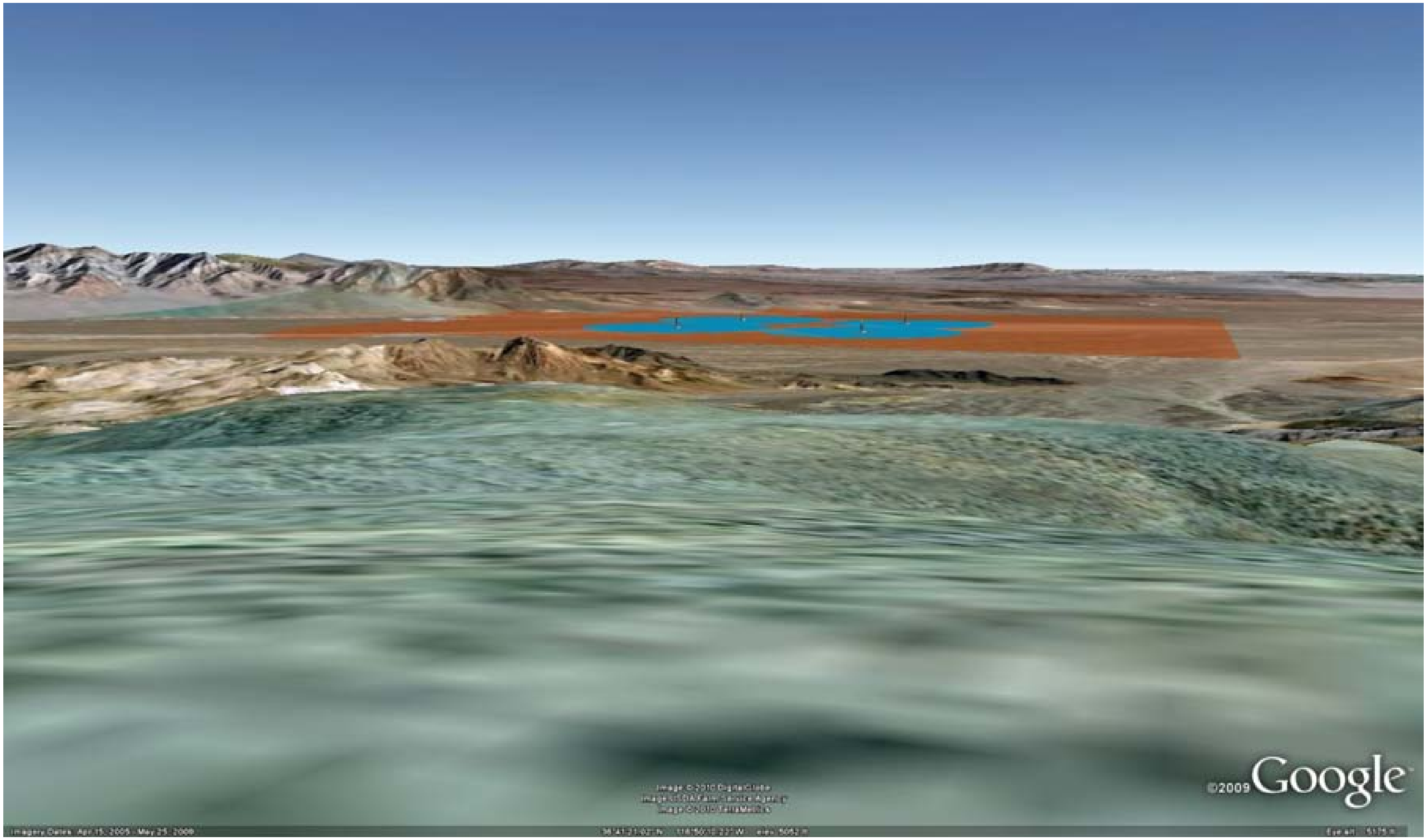

FIGURE 11.1.14.2-6 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Central Portion of the Amargosa Range in Death Valley NP

above the collector/reflector arrays, and their structural details could be evident, at least for facilities in the closest portion of the SEZ. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be possible, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ, they would be visible as very bright light sources against a backdrop of the Amargosa Valley floor, and the supporting tower structures would be visible. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that would likely be visible from this location, and could be very conspicuous from this location, given the area's dark night skies. Other lighting associated with solar facilities could be visible as well.

Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would attract visual attention, could potentially dominate the view, and would be expected to create strong visual contrasts as viewed from this location within the Death Valley NP.

Figure 11.1.14.2-7 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the Amargosa Range just west and 7 mi (11 km) south of the SEZ in California. The viewpoint is elevated about 1,000 ft (300 m) above the nearest point in the SEZ.

The visualization suggests that from this elevated viewpoint, the SEZ would occupy a substantial portion of the field of view to the east. Because it is farther from the SEZ and also lower in elevation than the viewpoint for Figure 11.1.14.2-6, the angle of view is lower, so that the SEZ and solar facilities within the SEZ would appear as bands across the valley floor, tending to repeat the line of the flat valley floor.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays. Their more vertical and irregular geometries and forms could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

If power towers were present within the SEZ, when operating, they would be visible as very bright light sources against a backdrop of the Amargosa Valley floor or the bajada at the base of Bare Mountain, and the supporting tower structures would be visible. At night sufficiently tall power towers would have navigation warning lights that would likely be visible from this location, and could be conspicuous. Other lighting associated with solar facilities could be visible as well.

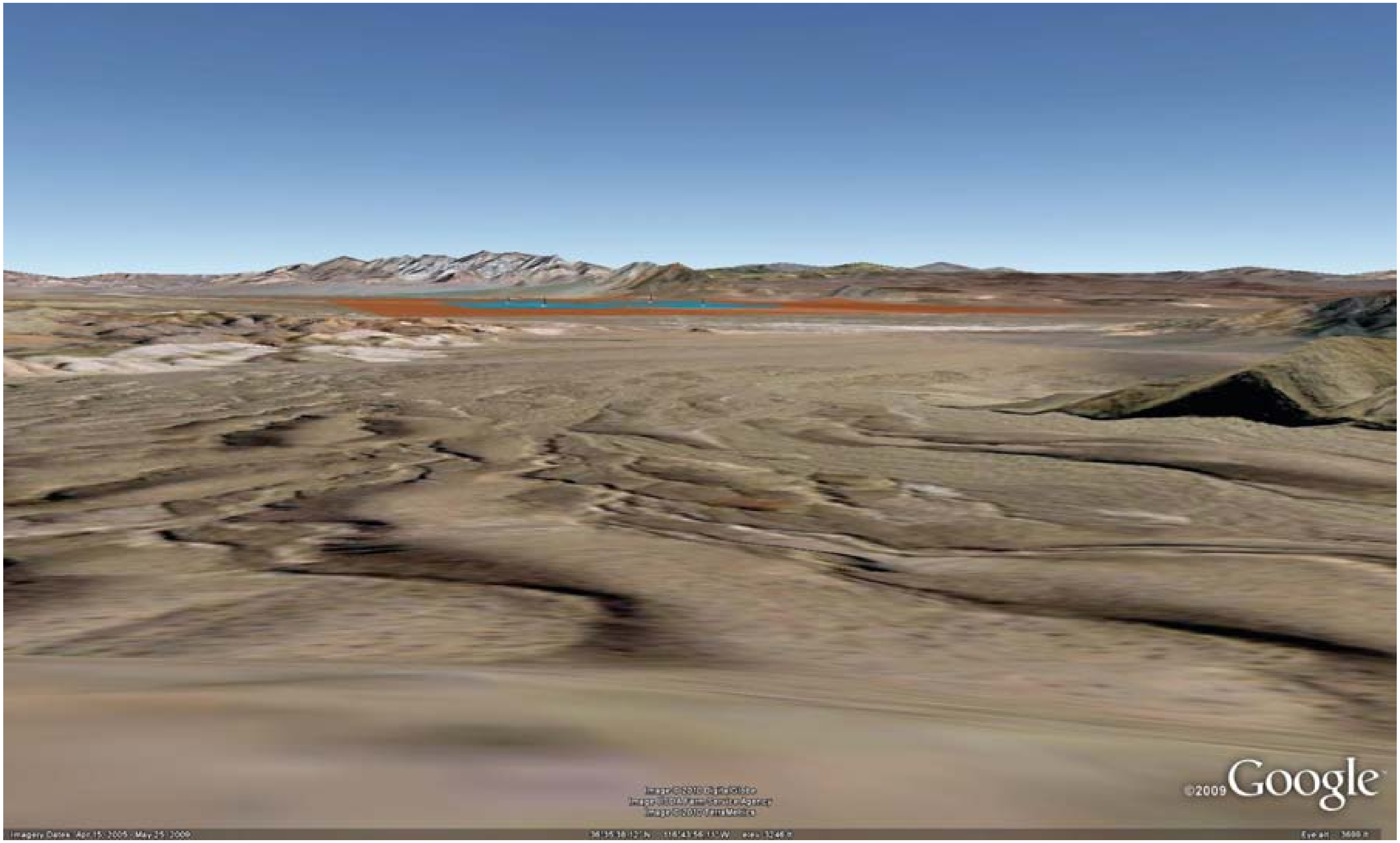

FIGURE 11.1.14.2-7 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Southern Portion of the Amargosa Range in Death Valley NP

Despite the low viewing angle, because the SEZ would occupy a large portion of the view from this location, under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would attract visual attention, could potentially dominate the view and would be expected to create strong visual contrasts as viewed from this location within the National Park.

Figure 11.1.14.2-8 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak on Tucki Mountain on the western side of Death Valley in the interior of the Death Valley NP. The viewpoint is approximately 25 mi (40 km) southwest of the SEZ. The viewpoint is elevated about 3,900 ft (1,200 m) above the nearest point in the SEZ.

The visualization suggests that from this elevated viewpoint, the view of the SEZ is partially screened by mountains in the Amargosa Range across Death Valley to the east; however, the far southern portion of the SEZ would be visible. The visible portion of the SEZ would occupy a very small portion of the field of view to the east. Because of the very long distance to the SEZ, the angle of view would be low, and the SEZ and solar facilities within the SEZ would appear as a very narrow band across the valley floor just above the Amargosa Range, tending to repeat the line of the flat valley floor. If power towers were present within the SEZ, when operating, they would be visible as distant star-like light sources against a backdrop of the Amargosa Valley floor during the day and, if more than 200 ft (61 m) tall, would have navigation warning lights at night that could be visible from this location. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create weak visual contrasts as viewed from this location within the National Park.

In summary, portions of Death Valley NP are within the BLM's foreground-middleground distance from the Amargosa Valley SEZ. The areas are located either in the Amargosa Range along the California-Nevada border or at lower elevations in the Nevada portion of the National Park. Most views of the SEZ in these areas would be from elevated viewpoints, and strong visual contrasts would be likely to occur where clear views of the SEZ exist, even beyond the 5-mi (8-km) limit of the foreground-middleground zone. The SEZ would not be visible from lower elevations within the National Park west of the Amargosa Range. There would be very limited visibility of the SEZ from higher elevations on Tucki Mountain and in the Panamint Range, but because of topographic screening and the long distance to the SEZ from these areas, expected visual contrasts would be weak. Potential impacts on the National Park would include night sky pollution, such as increased skyglow, light spillage, and glare.

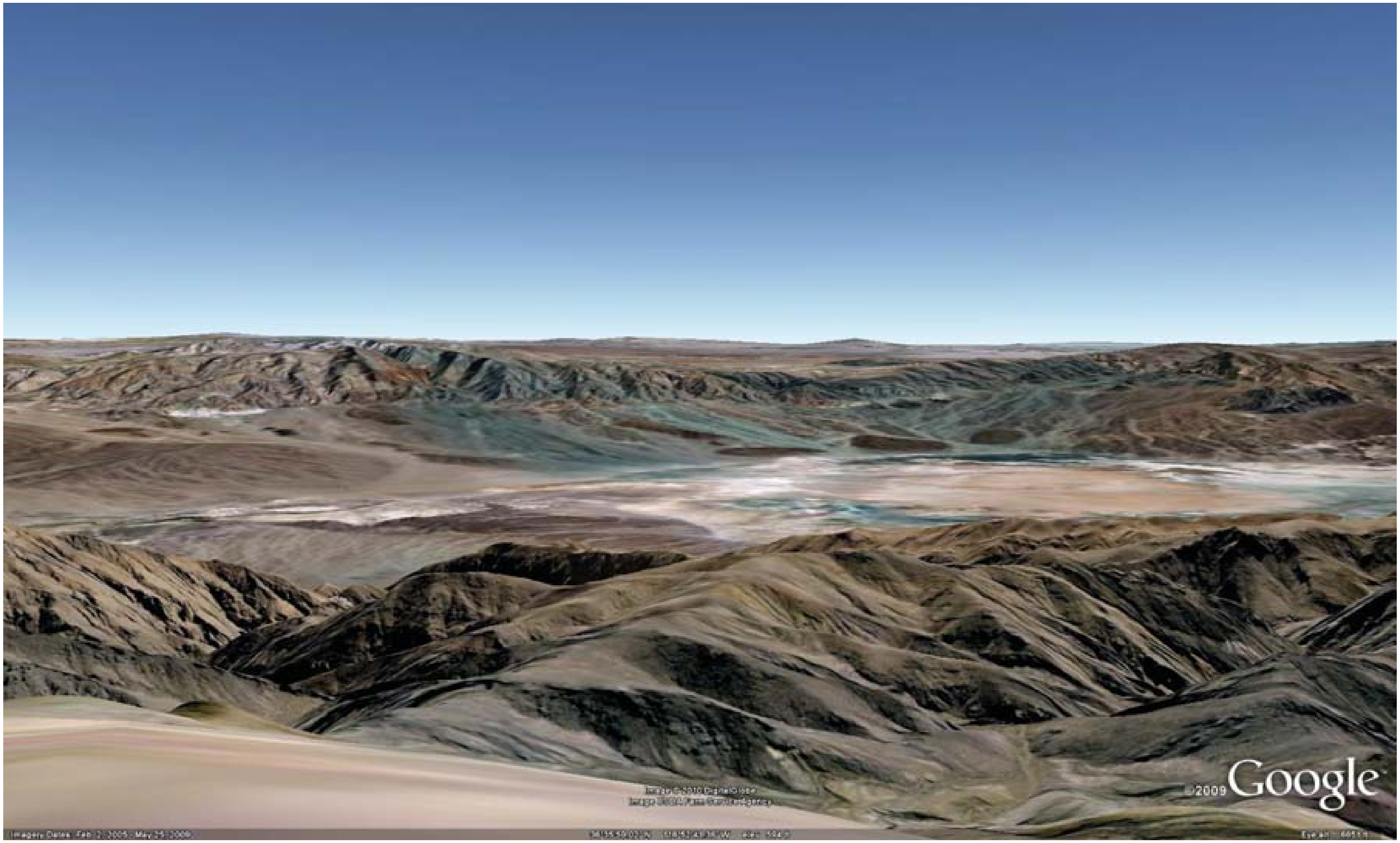

FIGURE 11.1.14.2-8 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on Tucki Mountain within Death Valley NP

Wilderness Areas

- *Death Valley*—Death Valley is a 3,074,256-acre (12,441.07-km^2) congressionally designated wilderness area (WA) located 0.7 mi (1.1 km) southwest of the SEZ. According to the NPS Web site (NPS 2010b), it is the largest area of designated National Park wilderness within the contiguous United States (NPS 2010). Within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the northeastern portions of the WA (about 67,944 acres [275 km^2] in the 650-ft [198.1-m] viewshed, or 2% of the total WA acreage, and 51,303 acres [208 km^2] in the 25-ft [7.5-m] viewshed, or 2% of the total WA acreage). The visible area of the WA extends to beyond 25 mi (40 km) from the southwestern boundary of the SEZ.

  The Death Valley WA is located entirely within the California portions of Death Valley NP and includes most of the park lands within California. Expected visual contrast levels for the WA are the same as those expected for the NP within California (see above).

- *Funeral Mountains*—Funeral Mountains is a 27,567-acre (111.56-km^2) congressionally designated WA located 18 mi (29 km) at the point of closest approach southeast of the SEZ, in California. Elevations range from 2,200 ft (670 m) to 5,300 ft (1,600 m) in the western portions of the WA. There are few visitors to this dry, desolate, and trail-free wilderness.

  Within 25 mi (40 km), solar energy facilities within the SEZ could be visible from portions of the northern and northwestern slopes of the mountains within the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total about 3,876 acres (15.69 km^2) in the 650-ft (198.1-m) viewshed, or 14% of the total WA acreage, and 3,263 acres (13.20 km^2) in the 24.6-ft (7.5-m) viewshed, or 12% of the total WA acreage. The visible area of the WA extends about 22 mi (35 km) from the southern boundary of the SEZ.

  Views of the Amargosa Valley SEZ from within the WA are screened at least partially by an intervening range of hills just on the Nevada side of the border with California, about 3.5 mi (5.6 km) west of Big Dune. As seen from within the WA, the hills screen much of the western portion of the SEZ from view, substantially reducing the potential visual impacts from solar development within the SEZ.

  Figure 11.1.14.2-9 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the northeastern portion of the WA, about 22 mi (35 km) from the southeast corner of the SEZ, near the point of maximum visibility of the SEZ from the WA.

  The visualization illustrates that because of the long distance to the SEZ from the WA, and the partial screening of the SEZ by the intervening range of hills, the SEZ would occupy a very small portion of the field of view, and the angle

FIGURE 11.1.14.2-9 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within the Funeral Mountains WA

of view to solar facilities within the SEZ would be very low. Solar collector/reflector arrays within the SEZ visible from the WA would be seen edge-on, reducing their apparent size, concealing their strong regular geometry and repeating the line of the horizon, which would tend to reduce visual contrast. Power towers within the SEZ could be visible as distant points of light on the northern horizon, against the backdrop of the Amargosa Valley floor or the lower slopes of Bare Mountain. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from the WA.

Visual contrasts associated with solar energy development within the SEZ would depend on viewer location within the WA; solar facility type, size, and location within the SEZ; and other visibility factors. Under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected. The highest contrast levels would be expected for peaks in the northern part of the WA, with lower contrasts expected for lower elevations and viewpoints in the southern part of the WA.

National Wildlife Refuge

- *Ash Meadows*—The 24,193-acre (97.906-km^2) Ash Meadows NWR is 16 mi (26 km) southeast of the SEZ at the closest point of approach. Approximately 68,000 visitors come each year to view the Ash Meadows NWR's spring-fed wetlands and alkaline desert uplands that provide habitat for a variety of unique plants and animals (USFWS 2010b). As shown in Figure 11.1.14.2-2, about 11,731 acres (47.474 km^2), or 49% of the NWR, are within the 650-ft (198.1-m) viewshed of the SEZ, and 1,750 acres (7.082 km^2), or 7% of the Ash Meadows NWR, are within the 24.6-ft (7.5-m) viewshed. The portions of the Ash Meadows NWR within the viewshed extend from 20 mi (32 km) southeast of the SEZ to beyond 25 mi (40 km) from the SEZ.

  Most of the Ash Meadows NWR (the western portion) is several hundred feet lower in elevation than the SEZ, so the angle of view is very low, and at a distance of 20 mi (32 km), the SEZ would occupy a very small portion of the field of view. In fact, for most of the Ash Meadows NWR, only the upper portions of sufficiently tall power towers would be visible; they would appear as distant points of light on the northwest horizon.

  The northeastern portion of the Ash Meadows NWR includes lands at the same or greater elevation than the SEZ, and in some areas, lower-height facilities (PV, trough, and solar dish) could be visible from these higher-elevation areas within the Ash Meadows NWR. Figure 11.1.14.2-10 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed ridge in the northeastern portion of the Ash Meadows NWR, about 1.1 mi (1.8 km) north of Devils Hole, and about 25 mi (40 km) from the

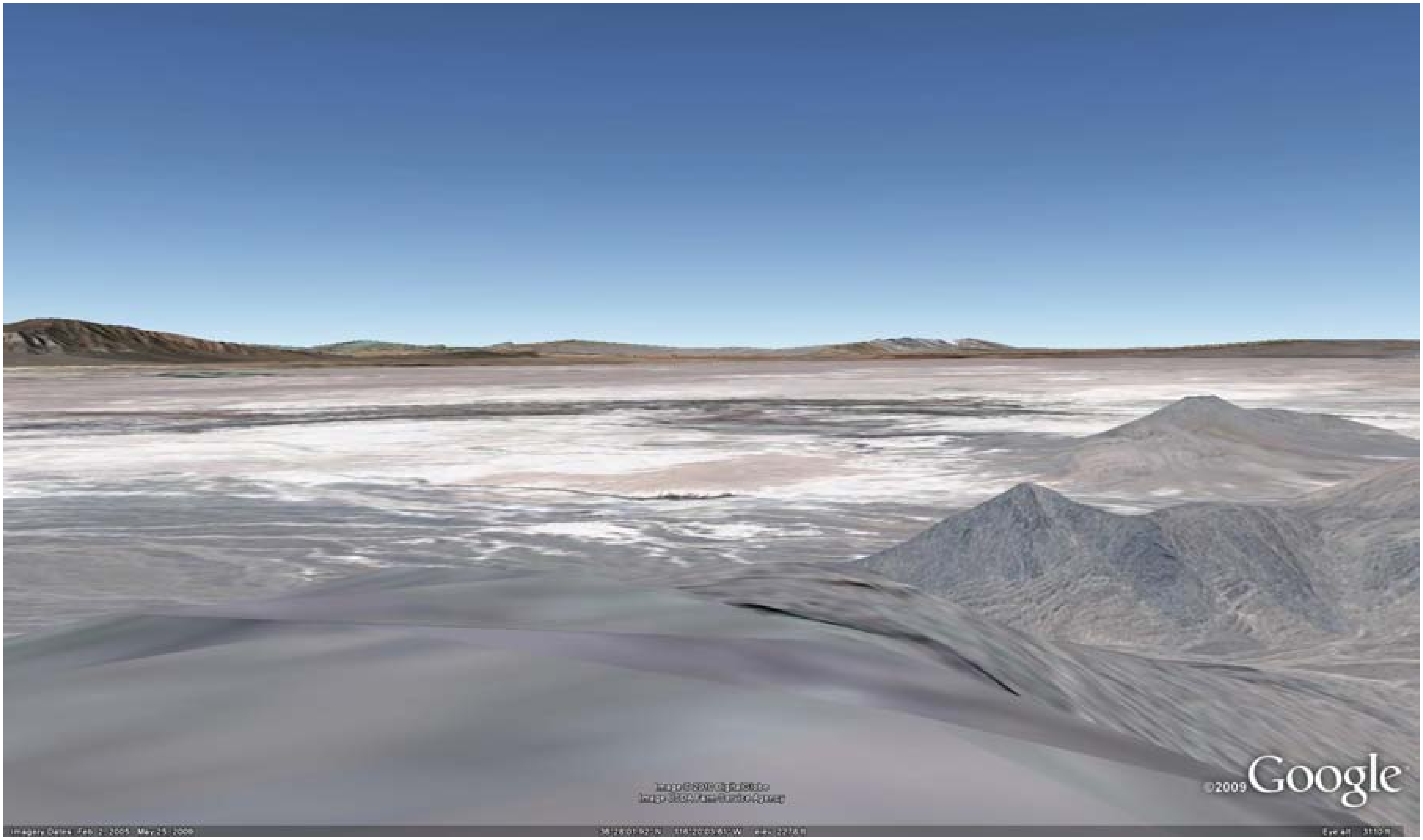

FIGURE 11.1.14.2-10 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Ash Meadows NWR

southeast corner of the SEZ. The viewpoint is about 500 ft (150 m) higher in elevation than the nearest point in the SEZ.

The visualization suggests that at this distance, the SEZ would occupy a very small portion of the field of view. Despite the elevated viewpoint, the SEZ is far enough away that solar facilities within the SEZ would be seen edge-on, reducing the associated visual contrasts. If power towers were located within the SEZ, they would be visible as distant points of light on the northwest horizon, against the backdrop of the base of the Amargosa Range. At night, if sufficiently tall, power towers would have navigation warning lights that could potentially be visible from the NWR.

Visual contrasts associated with solar energy development within the SEZ would depend on viewer location within the Ash Meadows NWR; solar facility type, size, and location within the SEZ; and other visibility factors. Under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected. The highest contrast levels would be expected for highlands in the northeastern part of the Ash Meadows NWR, with lower contrasts expected for lower elevations and viewpoints in the southwestern part of the NWR.

Special Recreation Management Area

- *Big Dune*—The Big Dune SRMA is a BLM-designated SRMA located 0.4 mi (0.6 km) east of the SEZ at the point of closest approach, and encompassing 11,572 acres (46.830 km^2). Big Dune SRMA is a 1.5-mi^2 (3.9-km^2) complex with a highest point of about 500 ft (150 m) above the valley floor. It is the second most popular dune in Nevada.

  Much of Big Dune could potentially have views of solar facilities in the SEZ, but with dunes screening the view of the SEZ from some of the southeast-facing dune slopes and depressions between dunes. The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 11,198 acres (45.317 km^2), or 97% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes 10,909 acres (44.147 km^2), or 94% of the total SRMA acreage.

  The base of Big Dune is slightly lower in elevation than the nearby southeast corner of the SEZ, but the tops of the highest dunes are equal in elevation to the central portion of the SEZ. The entire dune complex is within the BLM foreground-middleground distance to the SEZ, and the SEZ would be in full view of much of the Big Dune SRMA.

  Figure 11.1.14.2-11 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the top of the highest dune in the SRMA, about 3.9 mi

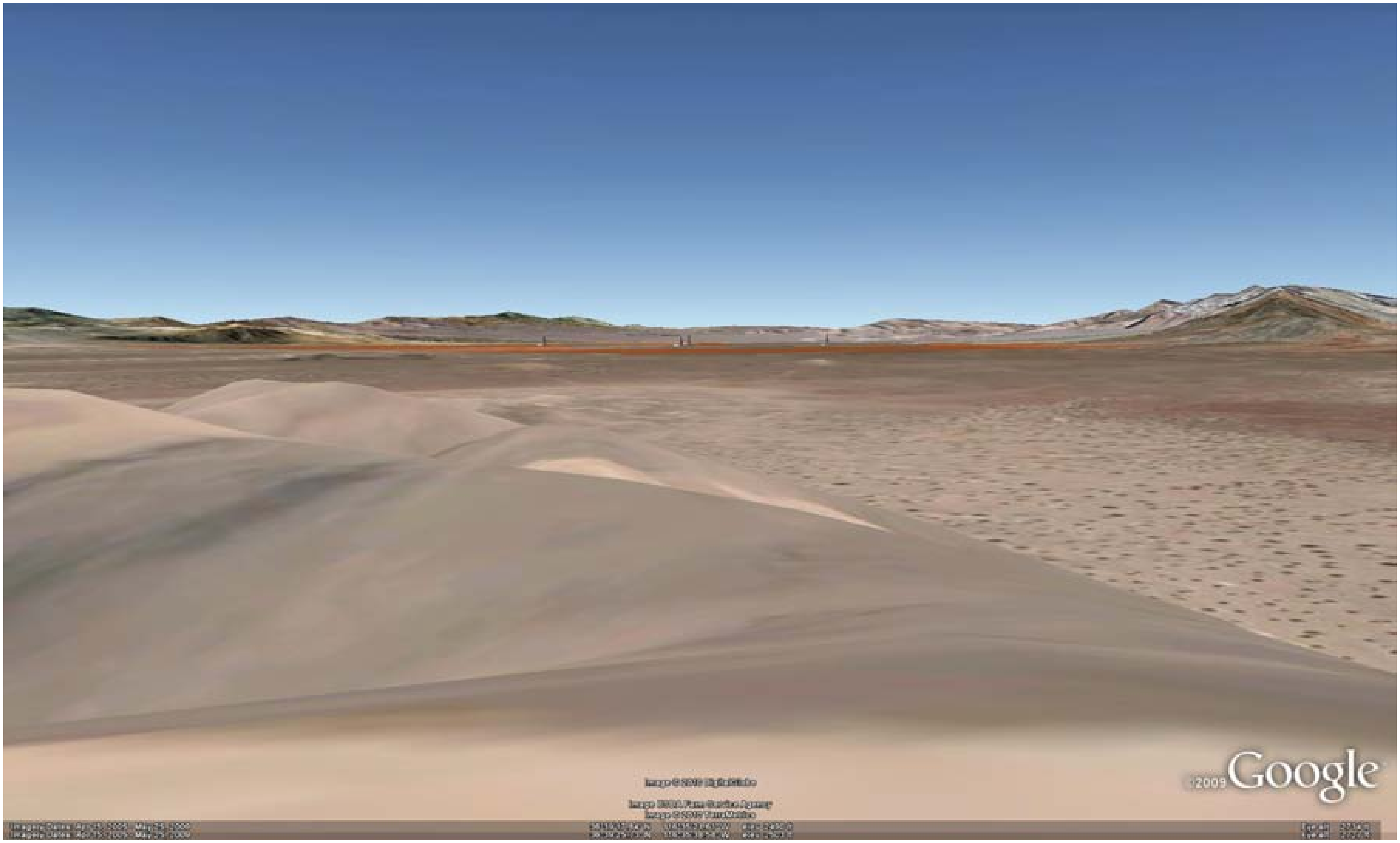

FIGURE 11.1.14.2-11 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Big Dune SRMA

(6.3 km) from the southeast corner of the SEZ. Because the viewpoint and the SEZ are close in elevation, the angle of view is low, and solar facilities within the SEZ would tend to repeat the line of the horizon as seen from Big Dune, which would tend to reduce visual contrasts. Because Big Dune is relatively close to the SEZ, however, the SEZ occupies much of the field of view. Tops of solar collector/reflector arrays in the nearest part of the SEZ might be just visible, but the SEZ would essentially be visible as a narrow band stretching across the valley floor.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and their structural details could be evident at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SRMA, the tower structures would likely be visible, as well as the receivers, which would appear as very bright to brilliant white light sources, depending on their design, the project layout, and their location within the SEZ. The lights of the receivers would likely be visible against the backdrop of the very distant mountains in the Amargosa Range. At night, the aircraft warning lights on the receiver tower would likely be visible for many miles, and would likely be very conspicuous from any point within the SRMA.

Visual contrasts associated with solar energy development within the SEZ would depend on viewer location within the SRMA; solar facility type, size, and location within the SEZ; and other visibility factors. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected in areas with a clear view of the SEZ. Contrast would be slightly weaker from viewpoints in the southeastern portion of the SRMA, because the distance to the SEZ is greater. Potential impacts on the SRMA would include night sky pollution, such as increased skyglow, light spillage, and glare.

ACEC Designated for Outstandingly Remarkable Scenic Values

- *Amargosa River*—The 27,797-acre (112.49-km^2) Amargosa River ACEC is located in California, 16 mi (26 km) southeast of the SEZ at the closest point of approach. The ACEC's scenic value is noted in its implementation plan (BLM 2007). The ACEC viewshed includes natural scenery entirely or partly within the boundaries of eight WAs and two Wilderness Study Areas (WSAs) managed by the BLM, as well as substantial wilderness acreage within Death

Valley NP. Approximately 2,919 acres (11.81 km^2), or 11% of the ACEC, is within the 650-ft (198.1-m) viewshed of the SEZ, and 189 acres (0.765 km^2) is in the 24.6-ft (7.5-m) viewshed, or 0.7% of the total ACEC acreage. The portion of the ACEC within the SEZ viewshed extends to approximately 25 mi (40 km) from the southern boundary of the SEZ.

The Amargosa River ACEC is several hundred feet lower in elevation than the Amargosa Valley SEZ and more than 23 mi (37 km) away from the SEZ, so the angle of view would be very low, and the distant SEZ would occupy a very small portion of the field of view. In addition, the western portions of the SEZ are screened from view of the ACEC by intervening terrain. Much of the ACEC is within the viewshed of the SEZ, but for most of the ACEC, visibility would be limited to the upper portions of sufficiently tall power towers.

Because of the long distance and very low viewing angle between the ACEC and the SEZ, solar facilities within the SEZ (except for power towers) would be unlikely to be seen from the ACEC. Sufficiently tall power towers placed within certain portions of the SEZ might be visible as distant points of light on the northwestern horizon. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from the ACEC. Under the 80% development scenario analyzed in this PEIS, minimal levels of visual contrast would be expected.

National Conservation Area

- *California Desert*—The California Desert Conservation Area (CDCA) is a 26-million-acre (105,000-km^2) parcel of land in southern California designated by Congress in 1976 through the Federal Land Policy and Management Act. About 10 million acres (40,000 km^2) of the CDCA is administered by the BLM. Portions of the CDCA are within the viewshed of the Amargosa Valley SEZ.

  The CDCA management plan (BLM 1999) notes the "superb" variety of scenic values in the CDCA and lists scenic resources as needing management to preserve their value for future generations. The CDCA management plan divides CDCA lands into multiple-use classes based on management objectives. The class designations govern the type and degree of land use actions allowed within the areas defined by class boundaries. All land use actions and resource-management activities on public lands within a multiple-use class delineation must meet the guidelines given for that class.

  CDCA land within the viewshed of the Amargosa Valley SEZ is within Death Valley NP. Portions of the CDCA within the 650-ft (198.1-m) viewshed for the Amargosa Valley SEZ include approximately 94,485 acres (382.37 km^2), or 0.4% of the total CDCA acreage. Portions of the CDCA within the 24.6-ft

(7.5-m) viewshed encompass about 61,851 acres (250.30 km^2), or 0.2% of the total CDCA acreage. Absent screening and other visibility factors that would prevent viewers from seeing solar energy facilities within the SEZ, all CDCA lands within the SEZ viewshed would be subject to visual impacts from solar development within the SEZ. The nature of the impacts experienced would vary with the distance from the SEZ; the angle of view; project numbers, sizes, and locations; and other project- and site-specific factors. It should be noted that more than 16,000 acres (65 km^2) of the CDCA are within the 5-mi (8-km), 24.6-ft (7.5-m) viewshed of the SEZ, while almost 20,000 acres (81 km^2) are within the 5-mi (8-km), 650-ft (198.1-m) viewshed. Some or all of these areas, and possibly substantially greater areas, would be subject to large potential impacts from the solar development within the SEZ, given the close proximity of the CDCA to the SEZ. Potential impacts on the CDCA would include night sky pollution, such as increased skyglow, light spillage, and glare.

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by other facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. Currently a 138-kV transmission line is within the proposed SEZ, so construction and operation of a transmission line outside the proposed SEZ would not be required. However, construction of transmission lines within the SEZ to connect facilities to the existing line would be required. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 138-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. Note that depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

Impacts on Selected Other Lands and Resources

U.S. 95. U.S. 95, a two-lane highway, passes through the northeast corner of the Amargosa Valley SEZ. The AADT value for U.S. 95 in the vicinity of the SEZ is about 3000 vehicles (NV DOT 2009), although traffic would increase slightly as a result of solar energy development within the SEZ. Under the PEIS development scenario, travelers on U.S. 95could be subject to large visual impacts from solar energy development within the SEZ.

About 31 mi (50 km) of U.S. 95 is within the SEZ viewshed, and solar facilities within the SEZ would be in full view from U.S. 95 as travelers approached from both directions. For travelers approaching the SEZ from Beatty, northwest of the SEZ, the SEZ would come into view about 2.6 mi (4.2 km) southeast of Beatty, or about 8.2 mi (13.2 km) from the SEZ. For travelers at highway speed, the SEZ would be in view for about 6 to 7 minutes before entering the SEZ. Facilities located within the SEZ, and especially near the road would strongly attract the eye as travelers approached the SEZ and would likely dominate views from the road.

Travelers approaching the SEZ from the east would have similar visual experiences to those just described for travelers from the west; however, the SEZ would come into view much earlier, at about 18 mi (29 km) from the SEZ, and would be in view for 15 to 18 minutes before reaching the SEZ boundary. The buildup in apparent size of the SEZ would thus be much more gradual than for eastbound travelers.

U.S. 95 passes through the SEZ for about 4.8 mi (7.7 km), which would take about 5 minutes at highway speeds. Because the road passes through the SEZ, strong visual contrasts could result, depending on solar project characteristics and location within the SEZ. Details of collector/reflector array and other structures might be visible, as well as strong contrasts of light and shadows falling between the collectors. Views of the Amargosa Desert and surrounding mountains could be completely or partially screened by solar facilities, depending on the layout of those facilities within the SEZ. If solar facilities were located on both sides of the road, the banks of solar collectors could form a visual “tunnel” that travelers would pass through.

Depending on lighting conditions, the solar technologies present, facility layout, and mitigation measures employed, there would be the potential for significant levels of reflections from facility components as travelers approached and passed through the SEZ. These effects could potentially distract drivers and/or impair views toward the facilities. These potential impacts could be reduced by siting reflective components away from the byway, employing various screening mechanisms, and adjusting the mirror operations to reduce potential impacts. However, because of their height, the receivers of power towers located close to the roadway could be difficult to screen.

If power tower facilities were located close to the road in the SEZ, the receivers could appear as brilliant white cylindrical or rectangular light sources as viewed from the road, and if sufficiently close to the road would likely strongly attract views, although they might be difficult for some people to look at for extended periods. Also, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that would be very conspicuous from this location, especially given the area's dark night skies. Other lighting associated with solar facilities would be visible as well.

Figure 11.1.14.2-12 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from U.S. 95 from within the SEZ. The closest power tower model in this view is 1.5 mi (2.4 km) from the viewpoint. From this location, solar facilities within the SEZ would be seen nearly edge-on, and they would repeat the strong line of the horizon, which would tend to reduce visual contrast. However, ancillary facilities and plumes could project above the collector/reflector arrays, depending on the solar technology employed, and could add strong contrasts in form, line, color, and texture from this short distance. The SEZ occupies more than the horizontal field of view, so viewers would have to turn their heads to see the full extent of the facilities within the SEZ. At this distance, solar facilities within the SEZ would strongly command visual attention and would likely dominate views from this location. Power towers located near the road could project beyond the mountain backdrop to be viewed against the sky.

State Route 374. Approximately 9 mi (14 km) of State Route 374 passes through the viewshed of the SEZ about 9 mi (14 km) northwest of the SEZ, extending northeast to southwest. The AADT value for State Route 374 in the vicinity of the SEZ is about 250 vehicles (NV DOT 2009). Solar energy development within the SEZ would likely be visible to travelers on State Route 374 for 7 to 8 minutes as they crossed Amargosa Valley between Beatty and Death Valley NP; however, intervening topography would provide partial screening of portions of the SEZ in the southwestern portion of the valley on State Route 374.

Figure 11.1.14.2-3 (presented in the Death Valley NP discussion above) is a Google Earth visualization of the SEZ (highlighted in orange) as seen from State Route 374 at the entrance to Death Valley NP, approximately 9.3 mi (15 km) from the northwest corner of the SEZ. The viewpoint is about 800 ft (244 m) higher in elevation than the SEZ. From this location, solar facilities within the SEZ would be seen nearly edge-on, and they would repeat the strong line of the horizon, which would tend to reduce visual contrast. However, the SEZ is close enough that it would occupy a moderate amount of the horizontal field of view.

Visual contrasts associated with solar energy development within the SEZ would depend on viewer location on State Route 374; solar facility type, size, and location within the SEZ; and other visibility factors. Under the 80% development scenario analyzed in this PEIS, weak to moderate levels of visual contrast would be expected at locations along State Route 374 with a clear view of the SEZ.

State Route 373. About 16.4 mi (26.4 km) of State Route 373 passes through the viewshed of the SEZ about 13 mi (21 km) southeast of the SEZ, extending north to south. The AADT value for State Route 373 in the vicinity of the SEZ is about 910 vehicles (NV DOT 2009). Solar energy development within the SEZ would likely be visible to travelers

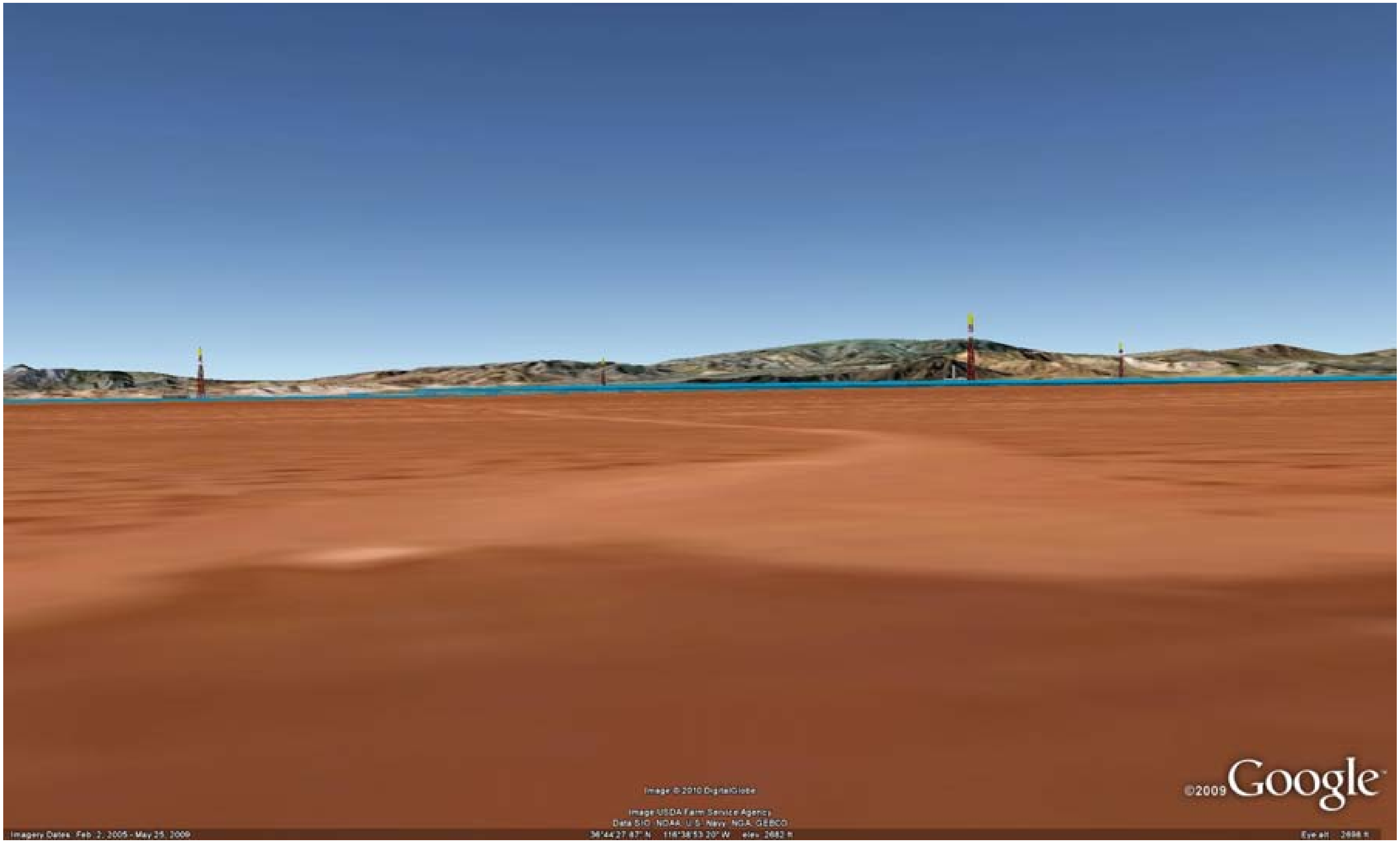

FIGURE 11.1.14.2-12 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on U.S. 95 within the SEZ

on State Route 373 for 12 to 16 minutes as they crossed Amargosa Valley between the Nevada-California state line and the Amargosa Valley stop on U.S. 95. However, topography would screen views of the lower height solar technologies for more than half of the route from the state line northward.

The Amargosa Valley slopes gently downward to the south, and State Route 373 is at about the same elevation as the SEZ for most of its length. Because the distance between State Route 373 and the SEZ exceeds 13 mi (21 km), the SEZ would occupy only a small portion of the horizontal field of view, and the angle of view would be very low.

Visual contrasts associated with solar energy development within the SEZ would depend on viewer location on State Route 373; solar facility type, size, and location within the SEZ; and other visibility factors. Under the 80% development scenario analyzed in this PEIS, minimal to weak levels of visual contrast would be expected at locations along State Route 373 with a clear view of the SEZ.

Other impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads, including but not limited to U.S. 95 and State Routes 374 and 373, as noted above. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

11.1.14.2.3 Summary of Visual Resource Impacts for the Proposed Amargosa Valley SEZ

Under the 80% development scenario analyzed in the PEIS, the SEZ would contain multiple solar facilities utilizing differing solar technologies, as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal, relatively uncluttered, and generally natural appearing landscape of the flat valley in which the SEZ is located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development due to major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within the SEZ.

The SEZ is in an area of low scenic quality. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ.

Utility-scale solar energy development within the proposed Amargosa Valley SEZ is likely to result in weak to strong visual contrasts for some viewpoints within Death Valley NP and WA, which are within 1 mi (1.6 km) of the SEZ; strong visual contrasts for some viewpoints within Big Dune SRMA; and strong contrasts for travelers on U.S. 95, which passes through the SEZ. Weak to moderate visual contrasts could be observed by travelers on State Route 374, and minimal to weak visual contrasts for some viewpoints within other sensitive visual resource areas within the SEZ 25-mi (40 km) viewshed.

11.1.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

The presence and operation of large-scale solar energy facilities and equipment in the SEZ would introduce major visual changes into a nonindustrialized landscape and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of design features intended to reduce visual impacts (described in Appendix A, Section A.2.2, of this PEIS) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited..

While the applicability and appropriateness of some measures would depend on site- and project-specific information that would be available only after a specific solar energy project had been proposed, some SEZ-specific design features can be identified for the Amargosa Valley SEZ at this time, as follows:

- Within the SEZ, in areas visible from and within 5 mi (8 km) of the boundary of Death Valley NP, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives (see Table 11.1.14.3-1), as experienced from KOPs (to be determined by the BLM in conjunction with NPS) within the National Park.

The VRM Class II impact level consistency mitigation would affect about 15,359 acres (62.2 km^2) within the southwestern portion of the SEZ. The affected area includes approximately 49% of the total area of the proposed SEZ. The area subject to SEZ-specific design features requiring consistency with VRM Class II management objectives is shown in Figure 11.1.14.3-1.

Application of the SEZ-specific design feature above would substantially reduce visual impacts associated with solar energy development within the SEZ and would substantially also reduce potential visual impacts on the Death Valley NP by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest. This measure would also reduce impacts to the Big Dune SRMA, the Amargosa River Scenic ACEC (California), and the Ash Meadows NWR.

TABLE 11.1.14.3-1 VRM Class Objectives

Class I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II	The objective to this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should both dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM (1986b).

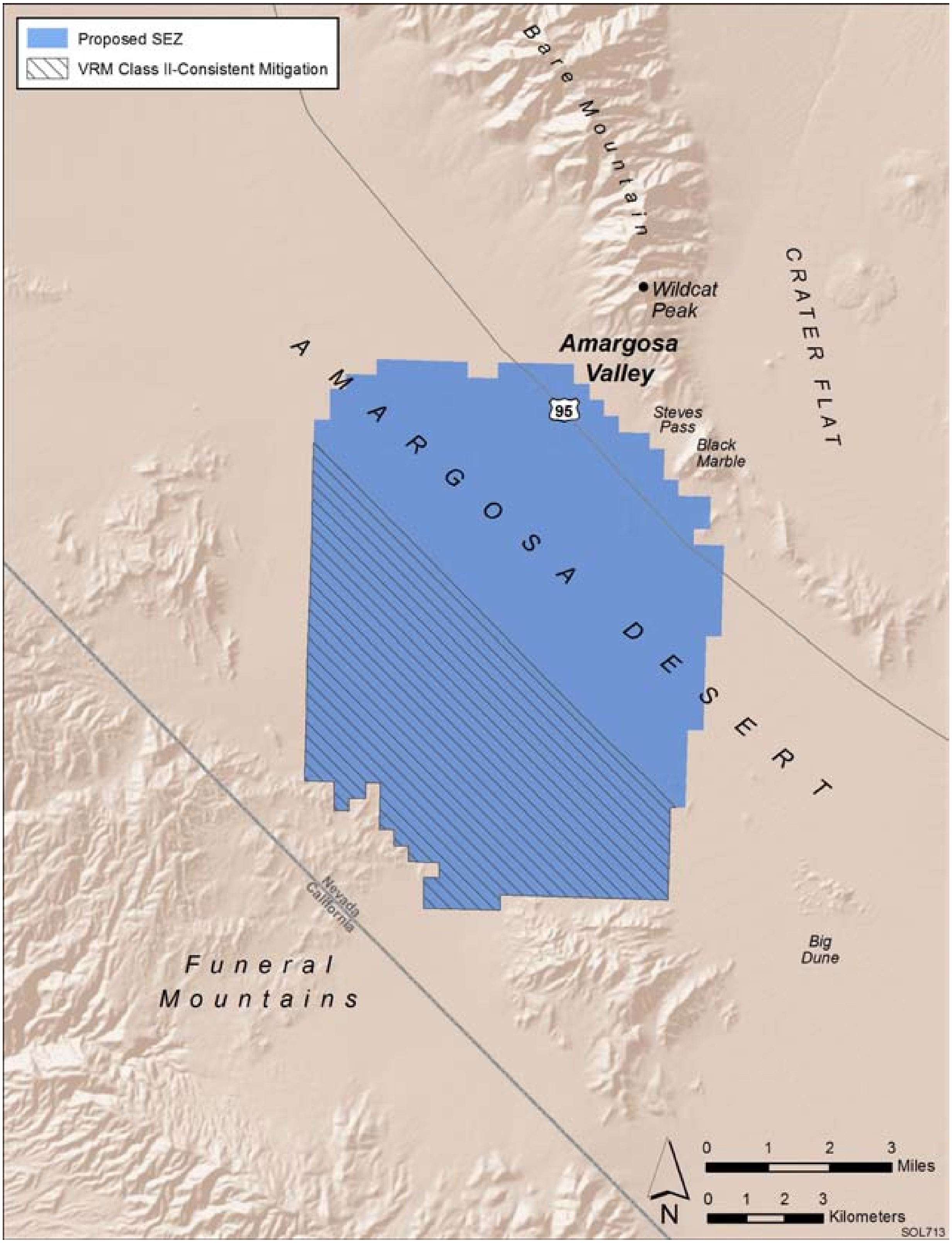

FIGURE 11.1.14.3-1 Areas within the Proposed Amargosa Valley SEZ Affected by SEZ-Specific Distance-Based Visual Impact Design Features

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11.1.15 Acoustic Environment

11.1.15.1 Affected Environment

The proposed Amargosa Valley SEZ is located in south-central Nevada, in the southern portion of Nye County. Neither the State of Nevada nor Nye County has established quantitative noise-limit regulations.

U.S. 95 runs through the northeast portion of the proposed Amargosa Valley SEZ. State Routes 373 and 374, which lead to Death Valley National Park in California, run about 13 mi (21 km) and 9 mi (14.5 km) to the southeast and northwest of the SEZ, respectively. Several existing dirt roads penetrate the area. Several airports are located around the SEZ: Beatty Airport, about 7 mi (11 km) north-northwest of the SEZ; Fran's Star Ranch Airport, about 11 mi (18 km) north of the SEZ; Jackass Aeropark, which is currently abandoned, about 12 mi (19 km) east-southeast of the SEZ; and Death Valley Airport, which is located about 15 mi (24 km) southwest of the SEZ. Small-scale irrigated agricultural lands are scattered to the south-southeast, starting from 4.5 mi (7.2 km) from the SEZ up to State Route 373. Industrial activities related to minerals and mining are located around the SEZ, while a disposal facility owned by US Ecology, Inc., is located adjacent to the north central SEZ boundary. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist around the proposed Amargosa Valley SEZ. The nearest residence lies about 4.5 mi (7.2 km) to the south-southeast of the SEZ, from which point many residences are scattered up to State Route 373. The nearby population centers with schools are Amargosa Valley, about 10 mi (16 km) to the southeast, and Beatty, about 10 mi (16 km) to the north. Accordingly, noise sources around the SEZ include road traffic, aircraft flyover, agricultural activities, industrial activities, and community activities and events. Other noise sources are associated with current land use around the SEZ, including outdoor recreation and OHV use. Noise levels would be relatively higher in the northeastern portion of the SEZ along U.S. 95, while noise levels in the western portion of the SEZ are similar to natural wilderness background levels. The proposed Amargosa Valley SEZ is in an undeveloped area, the overall character of which is rural. To date, no environmental noise survey has been conducted around the proposed Amargosa Valley SEZ. On the basis of the population density, the day-night average noise level (L_{dn} or DNL) is estimated to be 25 dBA for Nye County, well below the level typical of a rural area in the range of 33 to 47 dBA L_{dn} (Eldred 1982; Miller 2002).[10]

11.1.15.2 Impacts

Potential noise impacts associated with solar projects in the Amargosa Valley SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment and vehicular traffic on the nearest residence

10 Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during the daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

(about 4.5 mi [7.2 km] to the south-southeast of the southern SEZ boundary) would be anticipated, albeit of short duration. During the operations phase, potential impacts on nearby residences would be anticipated, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed Amargosa Valley SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2,k and through the application of any additional SEZ-specific design features (see Section 11.1.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

11.1.15.2.1 Construction

The proposed Amargosa Valley SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area where key components (e.g., steam turbine/generator) needed to generate electricity are located; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background level. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment and by temperature lapse conditions typical of daytime hours; thus noise attenuation to a 40-dBA level would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the nearest residence of the southern SEZ boundary, estimated noise levels at the nearest residence would be about 25 dBA, which is well below a typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn}[11] at this residence (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas.

It is assumed that a maximum of three projects would be developed at any one time for SEZs greater than 30,000 acres (121.4 km^2), such as the Amargosa Valley SEZ. If three projects

[11] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in day-night average noise level (L_{dn}) of 40 dBA.

were to be built in the southern portion of the SEZ near the nearest residence, noise levels would be about 28 dBA, which is still well below the typical daytime mean rural background level of 40 dBA, and their contribution to the existing L_{dn} would be minimal (about 0.1 dBA).

In addition, noise levels are estimated at the specially designated areas within 5-mi (8-km) range from the Amargosa Valley SEZ, which is the farthest distance that noise, except extremely loud noise, would be discernable. There are two specially designated areas within the range where noise might be an issue: Death Valley NP, which is located as close as about 1 mi (1.6 km) southwest of the SEZ; and Big Dune ACEC, which is located about 1.7 mi (2.7 km) southeast of the SEZ. For construction activities occurring near the SEZ boundary close to the specially designated areas, noise levels are estimated to be about 42 and 36 dBA at the boundaries of the Death Valley NP and Big Dune ACEC, respectively, which are comparable to the typical daytime mean rural background level of 40 dBA. As discussed in Section 5.10.2, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, construction noise from the SEZ is not likely to adversely affect wildlife or visitors at the nearby specially designated areas.

Depending on the soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearby residences would be anticipated to be negligible, considering the distance to the nearest residence (about 4.5 mi [7.2 km] from the southern SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction within the proposed Amargosa Valley SEZ would cause minimal unavoidable but localized short-term noise impacts on neighboring communities, even when construction activities would occur near the southern SEZ boundary, close to the nearest residence.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 138-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a minor component of construction impacts in comparison to solar facility construction, and would be temporary in nature.

11.1.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area, commuter/visitor/support/delivery traffic within and around the solar facility, and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and firewater pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southern SEZ boundary, the predicted noise level would be about 29 dBA at the nearest residence, located about 4.5 mi (7.2 km) from the SEZ boundary, which is much lower than typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[12]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residence, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. As for construction, if three parabolic trough and/or power tower facilities were operating around the nearest residence, combined noise levels would be about 32 dBA, which is still below the typical daytime mean rural background level of 40 dBA, and their contribution to existing L_{dn} level would be minimal (about 0.3 dBA). However, day-night average noise levels higher than those estimated above by using the simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Amargosa Valley SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong

[12] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[13] within 1 or 2 mi (2 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are lowest. To estimate the day-night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated noise level at the nearest residence (about 4.5 mi [7.2 km] from the southern SEZ boundary) would be 39 dBA, which is higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 43 dBA L_{dn}, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that sound levels would be lower than 43 dBA L_{dn} at the nearest residence, even if TES were used at a solar facility. In consequence, operating parabolic trough or power tower facilities using TES and located near the southern SEZ boundary could result in minor adverse noise impacts on the nearest residence, depending on background noise levels and meteorological conditions.

Associated with operation of a parabolic trough or power tower solar facility occurring near the southwestern SEZ boundary, estimated daytime level of 41 dBA at the boundary of the Death Valley NP is comparable to typical daytime mean rural background level of 40 dBA, while estimated nighttime level of 51 dBA is much higher than typical nighttime mean rural background level of 30 dBA. For the facility near the southeastern SEZ boundary, daytime and nighttime noise levels at the Big Dune ACEC are estimated to be 37 and 47 dBA, respectively. Accordingly, operation noise from the SEZ is not likely to adversely affect wildlife or visitors at the nearby specially designated areas (Manci et al. 1988).

In the permitting process, refined noise propagation modeling would be warranted along with measurement of background noise levels.

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the proposed Amargosa Valley SEZ, on the basis of the assumption of dish engine facilities of up to 2,811 MW total capacity (covering 80% of the total area, or 25,300 acres [102.4 km^2]), up to 112,440 25-kW dish engines could be employed. For a large dish engine facility, a couple of thousand step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA

13 A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

(typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from hundreds of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, for example, about 52 dBA at 1.0 mi (1.6 km) and 48 dBA at 2 mi (3.2 km) from the boundary of the squarely-shaped dish engine solar field, both of which are higher than typical daytime mean rural background level of 40 dBA. However, these levels would occur at somewhat shorter distance than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residence, it was assumed dish engines were placed all over the Amargosa Valley SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residence, about a 4.5-mi (7.2-km) distance from the SEZ boundary, would be about 41 dBA, which is comparable to typical daytime mean rural background level of 40 dBA. Assuming 12-hour daytime operation, the estimated 42 dBA L_{dn} at this residence is well below the EPA guideline of 55 dBA L_{dn} for residential areas. Considering other noise attenuation mechanisms, noise levels at the nearest residence would be lower than estimated values in the above and thus potential impacts on nearby residences would be anticipated to be minimal. However, noise from dish engines could cause minor adverse impacts on the nearest residence, depending on background noise levels and meteorological conditions.

For dish engines placed all over the SEZ, estimated noise levels would be about 48 and 47 dBA at the boundaries of the Death Valley NP and Big Dune ACEC, respectively, which are higher than the typical daytime mean rural background level of 40 dBA. However, dish engine noise from the SEZ is not likely to adversely affect the wildlife or visitors at the nearby specially designated areas (Manci et al. 1988).

Consideration of minimizing noise impacts is very important when siting dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also limit noise impacts.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the proposed Amargosa Valley SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be minimal.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and not be heard at the nearest residence, assuming a 5-mi (8-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 4.5 mi [7.2 km] to the nearest residence). Accordingly, potential impacts of these noise sources on the nearest residences would be negligible.

For impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of 230-kV transmission line towers would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. Corona noise includes high-frequency components, considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts unless a residence was located close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The proposed Amargosa Valley SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residences from corona noise along transmission lines within the SEZ would be negligible.

11.1.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction, but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minimal and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus minimal.

11.1.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. Due to the considerable distance to the nearest residence, activities within the proposed Amargosa Valley SEZ during construction and operation would be anticipated to cause only minor increases in noise level at the nearest residence. In addition, these activities are not likely to adversely affect wildlife or visitors at the specially designated areas around the SEZ. Accordingly, no SEZ-specific design features are required.

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11.1.16 Paleontological Resources

11.1.16.1 Affected Environment

The surface geology of the proposed Amargosa Valley SEZ is composed predominantly of more than 100-ft (30-m) thick alluvial deposits ranging in age from the Pliocene to Holocene. The alluvial deposits cover 31,192 acres (126 km^2) within the SEZ, or nearly 99% of the SEZ. Portions of the southern edge and southwest corner of the SEZ are composed of residual materials developed in sedimentary rocks. These discontinuous residual deposits account for 451 acres (1.8 km^2), or slightly more than 1% of the SEZ. In the absence of a Potential Fossil Yield Classification (PFYC) map for Nevada, a preliminary classification of PFYC Class 2 is assumed for the young Quaternary alluvial deposits and residual materials. This classification is based on a very preliminary field visit in February 2010 by a BLM Regional Paleontologist and findings on paleontological potential for the nearby Amargosa Farm Road Solar Energy Project (Sprowl 2010). Class 2 indicates that the potential for the occurrence of significant fossil material is low (see Section 4.14 for a discussion of the PFYC system).

11.1.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in the proposed SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above and are classified as PFYC Class 2, further assessment of paleontological resources is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found within the Amargosa Valley SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unlikely as any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new roads or transmission lines are currently anticipated for the Amargosa Valley SEZ, based on the assumption that existing corridors would be used, so no impacts on paleontological resources are anticipated from the creation of such new access pathways. However, impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

11.1.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, as described in Appendix A, Section A.2.2.

If the geological deposits on the proposed Amargosa Valley SEZ are determined to be as described above and are classified as PFYC Class 2, mitigation of paleontological resources within the SEZ is not likely to be necessary.

11.1.17 Cultural Resources

Cultural resources present on or adjacent to the proposed Amargosa Valley SEZ include archaeological sites, landscapes and features significant to Native Americans, prehistoric and historic trails, railroad grades and associated sites, mining camps and associated artifacts, and sites relating to the NTS and Nellis Air Force Base.

11.1.17.1 Affected Environment

11.1.17.1.1 Prehistory

The proposed Amargosa Valley SEZ is located in a transitional area of the Mojave Desert and the Great Basin. The earliest human use of this area was likely during the Paleoindian Period sometime between 12,000 and 10,000 B.P. Several Paleoindian sites have been documented in the Mojave Desert and the Great Basin, usually identified near inland pluvial lake margins (now mostly dry), streams, and desert terraces. The sites are usually surface finds of diffuse lithic scatters, and the location of the sites and the types of tools associated with the sites suggest that subsistence during this time period focused on mega fauna and/or on the local lake and marsh habitats. This region is also interesting for the number of pre-Paleoindian sites that have been suggested. These unsubstantiated claims are a major point of contention among archaeologists, but the fact that so many have been suggested in the region (Calico Man site near Barstow, California, Tule Springs site southeast of the proposed Amargosa Valley SEZ near Las Vegas, Nevada, and Lake Manix, located in the eastern Mojave Desert) make them worth mentioning here. The mega fauna became extinct around 10,000 to 11,000 B.P., and changes in the lifeways of the Paleoindians likely led to the end of the period around 7,000 to 8,000 B.P. This coincided with a warming climate and the receding of the ancient pluvial lakes. These early Paleoindian sites are characterized by the Clovis complex of fluted points and later by the Western Pluvial Lakes Tradition or San Dieguito complex. The latter complex is characterized by a material culture of core and flaked-based tools, crescents, choppers, planes and scrapers, and some leaf-projectile points (Rogers 1939; Warren and Crabtree 1986).

The Archaic Period in the Mojave Desert and Great Basin region lasted from approximately 8,000 to 1,500 B.P. In the southwestern portion of the Great Basin, the Pinto Cultural Complex is representative of most of the Early and Middle portions of the Archaic period. There is a lack of evidence for the Archaic Period in the region of the Amargosa Valley SEZ; however, several sites have been located in the eastern and southern portions of the Mojave Desert and north of the proposed Amargosa Valley SEZ in the Lake Lahontan Basin. The sites during this period are generally identified by distinctive projectile points and ground stone tools used for processing plant resources. The arid conditions in the Great Basin have allowed the preservation of artifacts that are normally perishable, so wicker baskets, split-twig figurines, duck decoys, and woven sandals appear in the archaeological record. By the Late Archaic Period, characterized by the Gypsum Cultural Complex, there is greater diversity in the material culture, likely an indicator that neighboring cultural groups were influencing people in the region. At this time, the projectile points change, indicating a technological change from the use of the atlatl to the bow and arrow, and probably also indicating a change in subsistence strategy to exploit more diverse ecological zones and smaller rather than larger game. The change in subsistence is also evident in the pattern of site locations towards the end of the Archaic Period, as sites are more frequently located near or in mesquite groves; with the increased presence of mortars and pestles in the archaeological assemblage, it appears plant foods were becoming increasingly important in the diet (Warren and Crabtree 1986).

The Late Prehistoric/Protohistoric Period began around 1500 B.P., extending until contact with Euro-American explorers and settlement of the area in the nineteenth century. The period can be further divided into the Saratoga Springs Period (1500 B.P to 800 B.P.) and the Shoshonean Period (800 B.P. to circa AD 1800). During the Saratoga Springs Period, the archaeological record suggests Virgin Anasazi/Puebloan influence in the region, especially in the Muddy River Valley (or Moapa River Valley) in the Eastern Mojave Desert. In addition to the Puebloan influence, there is evidence of Patayan and Hohokam influences, especially in the subsistence systems (slab-lined pits) and ceramic complexes (Patayan grey wares, buff wares, and brown wares). This Patayan and Hohokam influence was likely a result of trading or cross-cultural interactions, as these groups were not the ethnohistoric antecedents of contemporary Tribes. During this period major habitation sites were often located near major rivers and their tributaries, facilitating the practice of floodplain agriculture. Temporary camps are often found related to the more central habitation sites, usually located near springs, and were likely used to supplement agricultural practices by hunting and gathering resources. The archaeological assemblages related to this period include paddle-and-anvil pottery (Patayan–grey ware, buff ware and brown ware, Virgin Anasazi–grey ware, and decorated ceramics), bow-and-arrow technology (evidenced by smaller corner and side-notched points), rock art and intaglios, bedrock milling features, a shift in burial practices from inhumation to cremation techniques, and extensive trail systems along which “pot-drops,” lithics, and shrines are found. Around 800 B.P., Numic-speaking groups moved into the region and maintained a subsistence system similar to the Archaic hunting and gathering economy. These groups maintained task-specific sites and seasonal camps that were dispersed throughout large regions. The assemblage of this time period is characterized by Desert side-notched points, twined and coiled basketry, and brown ware ceramics. The expression of a Numic period is questioned by contemporary Native American groups in the region, because they see themselves as being descendants of the Anasazi, having occupied the area since the beginning of time, and do not perceive of a disconnect between Virgin Anasazi and Numic periods (Warren and Crabtree 1986; USAF Combat Command 2006; Lyneis 1995)). The following section describes the cultural history of the Native American groups in the area in greater detail.

11.1.17.1.2 Ethnohistory

The proposed Amargosa Valley SEZ is located in territory most often ascribed to the Western Shoshone (Thomas et al. 1986). Western Shoshone groups had stable base camps in Oasis Valley near present-day Beatty, 12 mi (20 km) to the north, and in Death Valley on the other side of the Funeral Mountains (Fowler 1991). However, the arid Amargosa Valley bottom also lies in a transition area close to the traditional range of the Southern Paiutes, who shared camps with the Western Shoshone at Ash Meadows 18 mi (30 km) to the southeast. Amargosa

Valley appears to have been a joint-use area shared by the Western Shoshone, Southern Paiute, and Owens Valley Paiute (AIWS 1996; Stoffle 2001).

Western Shoshone

The Western Shoshone are a group of ethnically similar Central Numic speakers who traditionally occupied a swath of the central Great Basin stretching from Death Valley in California through central Nevada and northwestern Utah to southeastern Idaho (Thomas et al. 1986). The territory lies primarily within the basin and range province of the Great Basin. They lived in small groups with rather fluid membership, usually identified with the land where they were centered. Their subsistence base and lifestyle varied with the resources within their territory. Those groups close to the SEZ established stable camps near reliable water sources they could use to grow crops. From these base camps, they would move seasonally in a flexible round to exploit resources in the surrounding mountains and other areas as they became available. They gathered a wide variety of plant resources (Stoffle et al. 1990; Crum 1994) supplemented by hunting and fishing. Pine nuts, available in the mountains, were a storable staple. Pronghorn antelope and bighorn sheep were among the large game animals they hunted, but smaller game, including rodents, birds, and, where available, fish, provided more protein in their diet. Groups varied in size and composition with the season. The largest groups gathered for the pine nut harvest, which could include a rabbit or antelope drive as well. Winter villages were usually close to stores of pine nuts. They interacted peacefully with the Southern Paiutes, with whom they were on good terms (Thomas et al. 1986), and with the Owens Valley Paiutes, through whom they were tied in trade to Tribes west of the Sierra Nevada (Liljeblad and Fowler 1986).

Pre-contact Western Shoshone technology was simple but effective. They produced a wide variety of both coiled and twined basketry vessels and implements, supplemented by simple, rudimentary pottery. Basketry and beaters were used to gather seeds, which were milled using stone manos and metates. They used sinew-backed bows of juniper and arrows of reed or willow. They also made a variety of wooden and horn tools, pipes, and musical instruments (Thomas et al. 1986). They built light structures of branches in their summer camps; in the winter they constructed conical huts finished with slabs of bark held down by stones, along with smaller sweathouses (Thomas et al. 1986; Crum 1994).

The first recorded Western Shoshone contact with Euro-Americans was in 1827, with the trapper Jedediah Smith, one of the first of many trappers to pass through their territory. Later, beginning in 1849, the Shoshone were more heavily impacted by the onslaught of prospectors seeking gold and other mineral wealth in California and Nevada. The Shoshone were occasionally hostile to miners and those traveling trails to the west. In the Treaty of Ruby Valley, signed in 1863, the Western Shoshone agreed to allow immigrants to cross their lands and the U.S. government to establish roads and forts, but did not relinquish title to their lands. The Western Shoshone were not willing to give up their mobile lifestyle. Nonetheless, reserves or "farms" were set aside for the Western Shoshone beginning in the late 1850s. Reservations were established, beginning with one at Moapa in 1873, and continued to be designated through the twentieth century (Fowler 1991). The Panamint or Timbisha Shoshone community was granted

Federal recognition in 1983 and a discontinuous reservation in November 2000. Their reservation includes parcels of land at Furnace Creek in Death Valley National Park; Death Valley Junction, California; Centennial, California; Scotty's Junction, Nevada, and Lida, Nevada (Sunderland 2007). The search for employment has drawn many Shoshone away from their reservations, and many now live in towns and urban centers, particularly Las Vegas. The Timbisha Reservation is the closest to the SEZ; however, the Western Shoshone norm of group exogamy, and their practice of travelling great distances, means that there is considerable population movement among the Western Shoshone. This, along with intermingling with neighboring Tribal groups, has resulted in individuals with traditional ties to the Amargosa Valley being scattered throughout the Shoshone and Paiute reservations, as well as within many communities outside the reservations (Stoffle 2001).

Southern Paiute

The Southern Paiute shared access to the area around the proposed Amargosa Valley SEZ with the Western Shoshone (Stoffle 2001). They appear to have moved into southern Nevada around A.D. 1150 (Euler 1964). Before the arrival of Euro-American colonists, the Southern Paiute may have been organized on a Tribal level under the ritual leadership of High Chiefs and bound together by a network of trails used by specialist runners (Stoffle and Dobyns 1983; Stoffle 2001). When first described by ethnographers, these groups had diminished significantly in size and did not maintain any overall Tribal organization. Territories were self-sufficient economically, and the only known organizations were kin-based bands, often no larger than that of a nuclear family (Kelly and Fowler 1986).

Like the Western Shoshone, the Southern Paiute occupied territory that stretched from the high Colorado plateaus west and southwest, following the bend in the Colorado River through canyon country and the basin and range geologic province into the Mojave Desert. It included high plateau, basin and range, and canyonlands topography. The Las Vegas "Band" was the closest group to the SEZ. Their home range did not extend north of Ash Meadows, but they hunted mountain sheep in Western Shoshone territory in the mountains close to the SEZ (Kelly and Fowler 1986).

The Southern Paiute practiced a mixed subsistence economy, gathering wild plant resources, hunting, and fishing. They also maintained some floodplain and irrigated agricultural fields, and husbanded wild plants through transplanting, pruning, burning, and irrigation (Stoffle and Dobyns 1983). The diet of the Southern Paiute was varied, if seasonally precarious. Southern Paiute dwellings varied with the seasons. In the summer, they lived under trees with brush bedding, using shades and windbreaks occasionally. After the fall harvest, they resided in conical or sub-conical shaped houses or in caves. It was not until the late nineteenth century that teepees and sweathouses were adopted from the Utes (Kelly and Fowler 1986). Like their Shoshone neighbors, the Southern Paiutes were skilled at basketry, with which they made light containers, and implements suitable to their mobile lifestyle. Pottery, usually unfired, was also made for daily use.

The arrival of Europeans in the New World had serious consequences for the Southern Paiute. Even before direct contact, the spread of European diseases and the slave trade implemented by Utes and Navajo for the Spanish colonial markets in New Mexico, Sonora, and California resulted in significant depopulation. The Southern Paiutes retreated from areas where there was an increased presence of Euro-American travelers, such as along the Old Spanish Trail. They were further displaced by Euro-American settlers, who sought the same limited sources of water. Dependence on wild plant resources likely increased during this time, as the Southern Paiute were forced to withdraw into more remote areas (Kelly and Fowler 1986). As Euro-American settlements grew, the Southern Paiute were drawn into the new economy, often serving as transient wage labor. Settlements or colonies of laborers grew up around settlements, farms, and mines, often including individuals from across the Southern Paiute homeland.

In 1865, an initial attempt to settle the Southern Paiutes in northeastern Utah with their traditional enemies, the Utes, failed. The Moapa Reservation, established in eastern Nevada in 1873, was more successful. In the first decades of the twentieth century, small reservations were created in southern Utah for the Shivwits, Indian Peak, Koosharem, and Kanosh Bands, and in northern Arizona for the Kaibab. Colonies at Las Vegas and Pahrump, Nevada, along with Cedar City, Utah, each acquired a small land base. Where feasible, the Southern Paiute farmed or ranched on these reservations, but mostly they served as wage laborers, travelling great distances. The Las Vegas and Pahrump colonies are closest to the Amargosa Valley (Stoffle and Dobyns 1983; Kelly and Fowler 1986).

Owens Valley Paiute

The Owens Valley Paiute inhabit the valley of the Owens River that parallels the eastern slope of the Sierra Nevada. They speak Mono, a Western Numic language, and are linguistically closely tied to the Northern Paiute. Owens Valley is well watered by streams flowing from the Sierra Nevada, and until it was partially diverted in the early twentieth century to help supply Los Angeles, the Owens River flowed into the saline Owens Lake. The valley was rich with game and plant resources, and the Owens Valley bands were able to maintain a more sedentary lifeway and a higher population density than their Great Basin neighbors. Semi-permanent base camps of some durability were constructed in unstructured settlements usually occupied by the same families from year to year (Liljenblad and Fowler 1986).

Seasonal food gathering followed the ripening cycles of seed and root crops, some 40 of which were harvested along with pine nuts and acorns. Some of these crops were encouraged by systems of irrigation whereby summer floodwaters were communally spread across water meadows. Hunters sought rabbit, mountain sheep, and deer (Liljenblad and Fowler 1986).

The Sierra Nevada provided resources and was not a barrier to travel and trade. Owens Valley women regularly made the trek to the western slopes to trade pine nuts and salt from Saline Valley with their Monache and Yokuts neighbors for acorns, thus introducing California cultural traits to the Great Basin and linking California in a trade network that stretched as far as Arizona. They shared access to Lake Owens with the Timbisha Shoshone (Liljenblad and Fowler 1986).

Owens Valley was relatively undisturbed by Euro-Americans until 1861, when the first settlers arrived. Conflict was immediate as the Paiute resisted the loss of their irrigated meadows. The U.S. military intervened, implementing a scorched earth policy, burning Paiute stores, houses, and equipment. In 1863, 900 Paiute prisoners were marched to the San Sebastian Reservation near Fort Tejon, California for internment, losing 100 along the way to death or escape. San Sebastian was ill-equipped to hold the Paiute, who gradually drifted back to the valley. Between 1902 and 1915, reservations were established at Fort Independence, Bishop, Lone Pine, Big Pine, and Benton. Beginning in 1905, the City of Los Angeles began to acquire water rights in the valley; by 1933 it owned 95% of the farmland and 85% of the town property and sought to consolidate or remove the Indians from the valley in order to obtain the remaining water rights. The issues were resolved by a series of land exchanges in 1937. Currently, each reservation is governed by its own elected council (Liljenblad and Fowler 1986).

Others

With the increased Euro-American presence in the area after about 1850, Native Americans of many ethnic backgrounds became increasingly involved in wage labor, often outside their traditional territories. Native Americans from elsewhere came to and often remained in the Mojave Desert (Stoffle 2001).

11.1.17.1.3 History

A Euro-American presence in the region did not occur until the early nineteenth century. The Old Spanish Trail was an evolving trail system from Santa Fe to Los Angeles, generally established in the early nineteenth century, tending to follow previously established paths used by Native Americans and earlier explorers. The trail was not a direct route, due to a desire to avoid hostile Indian Tribes and natural land formations such as the Grand Canyon. Several forks and cutoffs were established as more and more travelers made use of the trail system. The 2,700-mi (4,345-km) trail network crosses through six states with various paths between Santa Fe and Los Angeles. It was used primarily between 1829 and 1848 by New Mexican traders exchanging textiles for horses. The closest portion of the trail passes through the southern portion of the Pahrump Valley, about 75 mi (121 km) south of the proposed Amargosa Valley SEZ. In 1829, while following the Old Spanish Trail, Antonio Armijio found an oasis that served as a crucial stopping point along the trail. This oasis was named Las Vegas, Spanish for “The Meadows,” and in using this oasis groups traveling on the trail were able to significantly shorten their trip through the harsh desert (Fehner and Gosling 2000).

With the ratification of the Treaty of Guadalupe Hidalgo in 1848 closing out the Mexican-American War, the area came under American control. In 1847, the first American settlers arrived in the Great Basin, among them Mormon immigrants under the leadership of Brigham Young, who settled in the Valley of the Great Salt Lake in Utah. They sought to bring the entire Great Basin under their control, establishing an independent State of Deseret. From its center in Salt Lake City, the church sent out colonizers to establish agricultural communities in surrounding valleys and missions to acquire natural resources such as minerals and timber.

Relying on irrigation to support their farms, the Mormons often settled in the same places as the Fremont and Virgin Anasazi centuries before. The result was a scattering of planned agricultural communities from northern Arizona to southern Idaho and parts of Wyoming, Nevada, and southern California. In 1855, Brigham Young sent 30 men, led by William Bringhurst, to the Las Vegas Valley, southeast of the proposed Amargosa Valley SEZ, in an effort to establish a mission in the southern portion of Nevada. They called their mission Las Vegas Fort, but only stayed in the area for a few years before abandoning the mission due to the harsh climate and the closing of the nearby Potosi mine, which had provided the majority of the income and patronage at the mission (Fehner and Gosling 2000).

Nevada's nickname is the "Silver State," so named for the Comstock Lode strike in Virginia City in 1859, about 300 mi (483 km) north of the proposed Amargosa Valley SEZ. This was the first major silver discovery in the United States, and with the news of the strike hopeful prospectors flocked to the area in an effort to capitalize on the possible wealth under the surface of the earth. The discovery of the Comstock Lode led to the creation of Virginia City and other nearby towns that served the population influx. The population increase due to mining was so dramatic that while in 1850 there were less than a dozen non-native people in the State of Nevada, by 1860 there were 6,857, and by 1875 an estimated 75,000 people had settled in the state. The Comstock Lode strike is important to the history of Nevada not just because of the population growth and significant amount of money that was consequently brought to the area, but also because of several technological innovations that were created and employed in the mines, including the use of square-set timbering. This technique kept loose soil from collapsing on miners, a concept that was eventually employed around the world in other mines (Paher 1970).

Mining for valuable deposits occurred in all regions of the state of Nevada, including the vicinity of the proposed Amargosa Valley SEZ. Nye County was first settled by Euro-Americans in 1863, but due to inadequate water and timber for mining, mining ventures were short lived until the early 1900s when the Tonopah silver strike, about 100 mi (161 km) north of the proposed Amargosa Valley SEZ, revived mining interests in the area. The towns of Rhyolite, Bullfrog, Gold Center, and Carrara were established around the town of Beatty as part of the Bullfrog Mining District (approximately 10 mi [16 km] north of the SEZ). None of the mines associated with these towns produced any strikes of major note, but they are important to the history of the area because significant, albeit temporary, population growth occurred in the vicinity of the proposed Amargosa Valley SEZ as a result of these mines (Paher 1970). Keane Wonder Mine, one of the most successful gold mines in Death Valley, is also located nearby in California, approximately 8 mi (13 km) west of the proposed SEZ.

The construction of railroads in Nevada was often directly related to the mining activities that occurred in the state. In relation to the proposed Amargosa Valley SEZ, two railroads, the Tonopah and Tidewater Railroad and the Las Vegas and Tonopah Railroad, were constructed to connect the Bullfrog Mining District to Ludlow and Las Vegas, respectively. The Tonapah and Tidewater Railroad also connected to the Atchison, Topeka, and Santa Fe, and San Pedro, Los Angeles & Salt Lake Railroads. The San Pedro, Los Angeles & Salt Lake Railroad was one of the most significant factors in making Las Vegas the city it has become. At the turn of the nineteenth century, no railroad existed that connected two of the largest towns in the western

United States, Salt Lake City and Los Angeles. Fierce competition between U.S. Senator William Clark and Union Pacific owner Edward Harriman ensued, with Clark eventually ending up constructing the critical railroad in 1905, shortening the trip from Salt Lake City to Los Angeles to one day and making Las Vegas, Nevada, a critical railroad hub along the line (Fehner and Gosling 2000).

Nevada's desert-mountain landscape has made it a prime region for use by the U.S. military for several decades. Beginning in October of 1940, President Franklin D. Roosevelt established the Las Vegas Bombing and Gunnery Range, a 3.5-million-acre (14,000-km^2) parcel of land northwest of Las Vegas, near Indian Springs, Nevada. The main purpose of the range was to serve as air-to-air gunnery practice, but at the end of the Second World War the gunnery range was closed. It was reopened at the start of the Cold War in 1948 and was re-commissioned as the Las Vegas Air Force Base, later renamed Nellis Air Force Base in 1950 (Fehner and Gosling 2000).

Prior to dropping the atomic bomb on the Japanese cities of Nagasaki and Hiroshima, the only testing of nuclear weapons on U.S. soil was at the Trinity site, near Los Alamos Laboratory in Alamogordo, New Mexico. Tests of nuclear weapons had been conducted at the newly acquired Marshall Islands in the Pacific, but due to logistical constraints, financial expenditures, and security reasons, a test site for nuclear weapons was needed in a more convenient region. Project Nutmeg was commenced in 1948 as a study to determine the feasibility and necessity of a test site in the continental United States. It was determined that due to the public relations issues, radiological safety, and security issues, a continental test site should only be pursued in the event of a national emergency. In 1949 that emergency occurred when the Soviet Union conducted their first test of a nuclear weapon and the Korean War started in the summer of 1950. Five initial test sites were proposed: Alamogordo/White Sands Missile Range in New Mexico, Camp LeJeune in North Carolina, the Las Vegas-Tonopah Bombing and Gunnery Range in Nevada, a site in central Nevada near Eureka, and Utah's Dugway Proving Ground/Wendover Bombing Range. Several factors were taken into consideration when making the final decision, for example, fallout patterns, prevailing winds and predictability of weather, terrain, downwind populations, security, and public awareness and relations, with the Las Vegas-Tonopah Bombing and Gunnery Range being chosen as the Nevada Test Site by President Truman in December 1950.

Covering 1,375 mi^2 (3,561 km^2), the NTS was a part of the Las Vegas-Tonopah Bombing and Gunnery Range. It stretches from Mercury, Nevada, in the southeast to Pahute Mesa in the northwest. The first set of nuclear tests were conducted in January 1951; originally named FAUST (First American Drop United States Test) and later renamed Ranger, these bombs were detonated over Frenchman Flat, an area about 50 mi (80 km) east of the proposed Amargosa Valley SEZ. Tests were also later conducted at Yucca Flat, an area located northwest of Frenchman Flat, in an effort to minimize the effect of the blasts on the population in Las Vegas, which reported some disturbances (non-radiological in nature) from the series of tests conducted at Frenchman Flat. Tests were conducted at Jackass Flats, to the east of the proposed Amargosa Valley SEZ, and Pahute Mesa, located to the north of the proposed Amargosa Valley SEZ, as well. Nuclear tests were conducted in an effort to verify new weapons concepts, proof test existing weapons, test the impact of nuclear weapons on manmade structures and the physical environment, and conduct experimental testing in search of possible peaceful uses, namely the Pluto ramjet, Plowshare, and Rover rocket programs. The Pluto ramjet project was funded by the Air Force to design a system that could propel a vehicle at supersonic speeds and low altitudes, while the Rover rocket was a design for a nuclear-powered rocket for space travel. The Plowshare project was an attempt to show that nuclear weapons could be effective in moving large amounts of earth for canal and harbor construction. None of these three projects resulted in any sustained results in terms of the goals they were seeking, but they were important in their contribution to the overall work done at the NTS. In the fall of 1958, President Dwight Eisenhower declared a moratorium on nuclear testing, with the Soviet Union following suit, until 1961, when testing resumed. However, this testing was performed mostly underground at the NTS, with most atmospheric tests being conducted in the Pacific. The last atmospheric test at the NTS was on July 17, 1962, with the Limited Test Ban Treaty being signed by the United States and Soviet Union on August 5, 1963, ending nuclear testing in the atmosphere, ocean, and space. The last underground nuclear detonation at the NTS was on September 23, 1992, after which Congress declared a moratorium on nuclear testing. In 1996, a Comprehensive Test Ban Treaty was proposed by an international organization, but it has yet to be ratified by the U.S. Senate; nuclear tests have not been conducted since. In total, 1,021 of the 1,149 nuclear detonations that were detonated by the United States during the Cold War were conducted at the NTS (Fehner and Gosling 2000).

11.1.17.1.4 Traditional Cultural Properties—Landscape

The Native Americans whose historical homelands lie within the Great Basin have traditionally taken a holistic view of the world. In this view, the sacred and profane are inextricably intertwined. Most of the groups who have traditionally lived in the Mojave Desert believe they were created there and have a divine right to the land, along with a responsibility to manage and protect it. Landscapes as a whole are often culturally important. Adverse effects on one part damage the whole (Stoffle 2001). From their perspective, landscapes include places of power. Among the most important such places are sources of water; peaks, mountains, and elevated features; caves; distinctive rock formations; and panels of rock art. Places of power are important to the religious beliefs of the Western Shoshone and Southern Paiute. They may be sought out for individual vision quests or healing and may likewise be associated with culturally important plant and animal species. The view from such a point of power or the ability to see from one important place to another can be an important element of its integrity (Stoffle and Zedeño 2001b). Landscapes as a whole are tied together by a network of culturally important trails (Stoffle and Zedeño 2001a).

For the most part, the proposed Amargosa Valley SEZ lies between culturally important landscape features (Stoffle and Zedeño 2001b). It is situated between the water sources and associated Western Shoshone camps at Oasis Valley and the shared camps at Ash Meadows mentioned in Section 11.1.17.1.2. The SEZ also lies between culturally important mountains. For Native Americans, mountain peaks are important both as water sources and as places of power. The SEZ lies directly between the Funeral Mountains in California and Bare Mountain to the northeast, both of which are culturally important. Bare Mountain plays an important role in Native American folklore associated with the formation of Forty Mile Canyon, 15 mi (24 km) to the northeast. Yucca Mountain, between Bare Mountain and Forty Mile Canyon, Shoshone Mountain, east of the canyon, and the Timber Mountains, near Beatty, are also considered sacred. From these peaks, the view south to Charleston Peak (*Nuvagantu*) in the Spring Mountains, the site of Southern Paiute creation accounts, is important (Stoffle 2001; Stoffle and Zedeño 2001b; Fowler 1991). Charleston Peak is 58 mi (94 km) to the southeast and may be visible on the horizon from the SEZ. In the past, development in Pahrump Valley at the foot of the Spring Mountains has been a concern to Native Americans because of its proximity to Charleston Peak.

Forty Mile Canyon is an important location associated with rock art panels and a pathway providing access to upland resources, such as pine nuts and mountain sheep. Peoples in the Ash Meadows and Pahrump Valley traveled through Crater Flat to reach the canyon. Crater Flat opens onto Amargosa Valley, tying into trails coming through the Funeral Mountains to the west (Fowler 1991). The trails link the area into a network stretching from California to Arizona. It is possible that these trails approached or crossed the SEZ. Trails are also important when they lead to places of power or spiritual importance. Such trails may be traveled either physically or through song, prayer, or dream (Stoffle and Zadeño 2001a). The Southern Fox Trail, the route followed by Southern Fox, a Chemehuevi Southern Paiute culture hero, passes from Pahrump to Death Valley and may pass through or close to the SEZ (Laird 1976). The Salt Song Trail, the Paiute trail to the afterlife, extends as far north as Ash Meadows well south of the SEZ (Stoffle and Zadeño 2001b).

11.1.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources

At least 17 cultural resource surveys have been conducted in the proposed Amargosa Valley SEZ covering approximately 3% of the SEZ; most of these have been linear surveys along with some small block surveys, and another 53 surveys have been conducted within 5 mi (8 km) of the proposed SEZ. These surveys have resulted in the recording of four sites in the proposed Amargosa Valley SEZ, and at least 60 sites located within 5 mi (8 km) of the SEZ. Of the four sites located within the SEZ, two are prehistoric, one is historic, and one is a multi-component site consisting of both prehistoric and historic features. One of the prehistoric sites is located on a stabilized dune in the northern portion of the SEZ. The site consists of crypto-crystalline flakes incorporated into the desert pavement and several fire-cracked rock concentrations; it is a potentially eligible site with possible time depth (Hattori and McLane 1982). The historic site located in the SEZ is an historic tent camp site with associated trash scatters, likely related to the railroad construction that occurred in the area (Hattori and McLane 1982). However, the site has not been evaluated in terms of its possible NRHP designation, as more contextual information is needed. The Ashton site is a historic railroad siding associated with the Tonopah and Tidewater Railroad; however, due to a lack of integrity, the site is not eligible for listing in the NRHP. The fourth site in the SEZ is a lithic scatter consisting of debitage and biface fragments, but due to significant disturbance to the site it is not eligible for inclusion in the NRHP. Only 5 of the 60 sites within the 5-mi (8-km) radius of the SEZ are within 1 mi (1.6 km) of the SEZ; most of these are not considered eligible for listing in the NRHP. One site adjacent to the SEZ is potentially eligible for listing in the NRHP. A site located just to the southeast of the SEZ is a possible temporary prehistoric camp, rock formation, and lithic scatter consisting of 100 to 300 cryptocrystalline flakes (NVCRIS 1991). A possible gravesite is located within 1 mi (1.6 km) north of the SEZ along State Route 95, but it is unclear at the present time whether this site was mitigated prior to powerline construction.

Located about 1 mi (1.6 km) to the southwest of the proposed Amargosa Valley SEZ is Death Valley National Park, an expansive area managed by the NPS, home to several ethnohistoric groups and archaeological resources. Also located in the vicinity of the proposed SEZ are the NTS and Nellis Air Force Base, two military installations that have contributed to the overall historical context of the region.

National Register of Historic Places

There are no historic properties listed in the NRHP within the SEZ or within 5 mi (8 km) of the SEZ. However, as stated above, at least one site in the SEZ, as well as another, may potentially be eligible for NRHP listing. There are 53 NRHP-listed properties in Nye County, Nevada; all but 6 of them are located in or near Tonopah to the north. Sedan Crater is the closest listed property within the county at over 40 mi (64 km) northeast of the SEZ. Harmony Borax Works and Leadfield, in Inyo County, California, are the nearest listed properties, located approximately 15 mi (24 km) southwest of the SEZ and 18 mi (29 km) northwest of the SEZ in the Grapevine Mountains of the Amargosa Range within Death Valley National Park, respectively. Also located in Inyo County are the Death Valley Junction Historic District, 26 mi (42 km) to the south of the SEZ, and Skidoo, 27 mi (43 km) southwest of the SEZ. Although not currently listed, several of the mining districts (see Section 11.1.17.1.3) are also eligible properties, such as Keane Wonder Mine, Bullfrog, Rhyolite, Carrara, and Gold Center.

11.1.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Amargosa Valley SEZ; however, further investigation is needed. At least four sites have been recorded within the SEZ, and at least one of them is considered potentially eligible for listing on the NRHP; one is unevaluated and two were determined not eligible. Consistent with findings at other SEZs, dune areas continue to be an area with potential for significant sites within valley floors that are suitable for solar development. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. Section 5.15 discusses the types of effects that could occur on any significant cultural resources found to be present within the proposed Amargosa Valley SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur. No traditional cultural properties have been identified to date within the vicinity of the SEZ.

Indirect impacts on cultural resources that result from erosion outside of the SEZ boundary (including along ROWs) are unlikely, assuming programmatic design features to reduce water runoff and sedimentation are implemented (as described in Appendix A, Section A.2.2).

No needs for new transmission or access corridors have currently been identified, assuming existing corridors would be used; therefore, no new areas of cultural concern would be made accessible as a result of development within the proposed Amargosa Valley SEZ, so indirect effects resulting from vandalism or theft of cultural resources are not anticipated. However, impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

11.1.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features and cultural awareness training for the workforce, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

11.1.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns specific to Native Americans and to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Amargosa Valley SEZ, Section 11.1.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 11.1.8 discusses mineral resources; Section 11.1.9.1.3 discusses water rights and water use; Section 11.1.10 discusses plant species; Section 11.1.11 discusses wildlife species, including wildlife migration patterns; Section 11.1.13 discusses air quality; Section 11.1.14 discusses visual resources; Sections 11.1.19 and 11.1.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21.

11.1.18.1 Affected Environment

The Amargosa SEZ falls within the Tribal traditional use area generally attributed to the Western Shoshone (Liljeblad and Fowler 1986). It lies between the traditional territories recognized by the Indian Claims Commission for the Western Shoshone and Southern Paiute (Royster 2008). The Northern Amargosa Valley lies in an area of joint use shared by the Western Shoshone, Southern Paiute, and Owens Valley Paiute (Stoffle 2001). All federally recognized Tribes with Western Shoshone, Southern Paiute, or Owens Valley Paiute roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 11.1.18.1-1. Details of government-to-government consultation efforts are presented in Chapter 14; a listing of all federally recognized tribes contacted for this PEIS is given in Appendix K.

11.1.18.1.1 Territorial Boundaries

Western Shoshone

The Western Shoshone traditionally occupied a swath of the central Great Basin stretching from Death Valley in California through central Nevada and northwestern Utah to southeastern Idaho (Thomas et al. 1986). The Amargosa Valley SEZ lies at the southern edge of their traditional range where Shoshone territory blends into Southern Paiute territory.

Southern Paiutes

The traditional territory of the Southern Paiute lies mainly in the Mojave Desert, stretching from California to the Colorado Plateau. It generally follows the right bank of the Colorado River, including its tributary streams and canyons in southern Nevada and Utah. Near

TABLE 11.1.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed Amargosa Valley SEZ

Tribe	Location	State
Benton Paiute-Shoshone Tribe	Benton	California
Big Pine Paiute Tribe	Big Pine	California
Bishop Paiute Tribe	Bishop	California
Chemehuevi Indian Tribe	Lake Havasu	California
Colorado River Indian Tribes	Parker	Arizona
Duckwater Shoshone Tribe	Duckwater	Nevada
Ely Shoshone Tribe	Ely	Nevada
Fort Independence Indian Tribe	Fort Independence	California
Kaibab Paiute Tribe	Fredonia	Arizona
Las Vegas Paiute Tribe	Las Vegas	Nevada
Lone Pine Paiute-Shoshone Tribe	Lone Pine	California
Moapa Band of Paiutes	Moapa	Nevada
Pahrump Paiute Tribe	Pahrump	Nevada
Paiute Indian Tribe of Utah	Cedar City	Utah
Cedar Band	Cedar City	Utah
Indian Peak Band	Cedar City	Utah
Kanosh Band	Kanosh	Utah
Koosharem Band	Cedar City	Utah
Shivwits Band	Ivins	Utah
Timbisha Shoshone Tribe	Death Valley	California
Yomba Shoshone Tribe	Austin	Nevada

the SEZ, it extends as far north as Ash Meadows, where the Southern Paiutes shared traditional camp areas and hunting ground with the Western Shoshone (Fowler 1991).

Owens Valley Paiutes

The Owens Valley Paiutes occupy five relatively small reservations within Owens Valley in Inyo and Mono Counties, California, west of the SEZ. Their traditional use area ranged from the headwaters of the Owens River near Benton, California, southward to Owens Lake. They shared the shores of Owens Lake with Western Shoshone groups. The Indian Claims Commission placed Owens Valley within the traditional territory of the Northern Paiutes with whom the Owens Valley Tribes are linked linguistically (Liljeblad and Fowler 1986; Royster 2008).

11.1.18.1.2 Plant Resources

Native Americans continue to make use of a wide range of indigenous plants for food, medicine, construction materials, and other uses. The vegetation present at the Amargosa Valley SEZ is described in Section 11.1.10. The cover type present at the SEZ is almost entirely Sonora-

Mojave Creosotebush-White Bursage Desert Shrub, with small patches of Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Wash, and North American Warm desert Playa (USGS 2005a). The SEZ is sparsely vegetated. Creosotebush and white bursage are the dominant species. Of these, creosotebush has Native American medicinal uses. As shown in Table 11.1.18.1-2, there are likely to be some plants used by Native Americans for food in the SEZ (Stoffle and Dobyns 1983; Stoffle et al. 1999). Project-specific analyses will be needed to determine their presence at any proposed development site.

11.1.18.1.3 Other Resources

Water is an essential prerequisite for life in the arid areas of the Great Basin; as a result, it is a keystone of desert cultures' religion. Desert cultures consider all water sacred and a purifying agent. Water sources are often associated with rock art. Springs are often associated with powerful beings, and hot springs in particular figure prominently in Owens Valley Paiute and Southern Paiute creation stories. Water sources are seen as connected, so damage to one source damages all (Fowler 1991; Stoffle and Zedeño 2001a). Tribes are also sensitive about the

TABLE 11.1.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Amargosa Valley SEZ

Common Name	Scientific Name	Status
Food		
Beavertail Prickly Pear[a]	*Opuntia basilaris*	Possible
Desert Trumpet[a]	*Eriogonum inflatum*	Possible
Cat Claw	*Acacia greggii*	Possible
Dropseed	*Sporobolus* spp.	Possible
Greasewood	*Sarcobatus vermiculatus*	Observed
Indian Rice Grass	*Oryzopsis hymenoides*	Possible
Iodine Bush	*Allenrolfea occidentalis*	Possible
Honey Mesquite	*Prosopis Glandolosa*	Observed
Wolfberry[a]	*Lycium andersonii*	Possible
Medicine		
Burro Bush	*Hymenoclea salsola*	Possible
Creosotebush[a]	*Larrea tridentata*	Observed
Greasewood	*Sacarbatus vermiculatus*	Possible
Mormon Tea[a]	*Ephedra nevadensis*	Possible
Palmer's Phacelia[a]	*Phacelia palermi*	Possible
Saltbush[a]	*Atriplex canescens*	Possible

[a] Possible in dominant land cover class.

Sources: Field visit; USGS (2005a); Stoffle and Dobyns (1983); Stoffle et al. (1999).

use of scarce local water supplies for the benefit of far distant communities and recommend that determination of adequate water supplies be a primary consideration for whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

Wildlife likely to be found in the proposed Amargosa Valley SEZ is described in Section 11.1.11. Few game species traditionally important to Native Americans are found within the SEZ. The most important are the black-tailed jackrabbit (*Lepus californicus*) and the mule deer (*Odocoileus hemionus*) (Kelly and Fowler 1986; Stoffle and Dobyns 1983). Big horn sheep (*Ovis Canadensis*) occur in the Funeral Mountains but are less common on the desert floor. Smaller game important to Native Americans found in the SEZ include cottontails (*Sylvilagus audubonii*) and wood rats (*Neotoma lepida*).

Other animals traditionally important to the Southern Paiute include lizards, at least six species of which are likely to occur in the SEZ, and the golden eagle (*Aquila chrysaetosi*). The SEZ falls within the extent of the wide-ranging eagle. Animals important to Native Americans that are likely to be present in the proposed SEZ are listed in Table 11.1.18.1-3.

Other natural resources traditionally important to Native Americans include clay for pottery, salt, and naturally occurring mineral pigments for the decoration and protection of the skin (Stoffle and Dobyns 1983). None of these have been reported from the SEZ (see Section 11.1.7).

11.1.18.2 Impacts

In the past, the Western Shoshone, Southern Paiutes, and Owens Valley Paiutes have expressed concern over project impacts on a variety of resources. They tend to take a holistic view of their traditional homeland. For them, cultural and natural features are inextricably bound together. Effects on one part have ripple effects on the whole. Western distinctions between the sacred and the secular have no meaning in their traditional world view (Stoffle and Dobyns 1983). While no comments specific to the Amargosa Valley SEZ have been received from Native American Tribes to date, the Big Pine Paiute Tribe of the Owens Valley has commented on the scope of this PEIS. The Tribe recommends that the BLM preserve undisturbed lands intact and that recently disturbed lands, such as abandoned farm fields, rail yards, mines, and air fields, be given primary consideration for solar energy development. Potential impacts on existing water supplies were also a primary concern (Moose 2009). During energy development projects in adjacent areas, the Southern Paiute have expressed concern over adverse effects on a wide range of resources. Geophysical features and physical cultural remains are listed in Section 11.1.17.1.4. However, these places are often seen as important because they are the location of or have ready access to a variety of plant, animal, and mineral resources (Stoffle et al. 1997). Resources mentioned as important include food plants, medicinal plants, plants used in basketry, and plants used in construction; large game animals, small game animals, and birds; and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those likely to be found within the Amargosa Valley SEZ are discussed in Section 11.1.18.1.2. Traditional plant knowledge is found most abundantly among Tribal elders, especially female elders (Stoffle et al. 1999).

TABLE 11.1.18.1-3 Animal Species Used by Native Americans as Food Whose Range Includes the Proposed Amargosa Valley SEZ

Common Name	Scientific Name	Status
Mammals		
Badger	*Taxidea taxus*	All year
Black-tailed jack rabbit	*Lepus californicus*	All year
Bobcat	*Lynx rufus*	All year
Coyote	*Canis latrans*	All year
Desert cottontail	*Silvilagus audubonii*	All year
Desert woodrat	*Neotoma lepida*	All year
Gray fox	*Urocyon cinereoargenteus*	All year
Kangaroo rats	*Dipodomys* spp.	All year
Kit fox	*Vulpes macotis*	All year
Mule deer	*Odocoileus hemionus*	All year
Pocket gopher	*Thomomys bottae*	All year
Pocket mice	*Perognathus* spp.	All year
Porcupine	*Erethizon dorsatum*	All year
Red fox	*Vulpes vulpes*	All year
White-tailed antelope squirrel	*Ammospermophilus leucurus*	All year
Birds		
Burrowing owl	*Athene cunicular*	Summer
Common raven	*Corvus corax*	All year
Gambel's quail	*Callipipla gambelii*	All year
Golden eagle	*Aquila chrysaetos*	All year
Great blue heron	*Ardea herodias*	Spring/fall
Great horned owl	*Bubo virginianus*	All year
Greater road runner	*Geococcyx californianus*	All year
Mourning dove	*Zenaida macroura*	All year
Northern mockingbird	*Mimus polyglottos*	All year
Sandhill crane	*Grus canadensis*	Spring/fall
Reptiles		
Desert horned-lizard	*Phrynosoma platyrhinos*	All year
Desert tortoise	*Gopherus agassizii*	All year
Large lizards	Various species	All year

Sources: Field visit; USGS (2005b); Fowler (1986).

The Amargosa Desert appears to have been a joint use area shared by the surrounding Native American groups. Although it includes some plant species traditionally important to Native Americans, they appear to be relatively scant. Surrounding mountains and better watered valleys to the north and south of the SEZ are likely to be more abundant sources of resources important to Native Americans. The most important traditionally collected resource likely to be present in the valley is the black-tailed jackrabbit.

As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that there will be Native American concerns expressed over potential visual and other effects of solar energy development within the SEZ on specific resources and any culturally important landscape, such as features associated with the journeys of the culture hero Southern Fox (Laird 1976). Since solar energy facilities cover large tracts of land, even taking into account the implementation of programmatic design features, it is unlikely that avoidance of all resources important to Native Americans would be possible.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

11.1.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to address impacts of potential concern to Native Americans, such as avoidance of sacred sites, water resources, and Tribally important plant and animal species are provided in Appendix A, Section A.2.2. Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 11.1.17.3, in addition to mitigation strategies for historic properties discussed in Section 5.15.

The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with the affected Tribes listed in Table 11.1.18.1-1.

11.1.19 Socioeconomics

11.1.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the region of influence (ROI) surrounding the proposed Amargosa Valley SEZ. The ROI is a two-county area composed of Clark and Nye Counties in Nevada. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and non-payroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

11.1.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 938,914 (Table 11.1.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was higher in Clark County (3.2%) than in Nye County (0.5%). At 3.1%, growth rates in the ROI as a whole were higher than the average rate for Nevada (2.7%).

In the ROI in 2006, the services sector provided the highest percentage of employment at 59.5%, followed by the wholesale and retail trade at 14.9%, with a smaller employment share held by construction (11.6%) (Table 11.1.19.1-2). Within the two counties in the ROI, the distribution of employment across sectors is different from that of the ROI as a whole, with employment in wholesale and retail trade (48.1%), mining (8.3%), agriculture (3.6%), and manufacturing (3.6%) higher in Nye County than in the ROI as a whole, while employment in construction (10.2%), and services (48.1%) were lower than the ROI average.

TABLE 11.1.19.1-1 ROI Employment in the Proposed Amargosa Valley SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Clark County	675,693	922,878	3.2
Nye County	15,325	16,036	0.5
ROI	691,288	938,914	3.1
Nevada	978,969	1,282,012	2.7

Sources: U.S. Department of Labor (2009a,b).

TABLE 11.1.19.1-2 ROI Employment in the Proposed Amargosa Valley SEZ by Sector, 2006

	Clark County		Nye County		ROI	
Industry	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	213	0.0	325	3.6	538	0.1
Mining	522	0.1	750	8.3	1,272	0.1
Construction	100,817	11.6	925	10.2	101,742	11.6
Manufacturing	25,268	2.9	329	3.6	25,597	2.9
Transportation and public utilities	38,529	4.4	292	3.2	38,821	4.4
Wholesale and retail trade	128,498	14.8	1,714	19.0	130,212	14.9
Finance, insurance, and real estate	56,347	6.5	328	3.6	56,675	6.5
Services	516,056	59.6	4,340	48.1	520,396	59.5
Other	105	0.0	–	0.0	105	0.0
Total	866,093		9,029		875,122	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009).

11.1.19.1.2 ROI Unemployment

The average unemployment rate in Nye County over the period over the period 1999 to 2008 was 6.9%, higher than the rate in Clark County (5.6%) (Table 11.1.19.1-3). The average rate in the ROI over this period was 5.0%, the same as the average rate for Nevada. Unemployment rates for the first 11 months of 2009 contrast with rates for 2008 as a whole; in

TABLE 11.1.19.1-3 ROI Unemployment Rates for the Proposed Amargosa Valley SEZ (%)

Location	1999–2008	2008	2009[a]
Clark County	5.0	6.6	11.8
Nye County	6.9	9.7	14.3
ROI	5.0	6.6	11.8
Nevada	5.0	6.7	11.7

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

Nye County, the unemployment rate increased to 14.3%, while in Clark County the rate reached 11.8%. The average rates for the ROI (11.8%) and for Nevada as a whole (11.7%) were also higher during this period than the corresponding average rates for 2008.

11.1.19.1.3 ROI Urban Population

The population of the ROI in 2008 was 55% urban, with all urban areas in the ROI located in Clark County, and none in Nye County. The largest city, Las Vegas, had an estimated 2008 population of 562,849; other large cities in Clark County include Henderson (253,693) and North Las Vegas (217,975) (Table 11.1.19.1-4). In addition, there are two cities in the county, Mesquite (16,528) and Boulder City (14,954). There are a number of unincorporated urban areas in Clark County that are not included in the urban population, meaning that the percentage of the county population not living in urban areas is overstated.

Population growth rates in the ROI have varied over the period 2000 to 2008 (Table 11.1.19.1-4). North Las Vegas grew at an annual rate of 8.3% during this period, with higher than average growth also experienced in Mesquite (7.3%) and Henderson (4.7%). The city of Las Vegas (2.1%) experienced a lower growth rate between 2000 and 2008, while Boulder City (0.0%) experienced static population growth during this period.

11.1.19.1.4 ROI Urban Income

Median household incomes vary across cities in the ROI. Two cities for which data are available for 2006 to 2008—Henderson ($67,886) and North Las Vegas ($60,506)—had median

TABLE 11.1.19.1-4 ROI Urban Population and Income for the Proposed Amargosa Valley SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Boulder City	14,966	14,954	0.0	65,049	NA[b]	NA
Henderson	175,381	253,693	4.7	72,035	67,886	–0.7
Las Vegas	478,434	562,849	2.1	56,739	55,113	–0.3
Mesquite	9,389	16,528	7.3	52,005	NA	NA
North Las Vegas	115,488	217,975	8.3	56,299	60,506	0.2

[a] Data are averages for the period 2006 to 2008.

[b] NA = data not available.

Source: U.S. Bureau of the Census (2009b-d).

incomes in 2006 to 2008 that were higher than the average for the state ($56,348), while median incomes in Las Vegas ($55,113) were slightly lower than the state average (Table 11.1.19.1-4).

Growth rates between 1999 and 2006 to 2008 were small in North Las Vegas (0.2%), and negative in Henderson (–0.7%) and Las Vegas (–0.3%). The average median household income growth rate for the state as a whole over this period was 0.2%.

11.1.19.1.5 ROI Population

Table 11.1.19.1-5 presents recent and projected populations in the ROI and state as a whole. Population in the ROI stood at 1,923,268 in 2008, having grown at an average annual rate of 4.0% since 2000. Growth rates for ROI were higher than those in Nevada (3.4%) over the same period.

Both counties in the ROI experienced growth in population from 2000 to 2008; population in Clark County grew at an annual rate of 4.0%, while in Nye County population grew by 3.9%. The ROI population is expected to increase to 2,787,038 by 2021 and to 2,870,613 by 2023.

11.1.19.1.6 ROI Income

Total personal income in the ROI stood at $75.5 billion in 2007 and has grown at an annual average rate of 5.0% over the period 1998 to 2007 (Table 11.1.19.1-6). Per-capita income also rose over the same period at a rate of 1.0%, increasing from $36,327 to $40,109. Per-capita incomes were higher in Clark County ($40,307) than in Nye County ($31,836) in 2007. Growth

TABLE 11.1.19.1-5 ROI Population for the Proposed Amargosa Valley SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Clark County	1,375,765	1,879,093	4.0	2,710,303	2,791,161
Nye County	32,485	44,175	3.9	76,735	79,452
ROI	1,408,250	1,923,268	4.0	2,787,038	2,870,613
Nevada	1,998,257	2,615,772	3.4	3,675,890	3,779,745

Sources: U.S. Bureau of the Census (2009e,f); Nevada State Demographers Office (2008).

TABLE 11.1.19.1-6 ROI Personal Income for the Proposed Amargosa Valley SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Clark County			
Total income[a]	45.7	74.1	5.0
Per-capita income	36,509	40,307	1.0
Nye County			
Total income[a]	0.9	1.4	4.8
Per-capita income	28,857	31,836	1.0
ROI			
Total income[a]	46.6	75.5	5.0
Per-capita income	36,327	40,109	1.0
Nevada			
Total income[a]	68.9	105.3	4.3
Per-capita income	37,188	41,022	1.0

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of Census (2009e,f).

rates in total personal income have been slightly higher in Clark County than in Nye County. Personal income growth rates in the ROI were higher than the state rate (4.3%), but per-capita income growth rates in both counties were the same as in Nevada as a whole (1.0%).

Median household income during the period 2006 to 2008 varied from $42,275 in Nye County to $56,954 in Clark County (U.S. Bureau of the Census 2009d).

11.1.19.1.7 ROI Housing

In 2007, more than 770,750 housing units were located in the two ROI counties, with about 97% of these located in Clark County (Table 11.1.19.1-7). Owner-occupied units compose approximately 60% of the occupied units in the two counties, with rental housing making up 40% of the total. Vacancy rates in 2007 were 19.3% in Nye County and 12.2% in Clark County; with an overall vacancy rate of 12.4% in the ROI, there were 95,346 vacant housing units in the ROI in 2007, of which 56,902 are estimated to be rental units that would be available to construction workers. There were 8,977 units in seasonal, recreational, or occasional use in the

TABLE 11.1.19.1-7 ROI Housing Characteristics for the Proposed Amargosa Valley SEZ

Parameter	2000	2007
Clark County		
Owner-occupied	302,834	393,453
Rental	209,419	268,572
Vacant units	47,546	92,144
Seasonal and recreational use	8,416	NA[a]
Total units	559,799	754,169
Nye County		
Owner-occupied	10,167	9,630
Rental	3,142	3,760
Vacant units	2,625	3,202
Seasonal and recreational use	562	NA
Total units	15,934	16,592
ROI		
Owner-occupied	313,001	403,083
Rental	212,561	272,332
Vacant units	50,171	95,346
Seasonal and recreational use	8,977	NA
Total units	575,733	770,761

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h-j).

ROI at the time of the 2000 Census, with 1.5% of housing units in Clark County and 3.5% in Nye County used for seasonal or recreational purposes.

Housing stock in the ROI as a whole grew at an annual rate of 4.3% over the period 2000 to 2007, with 195,028 new units added to the existing housing stock (Table 11.1.19.1-7).

The median value of owner-occupied housing in 2006 to 2008 varied between $187,100 in Nye County and $299,200 in Clark County (U.S. Bureau of the Census 2009g).

11.1.19.1.8 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 11.1.19.1-8. In addition, two Tribal governments are located in the ROI, with members of other Tribal groups located in the state whose Tribal governments are located in adjacent states.

TABLE 11.1.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed Amargosa Valley SEZ

Governments	
City	
Boulder City	Mesquite
Henderson	North Las Vegas
Las Vegas	
County	
Clark County	Nye County
Tribal	
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada	
Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

11.1.19.1.9 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

Schools

In 2007, the two-county ROI had a total of 344 public and private elementary, middle, and high schools (NCES 2009). Table 11.1.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Clark County schools (19.0) is higher than that in Nye County schools (16.2), while the level of service is slightly higher in Nye County (9.0) than in Clark County, where there are fewer teachers per 1,000 population (8.7).

Health Care

The total number of physicians (4,220) and the number of physicians per population of 1,000 (2.3) is higher in Clark County than in Nye County (41; 0.9) (Table 11.1.19.1-10).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 11.1.19.1-11). Nye County has 104 officers and would provide law enforcement

TABLE 11.1.19.1-9 ROI School District Data for the Proposed Amargosa Valley SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Clark County	303,448	15,930	19.0	8.7
Nye County	6,427	396	16.2	9.0
ROI	309,875	16,326	19.0	8.7

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

TABLE 11.1.19.1-10 Physicians in the Proposed Amargosa Valley SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Clark County	4,220	2.3
Nye County	41	0.9
ROI	4,261	2.3

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

TABLE 11.1.19.1-11 Public Safety Employment in the Proposed Amargosa Valley SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Clark County	3,214	1.7	991	0.5
Nye County	104	2.4	82	1.9
ROI	3,318	1.8	1,073	0.6

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

services to the SEZ; there are 3,214 officers in Clark County. Levels of service of police protection are 1.7 per 1,000 population in Clark County and 2.4 in Nye County. Currently, there are 1,073 professional firefighters in the ROI (Table 11.1.19.1-11).

11.1.19.1.10 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism and illicit drug use, metal health, and divorce, which might be used as indicators of social change, are presented in Tables 11.1.19.1-12 and 11.1.19.1-13, respectively.

There is some variation in the level of crime across the ROI, with higher rates of violent crime in Clark County (8.0 per 1,000 population) than in Nye County (2.9) (Table 11.1.19.1-12). Property-related crime rates are also higher in Clark County (34.5) than in Nye County (20.8); overall crime rates in Clark County (42.5) were higher than in Nye County (23.7).

TABLE 11.1.19.1-12 County and ROI Crime Rates for the Proposed Amargosa Valley SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
Location	Offenses	Rate	Offenses	Rate	Offenses	Rate
Clark County	15,505	8.0	66,905	34.5	82,410	42.5
Nye County	124	2.9	892	20.8	1,016	23.7
ROI	15,629	7.9	67,797	34.2	83,426	42.1

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 11.1.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Amargosa Valley SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Nevada Clark	8.2	2.7	10.5	–[d]
Nevada Rural (includes Nye County)	8.0	2.7	9.5	–
Nevada				6.5

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] A dash indicates data not available.

Sources: SAMHSA (2009); CDC (2009).

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAHMSA region in which the ROI is located. There is slight variation across the two regions in which the two counties are located; rates for alcoholism and mental health are slightly higher in the region in which Clark County is located (Table 11.1.19.1-13).

11.1.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 11.1.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 245,549 people were employed in the ROI in the various sectors identified as recreation, constituting 26.8% of total ROI employment (Table 11.1.19.1-14). Recreation spending also produced almost $9,273 million in income in the ROI in 2007. The primary sources of recreation-related employment were hotels and lodging places and eating and drinking places.

11.1.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of projects employing various solar energy technologies are analyzed in detail in subsequent sections.

11.1.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and

TABLE 11.1.19.1-14 Recreation Sector Activity in the Proposed Amargosa Valley SEZ ROI, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	4,720	129.6
Automotive rental	2,914	88.4
Eating and drinking places	107,823	3,129.0
Hotels and lodging places	117,074	5,557.6
Museums and historic sites	2,779	64.2
Recreational vehicle parks and campsites	386	11.3
Scenic tours	5,459	215.5
Sporting goods retailers	4,394	76.9
Total ROI	245,549	9,273

Source: MIG, Inc. (2009).

their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy facilities are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar development in the ROI would be visible from popular recreation locations and that construction workers residing temporarily in the ROI would occupy accommodations otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy projects in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 0.1% in county population during construction of the trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families and the insufficient range of housing choices to suit all solar occupations make it likely that many workers will commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar development are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

11.1.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are presented in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) would be required for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of three projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 9,000 acres (36 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower, 2022 for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 8,765 jobs (Table 11.1.19.2-1). Construction activities would constitute 0.6% of total ROI employment. A solar facility would also produce $541.7 million in income. Direct sales taxes would be $3.5 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some

TABLE 11.1.19.2-1 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Amargosa Valley SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	5,232	1,103
Total	8,765	1,655
Income[b]		
Total	541.7	62.7
Direct state taxes[b]		
Sales	3.5	0.5
BLM payments		
Acreage-related fee	NA	2.0
Capacity fee[d]	NA	33.3
In-migrants (no.)	2,229	141
Vacant housing[c] (no.)	1,114	127
Local community service employment		
Teachers (no.)	19	1
Physicians (no.)	5	0
Public safety (no.)	5	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,800 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 5,060 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

in-migration of workers and their families from outside the ROI would be required, with 2,229 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 1,114 rental units expected to be occupied in the ROI. This occupancy rate would represent 2.0% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 19 new teachers, 5 physicians, and 5 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 1,655 jobs (Table 11.1.19.2-1). Such a solar facility would also produce $62.7 million in income. Direct sales taxes would be $0.5 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), acreage–related fees would be $2.0 million, and solar generating capacity fees, at least $33.3 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 141 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 127 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 3,491 jobs (Table 11.1.19.2-2). Construction activities would constitute 0.3 % of total ROI employment. Such a solar facility would also produce $215.8 million in income. Direct sales taxes would be less than $1.4 million.

TABLE 11.1.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Amargosa Valley SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	2,084	570
Total	3,491	754
Income[b]		
Total	215.8	26.2
Direct state taxes[b]		
Sales	1.4	0.1
BLM payments[c]		
Acreage-related fee	NA	2.0
Capacity fee[d]	NA	18.5
In-migrants (no.)	888	73
Vacant housing[c] (no.)	444	65
Local community service employment		
Teachers (no.)	8	1
Physicians (no.)	2	0
Public safety (no.)	2	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,811 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 888 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 444 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.8% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, eight new teachers, two physicians, and two public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 754 jobs (Table 11.1.19.2-2). Such a solar facility would also produce $26.2 million in income. Direct sales taxes would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), acreage–related fees would be $2.0 million, and solar generating capacity fees, at least $18.5 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 73 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 65 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 1,419 jobs (Table 11.1.19.2-3). Construction activities would constitute 0.1% of total ROI employment.

TABLE 11.1.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Amargosa Valley SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	847	554
Total	1,419	733
Income[b]		
Total	87.7	25.5
Direct state taxes[b]		
Sales	0.6	0.1
BLM payments[c]		
Acreage-related fee	NA	2.0
Capacity fee[d]	NA	18.5
In-migrants (no.)	361	71
Vacant housing[c] (no.)	180	63
Local community service employment		
Teachers (no.)	3	1
Physicians (no.)	1	0
Public safety (no.)	1	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,811 MW.

b Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Such a solar facility would also produce $87.7 million in income. Direct sales taxes would be $0.6 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 361 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 180 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, three new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 733 jobs (Table 11.1.19.2-4). Such a solar facility would also produce $25.5 million in income. Direct sales taxes would be $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), acreage–related fees would be $2.0 million, and solar generating capacity fees, at least $18.5 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 71 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 63 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 662 jobs (Table 11.1.19.2-4). Construction activities would constitute less than 0.1 % of total ROI employment. Such a solar development would also produce $40.9 million in income. Direct sales taxes would be $0.3 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 168 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 84 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 73 jobs (Table 11.1.19.2-4). Such a solar facility would also produce $2.5 million in income. Direct sales taxes would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), acreage–related fees would be $2.0 million, and solar generating capacity fees, at least $14.8 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with seven persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with six owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

TABLE 11.1.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Amargosa Valley SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	395	55
Total	662	73
Income[b]		
Total	40.9	2.5
Direct state taxes[b]		
Sales	0.3	<0.1
BLM payments[c]		
Acreage-related fee	NA	2.0
Capacity fee[d]	NA	14.8
In-migrants (no.)	168	7
Vacant housing[c] (no.)	84	6
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,811 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d) , assuming full build-out of the site.

11.1.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Amargosa Valley SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

11.1.20 Environmental Justice

11.1.20.1 Affected Environment

On February 11, 1994, the President signed Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register*, Volume 59, page 7629, Feb. 11. 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the Council on Environmental Quality's (CEQ's) *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons who identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origins may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income.** Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 11.1.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in California, 22.8% of the population is classified as minority, while 10.4% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

In the Nevada portion of the 50-mi (80-km) radius, 34.8% of the population is classified as minority, while 10.3% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or

TABLE 11.1.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Amargosa Valley SEZ

Parameter	California	Nevada
Total population	2,034	32,758
White, non-Hispanic	1,570	27,236
Hispanic or Latino	245	2,816
Non-Hispanic or Latino minorities	219	2,706
One race	162	1,920
Black or African American	2	1,029
American Indian or Alaskan Native	132	420
Asian	17	290
Native Hawaiian or Other Pacific Islander	9	105
Some other race	2	76
Two or more races	57	786
Total minority	464	5,522
Low-income	212	3,377
Percentage minority	22.8	16.9
State percentage minority	53.3	34.8
Percentage low-income	10.4	10.3
State percentage low-income	14.2	10.5

Source: U.S Bureau of the Census (2009k,l).

more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

11.1.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of the programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed Amargosa Valley SEZ include noise and dust during the construction; noise and electromagnetic field (EMF) effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Impacts are likely to be small, and there are no minority populations defined by CEQ guidelines (Section 11.1.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects would not disproportionately affect minority populations. Because there are also no low-income populations within the 50-mi (80-km) radius, there would be no impacts on low-income populations.

11.1.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Amargosa Valley SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

11.1.21 Transportation

The proposed Amargosa Valley SEZ is accessible by road via U.S. 95. The nearest railroad access is approximately 100 mi (161 km) away. One small airport serves the area, and three other public use airports are within a drive of approximately 100 mi (161 km). General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

11.1.21.1 Affected Environment

U.S. 95 extends northwest–southeast along the northeast border of the Amargosa Valley SEZ (Figure 11.1.21.1-1), and several local unimproved dirt roads cross the SEZ. The small town of Beatty is 11 mi (18 km) north-northwest of the SEZ along U.S. 95. Las Vegas is about 84 mi (135 km) southwest of the SEZ via U.S. 95. U.S. 95 connects with State Route 267 north of Beatty and State Route 374 in Beatty to the north and with State Routes 373 and 160 toward Las Vegas. Both State Route 267 and State Route 374 travel south from U.S. 95 into Death Valley in California. State Route 373 also travels south toward Death Valley. State Route 160 leads south to Pahrump, near the Nevada–California border. The area in and around the proposed SEZ has been designated as "Limited to existing roads, trails, and dry washes," indicating that these features are open for vehicle and OHV use (BLM 2010b). As shown in Table 11.1.21.1-1, U.S. 95 carries an annual average daily traffic (AADT) volume of about 3,000 vehicles in the vicinity of the Amargosa Valley SEZ (NV DOT 2009).

The Union Pacific (UP) Railroad serves the region. The nearest rail access is in Las Vegas. The main line passes through Las Vegas on its way between Los Angeles and Salt Lake City.

The nearest public airport is the Beatty Airport, a small county airport, about a 9-mi (15-km) drive north-northeast of the SEZ. The airport has one asphalt runway in good condition (as listed in Table 11.1.21.1-2). Another small county airport is the Tonopah Airport, located north of Beatty at a driving distance of approximately 115 mi (185 km). Neither the Beatty nor Tonopah Airports has scheduled commercial passenger service or regular freight service. North Las Vegas Airport, 95 mi (153 km) southeast, does not have scheduled commercial passenger service, but caters to smaller private and business aircraft (North Las Vegas Airport 2010). In 2008, 22,643 passengers arrived at North Las Vegas Airport and 23,950 departed (BTS 2008). Nearby in Las Vegas, McCarran International Airport is served by all major U.S. airlines. In 2008, 20.43 million and 20.48 million passengers arrived at and departed from McCarran International Airport, respectively (BTS 2008). About 83.2 million lb (37.7 million kg) of freight departed and 117 million lb (53.2 million kg) arrived at McCarran in 2008 (BTS 2008).

11.1.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). This additional traffic on U.S. 95 would represent a two-thirds increase in traffic volume in the area of the SEZ. Should up to

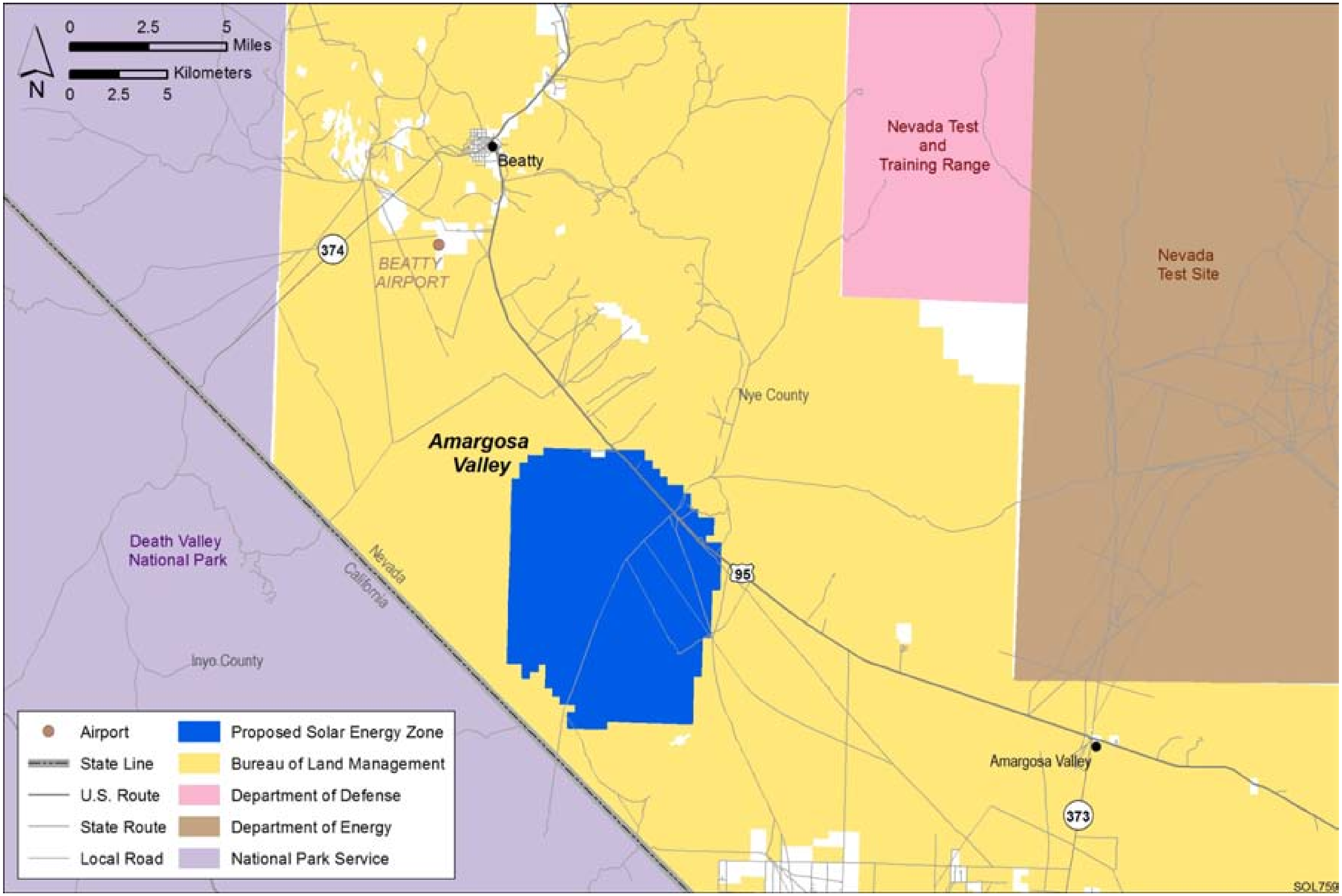

FIGURE 11.1.21.1-1 Local Transportation Network Serving the Proposed Amargosa Valley SEZ

TABLE 11.1.21.1-1 AADT on Major Roads near the Proposed Amargosa Valley SEZ in 2008

Road	General Direction	Location	AADT (Vehicles)
U.S. 95	Northwest–Southeast	Junction State Route 266	2,000
		Between State Routes 267 and 374	2,300
		North of Beatty	2,500
		South of State Route 374 junction in Beatty, north of the SEZ	3,400
		North of State Route 373 junction, south of the SEZ	2,600
		South of State Route 373 junction	2,900
		East of State Route 160 junction	2,900
State Route 267	Southwest–Northeast	Southwest of U.S. 95	50
State Route 374	Southwest–Northeast	0.6 mi (1 km) west of U.S. 95	390
		4.2 mi (6.8 km) west of U.S. 95	250
State Route 373	North–South	South of junction with U.S. 95	910
State Route 160	North–South	Junction U.S. 95	1,000
		Outskirts of Pahrump, south of Leslie Road	1,600
		East of State Route 372 junction in Pahrump	23,000
		West of State Route 372 Junction in Pahrump	21,000

Source: NV DOT (2009).

three large projects with approximately 1,000 daily workers each be under development simultaneously, up to 6,000 vehicle trips per day could be added to U.S. 95 in the vicinity of the SEZ, which is about a 200% increase in the current average daily traffic level on most segments of U.S. 95 near the SEZ. Because higher traffic volumes would be experienced during shift changes, traffic on U.S. 95 could experience moderate slowdowns during these time periods in the general area of the SEZ. Local road improvements would be necessary on any portion of U.S. 95 that might be developed so as not to overwhelm the local access roads near any site access point(s). Potential existing site access roads would require improvements, including asphalt pavement.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any designated as open within the proposed SEZ, open routes crossing areas granted ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

TABLE 11.1.21.1-2 Airports Open to the Public in the Vicinity of the Proposed Amargosa Valley SEZ

			Runway 1			Runway 2		
Airport	Location	Owner/ Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Beatty	South of Beatty, about 9 mi (14.5 km) via U.S. 95 north of the SEZ	Nye County	5,600 (1,707)	Asphalt	Good	NA[a]	NA	NA
North Las Vegas	Near U.S. 95 in North Las Vegas, 95 mi (153 km) drive from the SEZ	Clark County	4,202 (1,281)	Asphalt	Good	5,000 (1,524)	Asphalt	Good
McCarran International	Off I-15 in Las Vegas, about 108 mi (174 km) from SEZ	Clark County	8,985 (2,739)	Concrete	Good	9,775 (2,979)	Concrete	Good
Tonopah	East of Tonopah, 115 mi (185 km) north of the SEZ via U.S. 95 and U.S. 6	Nye County	6,196 (1,889)	Asphalt	Good	7,161 (2,183)	Asphalt	Good

[a] NA = not applicable.

Source: FAA (2009).

11.1.21.3 Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed Amargosa Valley SEZ. The programmatic design features described in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented

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11.1.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Amargosa Valley SEZ in Nye County, Nevada. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental effects of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The land surrounding the proposed Amargosa Valley SEZ is undeveloped with few permanent residents living in the area. The nearest population centers are the small community of Beatty, population 1,600, approximately 11 mi (18 km) north of the SEZ, and Amargosa Valley, about 12 mi (20 km) southeast of the SEZ. The SEZ is located 84 mi (135 km) northwest of Las Vegas, Nevada. Death Valley NP in California is adjacent to the southwestern border of the SEZ. The Nevada Test and Training Range is located 10 mi (16 km) northeast of the SEZ, and the NTS is located 10 mi (16 km) east of the SEZ. The Funeral Mountains WA is located 20 mi (32 km) south of the SEZ in California, and the Ash Meadow NWR is located 20 mi (32 km) southeast of the SEZ. The Desert NWR is located 40 mi (64 km) east of the SEZ, and the Spring Mountains National Recreation Area is located 40 mi (64 km) southeast of the SEZ. Two other WAs (both in California) are within 50 mi (80 km) of the SEZ.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the proposed Amargosa Valley SEZ is identified in Section 11.1.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 11.1.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 11.1.22.3. Cumulative impacts for each resource area are discussed in Section 11.1.22.4.

11.1.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the proposed Amargosa Valley SEZ is provided in Table 11.1.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than visual resources). The BLM, the USFWS, the NPS, the DOE, and the DoD administer most of the land around the SEZ; the Tribal lands of the Death Valley Timbi-Sha Shoshone Band of California are also about 30 mi (48 km) southwest of the SEZ. The BLM administers approximately 28% of the lands within a 50 mi (80 km) radius of the SEZ.

TABLE 11.1.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Amargosa Valley SEZ

Resource Area	Geographic Extent
Land Use	Southern Nye County
Specially Designated Areas and Lands with Wilderness Characteristics	Southern Nye County
Rangeland Resources	Southern Nye County
Recreation	Southern Nye County
Military and Civilian Aviation	Southern Nye County
Soil Resources	Areas within and adjacent to the Amargosa Valley SEZ
Minerals	Southern Nye County
Water Resources	
Surface Water	Amargosa River; Fortymile Wash; Topopah Wash; Unnamed Wash; Ash Meadows NWR (wetlands, streams, surface seeps)
Groundwater	Amargosa Desert groundwater basin; Ash Meadows NWR (springs and seeps); Devils Hole (geothermal pool); springs within DVNP (Travertine, Nevares); Texas Springs within the Furnace Creek discharge area of the lower carbonate rock aquifer
Air Quality and Climate	A 31 mi (50 km) radius from the center of the Amargosa Valley SEZ
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50 mi (80 km) radius from the center of the Amargosa Valley SEZ, including portions of Nye, Clark, and Esmeralda Counties in Nevada, and Inyo County in California
Visual Resources	Viewshed within a 25 mi (40 km) radius of the Amargosa Valley SEZ
Acoustic Environment (noise)	Areas adjacent to the Amargosa Valley SEZ
Paleontological Resources	Areas within and adjacent to the Amargosa Valley SEZ
Cultural Resources	Areas within and adjacent to the Amargosa Valley SEZ for archaeological sites; viewshed within a 25 mi (40 km) radius of the Amargosa Valley SEZ for other properties, such as traditional cultural properties
Native American Concerns	Northern Amargosa Valley and surrounding mountains; viewshed within a 25 mi (40 km) radius of the Amargosa Valley SEZ
Socioeconomics	Nye County, Clark County
Environmental Justice	Nye County
Transportation	U.S. 95, State Routes 374 and 373

11.1.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable"; that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;

- Proposals in a detailed design phase;

- Proposals listed in formal NOIs published in the *Federal Register* or state publications;

- Proposals for which enabling legislations has been passed; and

- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 11.1.22.2.1), and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 11.1.22.2.2). Together, these actions and trends have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

11.1.22.2.1 Energy Production and Distribution

There are no existing energy production facilities within a 50 mi (80 km) radius of the center of the proposed Amargosa Valley SEZ, which includes portions of Nye, Clark, and Esmeralda Counties in Nevada, and Inyo County in California. Reasonably foreseeable future actions related to energy production and distribution are identified in Table 11.1.22.2-1 and are described in the following sections. Renewable energy projects identified include solar and wind, but no foreseeable geothermal projects have been identified. The area is otherwise largely undeveloped and would be expected to remain so in the absence of renewable energy development. Thus, this analysis focuses on existing facilities, renewable energy development, and any other foreseeable large projects nominally covering 500 acres (2 km^2) or more, or requiring amounts of water on the scale of utility-scale CSP.

Renewable Energy Development

On February 16, 2007, Governor Jim Gibbons of Nevada signed an Executive Order to encourage the development of renewable energy resources in the state (Gibbons 2007a). The Executive Order requires all relevant state agencies to review their permitting processes to ensure the timely and expeditious permitting of renewable energy projects. On May 9, 2007, and June 12, 2008, the Governor signed Executive Orders creating the Nevada Renewable Energy Transmission Access Advisory Committee Phase I and Phase II that will propose recommendations for improved access to the grid system for renewable energy industries (Gibbons 2007b, 2008). On May 28, 2009, the Nevada legislature passed a bill modifying the Renewable Energy Portfolio Standards (Senate Bill 358, 2009). The bill requires that 25% of the electricity sold to be produced by renewable energy sources by 2025.

The DOE and U.S. Department of the Interior (DOI) intend to construct and operate solar energy demonstration projects (EERE 2010). These projects will be located in a 25-mi^2 (64-km^2) Solar Demonstration Zone located in the southwest corner of the NTS, about 10 mi (16 km) east of the SEZ. DOE will use the site to demonstrate CSP technologies.

Table 11.1.22.2-1 lists two foreseeable solar energy projects on public land, one that is a fast-track project. Fast-track projects are those on public lands for which the environmental review and public participation process is under way and the applications could be approved by December 2010 (BLM 2010c). The fast-track project is considered foreseeable because the permitting and environmental review processes are under way. The second project has issued an NOI to prepare an EIS.

Solar Energy Development

Amargosa Farm Road (Solar Millennium) Solar Energy Project (NVN 084359). This proposed fast-track project would be a two-unit parabolic trough facility with an output of 464 MW. The project would be located on 4350 acres (17.6 km^2) of mostly BLM-administered land in the Amargosa Valley in Nye County, Nevada, 80 mi (130 km) northwest of Las Vegas. The solar collectors follow the path of the sun, and incident solar radiation is focused on receiver tubes containing an HTF, synthetic oil, which is heated to 752ºF (400ºC). The HTF flows through a heat exchanger, producing steam that drives a steam turbine and generator. Each unit would have a net output of 232 MW. A nitrate salt thermal energy storage system would be utilized to store excess heat, which would be used to generate electricity during periods of cloud cover and up to 4.5 h after sundown. The proposed project would include power blocks (located in the center of each solar field), an office and maintenance building, a parking area, a laydown area, a stormwater detention basin, and a switchyard. The project would utilize a dry-cooling system.

The project would be constructed in two phases, beginning in 2010, and would require 39 months. Construction would require an average of about 650 workers, with a peak of 1,300; operation would require about 180 employees.

TABLE 11.1.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution and Other Major Actions near the Proposed Amargosa Valley SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Fast-Track Solar Energy Projects on BLM-Administered Land			
Amargosa Farm Road Solar Energy Project (Solar Millennium) (NVN-84359), 464 MW, parabolic trough, 4,350 acres[b]	DEIS March 19, 2010	Terrestrial habitats, wildlife	6 mi (10 km) southeast of the SEZ
Renewable Energy Development			
Amargosa North Solar Project (NVN-84465), 150 MW, PV, 7,500 acres	NOI Dec. 14, 2009	Terrestrial habitats, wildlife	Adjacent to the SEZ
Transmission and Distribution Systems			
138-kV transmission line	Operating		Corridor passes adjacent to the SEZ

[a] Projects in later stages of agency environmental review and project development.

[b] Project approved. Updated information will be included in the Final EIS. See http://www.blm.gov/wo/st/en/prog/energy/renewable_energy/fast-track_renewable.html for details.

Four special-status or sensitive wildlife species have the potential to occur on the site: desert tortoise (Mojave Population), western burrowing owl, prairie falcon, and LeConte's Thrasher. Construction will require 1,950 ac-ft (2,400,000 m^3) of water over the 39-month construction period. Water requirements for operation will be about 400 ac-ft/year (490,000 m^3/yr). Options for the water supply are either leasing from three wells located on private land near the site or purchasing the existing water rights from these three wells (BLM 2010c).

Amargosa North Solar Project (NVN 084465). Pacific Solar Investments is planning to build a 150-MW thin-film solar PV energy generation facility on 7,500 acres (30 km^2) of public land adjacent to the SEZ in the Amargosa Valley in Nye County, Nevada, 80 mi (130 km) northwest of Las Vegas. Thin-film PV arrays will be mounted in rows attached to fixed support systems. The arrays are stationary and are oriented along an east–west axis. The arrays are fixed at an angle of 25 degrees, tilted towards the south. This tilt angle is chosen in order to maintain the most favorable angle between the panel and the sun over the course of the operating period.

The proposed project includes the solar facility, a substation, a 20 mi (32 km) transmission line that will connect to the Nevada Power grid, an operation and maintenance building, and access roads. The facility would occupy 1,232 acres (4.99 km^2), and the interconnecting transmission line and substation would require 1,124 acres (4.55 km^2). The project would be constructed in three phases, 50 MW each, beginning in 2010. The first phase would require 13 months to complete, and subsequent phases 12 months each. Construction would require more than 200 workers, and operation about 10 employees.

Five special status or sensitive wildlife species have the potential to occur on the site: desert tortoise (Mojave Population), western burrowing owl, and three species of bat. Construction would require up to 3 ac-ft (3,800 m^3) of water for dust control. Panel cleaning will require up to 0.3 ac-ft/yr (380 m^3/yr). Options for water supply include tanker truck delivery, on-site groundwater, or reclaimed water from local sources (BLM 2009c).

Pending Solar and Wind ROW Applications on BLM-Administered Lands

Applications for right-of-way grants that have been submitted to the BLM include 12 pending solar projects, two pending authorization for wind site testing and one authorized for wind testing that would be located either within the Amargosa Valley SEZ or within 50 mi (80 km) of the SEZ (BLM 2010c). Table 11.1.22.2-2 lists these applications and Figure 11.1.22.2-1 shows their locations.

The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The projects are all listed in Table 11.1.22.2-2 for completeness and as an indication of the level of interest in development of solar and wind energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects. The following paragraph summarizes wind site testing activities for the AltaGas Renewable Energy Pacific wind project, which is a project authorized for wind site testing, as listed in the table.

Ryolite Wind Energy Site Testing and Monitoring (NVN 084067). AltaGas Renewable Energy Pacific proposes to install one 197 ft (60 m) meteorological tower to collect wind data on a site about 4 mi (6 km) southwest of Beatty, Nevada. The 6,798-acre (27.5-km^2) site is being considered for wind energy generation. The disturbed area would be about 3 acres (0.012 km^2) (BLM 2009a).

Transmission and Distribution

Existing 138-kV Transmission Line. The Valley Electric Association owns the existing 138-kV transmission that runs parallel to U.S. 95 adjacent to the SEZ.

TABLE 11.1.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Amargosa Valley SEZ

Serial Number	Applicant	Application Received	Size (acres)	MW	Technology	Status	Field Office
Solar Applications[a]							
NVN 86571	Abengoa Solar, Inc.	Dec. 12, 2008	1,920	250	PV	Pending	Pahrump
NVN 84704	Amargosa Flats Energy, LLC	March 12, 2008	7,040	140	Compact linear Fresnel reflector	Plan of Development received	Pahrump
NVN 86246	Ausra NV I, LLC	Oct. 6, 2008	4,480	140	Parabolic trough	Pending	Pahrump
NVN 86248	Ausra NV I, LLC	Oct. 6, 2008	10,080	420	Parabolic trough	Pending	Pahrump
NVN 86249	Ausra NV I, LLC	Oct. 9, 2008	4,480	–[b]	Parabolic trough	Pending	Pahrump
NVN 83150	Cogentrix Solar Services	Feb. 14, 2007	13,440	1,000	CSP	Pending	Pahrump
NVN 83220	Cogentrix Solar Services	March 5, 2007	12,800	1,400	CSP	Pending	Pahrump
NVN 83221	Cogentrix Solar Services	March 5, 2007	22,400	1,400	CSP	Pending	Pahrump
NVN 85201	Ewindfarm, Inc.	May 14, 2008	10,880	500	PV	Plan of Development received	Pahrump
NVN 86217	Nye County Solar I, LLC	Sept. 29, 2008	14,160	300	Parabolic trough	Pending	Las Vegas
NVN 84466	Iberdrola DBA Pacific Solar Investments	Dec. 7, 2007	7,700	500	Parabolic trough	Pending	Las Vegas
NVN 85657	Cogentrix Solar Services	July 7, 2008	7,700	720	Parabolic trough	Pending	Pahrump
Wind Applications							
NVN 85746	–	–	–	–	Wind	Pending wind site testing	Pahrump
NVN 88602	–	–	–	–	Wind	Pending wind site testing	Pahrump
NVN 84067	AltaGas Renewable Energy Pacific	Aug. 30, 2007	7,360		Wind	Authorized wind site testing	Pahrump

[a] Total solar applications = 117,080 acres.

[b] A dash indicates data not available.

Source: BLM (2009d).

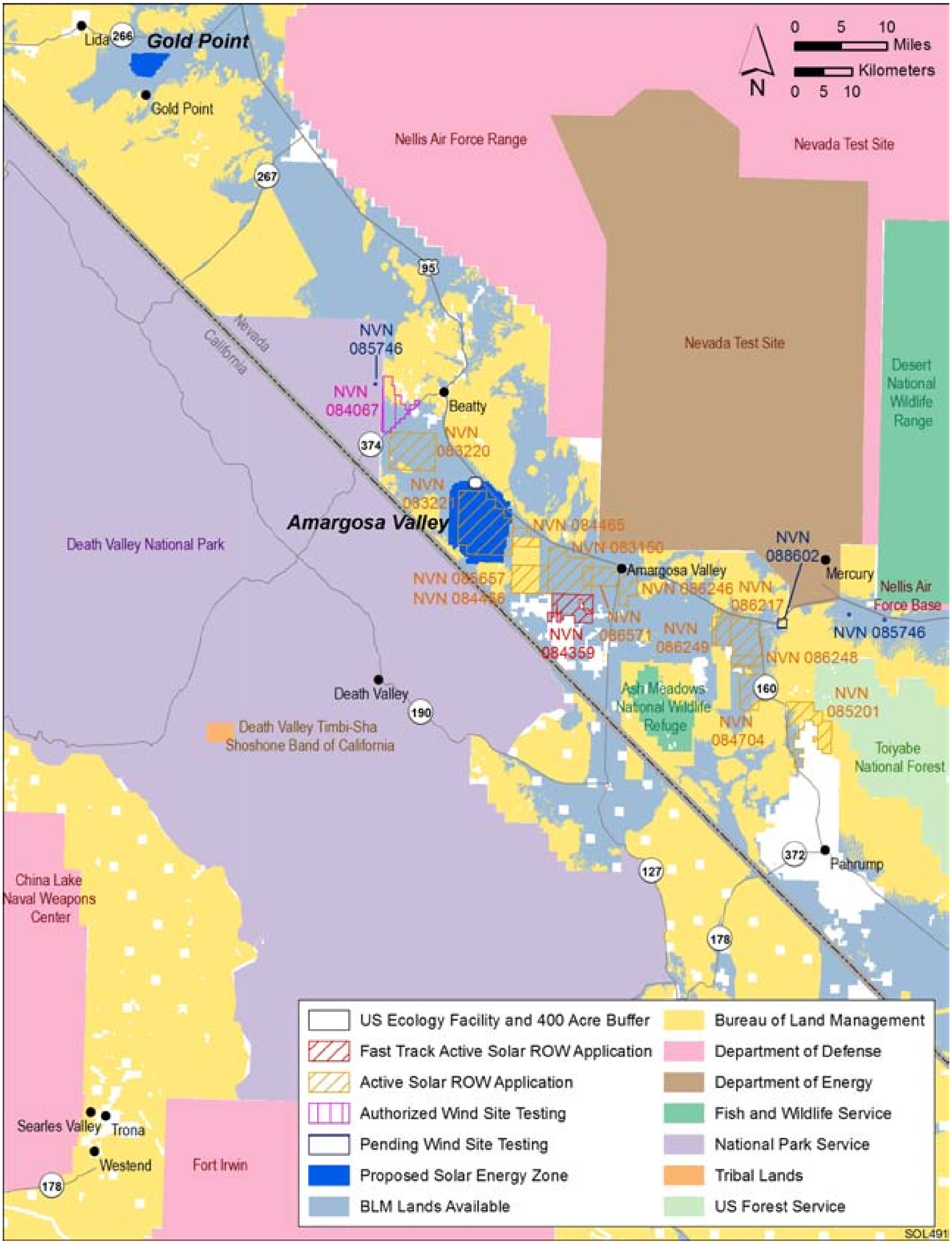

FIGURE 11.1.22.2-1 Locations of Renewable Energy Proposals on Public Land within a 50-mi (80-km) Radius of the Proposed Amargosa Valley SEZ

11.1.22.2.2 Other Actions

The following is a summary of two of the larger projects in the vicinity of the proposed Amargosa Valley SEZ. The projects are also listed in Table 11.1.22.2-3, which describes the projects' status and location and lists natural resources that might be potentially affected by the project and that might also incur cumulative impacts from other actions, including solar development in the SEZ.

Hazardous Waste Management Facility

US Ecology-Nevada operates a hazardous waste management facility 11 mi (18 km) south of Beatty, Nevada, adjacent to the SEZ. The site is 80 acres (0.32 km^2) with a 400 acre (1.6 km^2) buffer. A portion of the site was opened in 1962 for disposal of low-level radioactive waste (LLRW). LLRW disposal was terminated in 1993. A full range of Resource Conservation and Recovery Act hazardous waste is now accepted for disposal at the site (US Ecology 2009).

Beatty Water and Sanitation District Water Treatment Plant

The Beatty Water and Sanitation District proposes installing a water treatment facility to remove arsenic from the drinking water supply for Beatty. The total disturbed area would be about 8.5 acres (0.034 km^2). The facility would include a septic tank leach field, backwash holding tank, and an evaporation/infiltration basin (BLM 2009b).

Caliente Rail Alignment

The DOE proposes to construct and operate a railroad for the shipment of spent nuclear fuel and high-level radioactive waste to the geologic repository at Yucca Mountain, Nevada. The

TABLE 11.1.22.2-3 Other Major Actions near the Proposed Amargosa Valley SEZ

Description	Status	Resources Affected	Primary Impact Location
Hazardous Waste Management Facility	In operation since 1962	Soils, terrestrial habitats, noise, air quality	Adjacent to the SEZ
Beatty Water and Sanitation District Water Treatment Plant	EA November 2009	Soils, minor other impacts	10 mi (16 km) north of SEZ
Caliente Rail Realignment	FEIS June 2008	Terrestrial habitats, wildlife cultural resources	8 mi (13 km) northeast of the SEZ

rail line would begin near Caliente, Nevada; extend north; turn in a westerly direction, passing about 8 mi (13 km) northeast of the SEZ, to a location near the northwest corner of the Nevada Test and Training Range; and then continue south–southwest to Yucca Mountain. The rail line would range in length from approximately 328 to 336 mi (528 to 541 km), depending upon the exact location of the alignment, and would be restricted to DOE shipments. Over a 50-year period, 9,500 casks containing spent nuclear fuel and high-level radioactive waste, and approximately 29,000 rail cars of other materials, including construction materials, would be shipped to the repository. An average of 17 one-way trains per week would travel along the rail line. Construction of support facilities—interchange yard, staging yard, maintenance-of-way facility, rail equipment maintenance yard, cask maintenance facility, and Nevada Rail Control Center and National Transportation Operation Center—would also be required. Construction would take 4 to 10 years and cost $2.57 billion. Construction activities would occur inside a 1000-ft (300-m) wide ROW for a total footprint of 40,600 acres (164 km^2) (DOE 2008).

Grazing Allotments

There are no active grazing allotments in the immediate vicinity of the proposed Amargosa Valley SEZ.

11.1.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change for the proposed Amargosa Valley SEZ are presented in this section. Table 11.1.22.3-1 lists the relevant impacting factors for the trends.

11.1.22.3.1 Population Growth

Over the period 2000 to 2008, the population grew by 3.9% in Nye County and by 4.0% in Clark County, which contain portions the 50-mi (80-km) ROI for the analysis of socioeconomic effects of the Amargosa Valley SEZ (Section 11.1.19.1.5). The population of the ROI in 2006 to 2008 was 55% urban, with all urban areas in the ROI located in Clark County and none in Nye County. The growth rate for the state of Nevada as a whole was 3.4%. Most of the population growth over this period was in North Las Vegas, at a rate of 8.2%.

11.1.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floor space, transportation, manufacturing, and services. Given that population growth is expected in all SEZ areas in Nevada between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of the high cost of oil and improvements in energy efficiency throughout the projection period. Primary energy consumption in the United States between 2007 and 2030

TABLE 11.1.22.3-1 General Trends Relevant to the Proposed SEZs in Nevada

General Trend	Impacting Factors
Population growth	Urbanization Increased use of roads and traffic Land use modification Employment Education and training Increased resource use (e.g., water and energy) Tax revenue
Energy demand	Increased resource use Energy development (including alternative energy sources) Energy transmission and distribution
Water availability	Drought conditions and water loss Conservation practices Changes in water distribution
Climate change	Water cycle changes Increased wildland fires Habitat changes Changes in farming production and costs

is expected to grow by about 0.5% each year; the fastest growth is projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5, 0.4, and 0.1% each year, respectively (EIA 2009).

11.1.22.3.3 Water Availability

As described in Section 11.1.9.1, the perennial yield for the Amargosa Desert Basin (in combination with five smaller adjacent basins to the north and east) is 24,000 ac-ft/yr (29.6 million m^3/yr), with 17,000 ac-ft/yr (20.9 million m3/yr) committed to wildlife purposes as discharge to the system of springs within Ash Meadows NWR (NDWR 2007). The remaining 7,000 ac-ft/yr (8.6 million m^3/yr) of the perennial yield is over-allocated, with 25,335 ac-ft/yr (31.2 million m^3/yr) committed for beneficial uses (NDWR 2010d), of which 16,380 ac-ft/yr (22.0 million m^3/yr) was used in 2009 (NDWR 2010b)..

Groundwater surface elevations have been relatively steady over time in the northern portion of the Amargosa Desert Valley, with significant groundwater drawdown occurring near the irrigated fields of the Amargosa Farms region located approximately 10 to 15 mi (16 to 24 km) southeast of the proposed SEZ. Groundwater surface elevations have fallen at a rate of 0.5 to 1.5 ft/yr (0.2 to 0.5 m/yr) since the late 1980s near Amargosa Farms (USGS 2010b), where groundwater surface elevations had previously declined an approximate 27 ft (8 m) from 1962 to

1984 (Nichols and Akers 1985). Groundwater surface elevations at Ash Meadows have been steady over the past two decades (Fenelon and Moreo 2002), with depth to groundwater approximately 20 ft (6 m) below the land surface (USGS 2010b). The Devils Hole seep gauge measures water levels relative to a set datum. Water table elevations in Devils Hole were drastically lower during the 1960s and 1970s as a result of nearby groundwater withdrawals for irrigation, which ceased by the mid-1970s (Riggs and Deacon 2004; Section 11.1.9.1.3). The water table levels reached a low of 3.7 ft (1.2 m) below the datum between 1972 and 1973 and slowly recovered by the late 1980s to about 2 ft (0.6 m) below the datum (USGS 2010b). From 1988 to 2004, water table elevations in Devils Hole gradually declined; it is suspected that the cause is regional-scale groundwater withdrawals and changes to groundwater recharge rates (Bedinger and Harrill 2006).

In 2005, water withdrawals from surface waters and groundwater in Nye County were 76,859 ac-ft/yr (94.8 million m^3/yr), of which 41% came from surface waters and 59% from groundwater. The largest water use category was irrigation, at 56,583 ac-ft/yr (69.8 million m^3/yr), of which 55% came from surface waters and 45% from groundwater. Groundwater supplied the majority of the remaining water uses, with 12,431 ac-ft/yr (15.3 million m^3/yr) for domestic supply and 6,580 ac-ft/yr (8.1 million m^3/yr) for mining (Kenny et al. 2009).

11.1.22.3.4 Climate Change

Governor Jim Gibbons' Nevada Climate Change Advisory Committee (NCCAC) conducted a study of climate change and its effects on Nevada (NCCAC 2008). The report summarized the present scientific understanding of climate change and its potential impacts on Nevada. A report on global climate change in the United States prepared by the U.S. Global Change Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from these reports indicate the following:

- Decreased precipitation, with a greater percentage of that precipitation coming from rain, will result in a greater likelihood of winter and spring flooding and decreased stream flow in the summer.

- The average temperature in the southwest has already increased by about 1.5 ºF (0.8ºC) compared to a 1960 to 1979 baseline, and by the end of the century, the average annual temperature is projected to rise 4ºF to 10ºF (2ºC to 6ºC).

- A warming climate and the related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires.

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end.

- Much of the Southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region.

- As temperatures rise, the landscape will be altered as species shift their ranges northward and upward to cooler climates.

- Temperature increases, when combined with urban heat island effects for major cities such as Las Vegas, present significant stress to health and electricity and water supplies.

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

11.1.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Amargosa Valley SEZ on the basis of the following assumptions: (1) because of the large size of the proposed SEZ (more than 30,000 acres [121 km^2]), up to three projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 25,300 acres (102 km^2) (80% of the entire proposed SEZ). For purposes of analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. Since an existing 138-kV transmission line runs along the along the northeast border of the SEZ, no analysis of impacts has been conducted for the construction of a new transmission line outside of the SEZ that might be needed to connect solar facilities to the regional grid (see Section 11.1.1.2). Regarding site access, because U.S. 95 also passes along the northeast border of the SEZ, no major road construction activities outside of the SEZ would be needed for development to occur in the SEZ.

Cumulative impacts that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section in each resource area are discussed below. At this stage of development, because of the uncertainty of the future projects in terms of size, number, location within the proposed SEZ, and the types of technology that would be employed, the impacts are discussed qualitatively or semiquantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

11.1.22.4.1 Lands and Realty

The area covered by the proposed Amargosa Valley SEZ is largely undeveloped. In general, the areas surrounding the SEZ are rural. Numerous dirt/ranch roads provide access throughout the SEZ.

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. Utility-scale solar energy development would be a new and discordant land use in the area.

In addition, numerous solar projects and at least one wind energy project are proposed within a 50-mi (80-km) radius of the proposed Amargosa Valley SEZ. As shown in Table 11.1.22.2-2 and Figure 11.1.22.2-1, a total of 12 solar applications are pending, including one fast-track project, that cover a total of about 117,000 acres (473 km^2). Also, one wind application, which covers 7,360 acres (30 km^2), is authorized for wind testing and two more are pending such authorization on public land within this distance. The majority of the solar applications within 50 mi (80 km) of the SEZ lie to the southeast in Nevada, while one lies within the proposed SEZ and one lies about 3 mi (5 km) to the northwest. In addition, the proposed Gold Point SEZ is about 62 mi (100 km) to the northwest. The authorized wind testing application is about 10 mi (16 km) to the northwest. Although not all of these proposed solar and wind projects would likely be built, the number of applications indicates a strong interest in the development of solar energy in particular in the region. In addition, the existing US Ecology hazardous waste facility lies adjacent to the proposed SEZ on 80 acres (0.32 km^2) and includes a 400 acre (1.6 km^2) buffer.

The development of utility-scale solar projects on public lands in combination with ongoing and foreseeable actions within the geographic extent of effects, nominally 50 mi (80 km), would have small to moderate cumulative effects on land use in the proposed Amargosa Valley SEZ. Most other actions outside of the proposed SEZ are wind energy projects, which would allow many current land uses to continue, including farming. However, the number and size of such projects could result in cumulative effects, especially if the SEZ is fully developed with solar projects.

11.1.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

Seven specially designated areas are near the proposed Amargosa Valley SEZ in Nevada and California, the largest being Death Valley NP, within 2 mi (3 km) to the west. Potential exists for cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and the construction of transmission lines outside the SEZ. The exact nature of cumulative visual impacts on the users of these areas would depend on the specific solar technologies employed in the SEZ and the locations selected within the SEZ for solar facilities and outside the SEZ for transmission lines. Two reasonably foreseeable energy projects were identified within 50 mi (80 km) of the proposed SEZ: Amargosa Farm Road Solar Energy Project (NVN-084359), located about 8 mi (13 km) to the southeast, and the Amargosa North Solar Project (NVN-084465) adjacent to the eastern boundary of the SEZ; the existing US Ecology-Nevada hazardous waste facility adjacent to the SEZ may also be seen from visually sensitive areas near the SEZ.

11.1.22.4.3 Rangeland Resources

The area in and around the proposed Amargosa Valley SEZ is currently not used for grazing. If utility-scale solar facilities were constructed on the SEZ, those areas occupied by the solar projects would be excluded from future grazing. The effects of other renewable energy projects within the geographic extent of effects, including the Amargosa Farm Road Solar Energy Project, the Amargosa North Solar Project, and any of the other pending solar applications within 50 mi (80 km) of the SEZ that are ultimately developed would not likely result in cumulative impacts on grazing because of the low level of grazing in the Amargosa Valley.

Because the Amargosa Valley SEZ is 5.3 mi (8.5 km) or more from any wild horse and burro HMA managed by BLM and more than 35 mi (56 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly affect wild horses and burros that are managed by these agencies.

11.1.22.4.4 Recreation

Limited outdoor recreation (e.g., OHV use, photography, and hunting) occurs on or in the immediate vicinity of the SEZ. Construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. Access to public land and NPS areas south and west of the SEZ would be made more difficult by development of the SEZ. There would be a potential for visual impacts on recreational users of the Death Valley NP and other sensitive viewing areas near the SEZ. Because the area of the proposed SEZ has low current recreational use and because major foreseeable and potential actions, primarily potential solar projects located to the northwest and southeast, would similarly affect areas of low recreational use, cumulative impacts on recreation within the geographic extent of effects would be small.

11.1.22.4.5 Military and Civilian Aviation

The area around the proposed Amargosa Valley SEZ is used intensively for flight training by the military. The closest civilian municipal aviation facility is the Nye County Airport at Beatty, 7 mi (11 km) north of the SEZ. Recent information from the DoD indicates that there are concerns about solar development in the SEZ, particularly regarding structures taller than 50 ft (15 m) AGL (Section 11.1.6.2). Thus, solar energy development in the proposed SEZ in combination with other foreseeable or potential projects in the area, including solar and wind facilities, could result in cumulative impacts on military or civilian aviation.

11.1.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from construction of other renewable energy facilities, recreational uses, and agriculture. Overall, the cumulative impacts on soil resources would be small, however, because of the small number of currently foreseeable projects within the geographic extent of effects. The number of pending solar applications in this area suggests that future impacts could increase somewhat over those from the firmly foreseeable projects but would be expected to remain small.

Landscaping of solar energy facility areas could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that from other development activities and agriculture. However, with the expected programmatic design features in place, cumulative impacts would be small.

11.1.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 11.1.8, there is currently a single closed oil and gas lease within the proposed Amargosa Valley SEZ, but there are no mining claims or proposals for geothermal energy development pending. Because of the generally low level of mineral production in the proposed SEZ and surrounding area and the expected low impact on mineral accessibility of other foreseeable actions within the geographic extent of effects, cumulative impacts on mineral resources would be small.

11.1.22.4.8 Water Resources

Section 11.1.9.2 describes the water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities. The amount of water needed during the peak construction year for all evaluated solar technologies would be 3,390 to 4,886 ac-ft (4.2 million to 6.0 million m^3). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for all evaluated solar technologies would range from 144 to 75,971 ac-ft/yr (177,600to 93.7 million m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. As discussed in Section 11.1.22.2.3, water withdrawals in 2005 from surface waters and groundwater in Nye County were 76,859 ac-ft/yr (94.8 million m^3/yr), of which 41% came from surface waters and 59% came from groundwater. Therefore, cumulatively the additional water resources needed for solar facilities in the SEZ during operations would constitute a relatively small (0.2%) to a very large (99%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Nye County) depending on the solar technology used (PV technology at the low end and the wet-cooled parabolic technology at the high end). However, as discussed in Section 11.1.9.1.3, the current perennial yield for the Amargosa Desert Basin (in combination with five smaller adjacent basins to the north and east) is only an estimated 24,000 ac-ft/yr (29.6 million m^3/yr) of which 7,000 ac-ft/yr (8.6 million m^3/yr) is transferrable and over-appropriated at 25,335 ac-ft/yr (31.5 million m^3/yr)

(NDWR 2010d). A large portion of the perennial yield is allocated to the USFWS for wildlife purposes and represents discharge to springs within Ash Meadows NWR and at Devils Hole, leaving roughly 30 percent of the perennial yield available for groundwater development. The current levels of pumping exceed the perennial yield available for groundwater development by roughly two times according to Nevada State Engineer Ruling 5750 (NDWR 2007). Thus, springs are already sensitive to current withdrawal levels. Groundwater surface elevations have been relatively steady in the northern portion of the Amargosa Desert Valley, while significant drawdown is occurring near the irrigated fields of the Amargosa Farms region 10 to 15 mi (16 to 24 km) southeast of the proposed SEZ.

While solar development of the proposed SEZ with water-intensive wet-cooled technologies would likely be infeasible due to impacts on groundwater supplies and restrictions on water rights, even withdrawals at currently appropriated levels could result in impacts on spring-supported wetlands and sensitive aquatic species in the Amargosa Valley (Section 11.1.9.1.2). Thus, a significant increase in withdrawals from development within the proposed SEZ could result in a major impact on groundwater in the Amargosa Valley, while further cumulative impacts could occur when combined with other future uses in the valley. Other projects that could contribute to incremental increases in the withdrawals from the regional flow system in Nye County include the Amargosa Farm Road Solar Energy Project, the US Ecology-Nevada hazardous waste management facility adjacent to the SEZ, and any potential solar projects in the Amargosa Desert, including, in particular, any of the 12 non-PV proposed solar projects listed in Table 11.1.22.2-2.

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 28 to 222 ac-ft (34,500 to 273,800 m^3) during the peak construction year and between 3 and 71 ac-ft/yr (up to 87,600 m^3/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to put undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet-cooling systems, there would also be 799 to 1,437 ac-ft/yr (986,000 to 1.8 million m^3/yr) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

11.1.22.4.9 Vegetation

The proposed Amargosa Valley SEZ is located within the Amargosa Desert ecoregion, which primarily supports a creosotebush and white bursage community. Many endemic plants also occur in this ecoregion, particularly in Ash Meadows. Lands within the proposed Amargosa Valley SEZ and within a 5 mi (8 km) area outside the SEZ boundary are classified primarily as Sonora–Mojave Creosotebush–White Bursage Desert Scrub. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the

SEZ over 80% of its area would result in moderate impacts on Sonora–Mojave Creosotebush–White Bursage Desert Scrub (Section 11.1.10.2.1). There are no known wetlands within the proposed SEZ; however, any wetland or riparian habitats outside of the SEZ supported by groundwater discharge could be affected by hydrologic changes resulting from project activities. The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other construction, agriculture, recreation, and transportation. The cumulative dust loading could result in reduced productivity or changes in plant community composition. Similarly, surface runoff from project areas after heavy rains could increase sedimentation and siltation in areas downstream. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats. The primary plant community types within the proposed SEZ generally have a wide distribution within the Amargosa Valley area, and thus other ongoing and reasonably foreseeable future actions would have a cumulative effect on them. Such effects could be moderate with full build-out of the SEZ, but would likely be small for foreseeable development because of the abundance of the primary species and the relatively small number of foreseeable actions within the geographic extent of effects. Cumulative effects on wetland species could occur from water use, drainage modifications, and stream sedimentation from development in the region. The magnitude of such effects is difficult to predict at the current time.

11.1.22.4.10 Wildlife and Aquatic Biota

Wildlife species that could potentially be affected by the development of utility-scale solar energy facilities in the proposed SEZ include amphibians, reptiles, birds, and mammals. The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, and wildlife injury or mortality. In general, species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These programmatic design features may include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance of or minimization of disturbance to those habitats.

Other ongoing and reasonably foreseeable and potential future actions within 50 mi (80 km) of the proposed SEZ are dominated by solar energy projects (Section 11.1.22.2), the majority of which lie to the southeast, although one lies within the proposed SEZ and one lies about 3 mi (5 km) to the northwest (Figure 11.1.22.2-1). While full build-out over 80% of the proposed SEZ would result in up to moderate impacts on some amphibian, reptile, bird, and mammal species (Section 11.1.11), foreseeable development within the 50-mi (80-km) geographic extent of effects would result in small to moderate impacts. Many of the wildlife species present within the proposed SEZ that could be affected by other actions have extensive available habitat within the region, although only two major new actions, the Amargosa Farm Road Solar Energy Project and the Amargosa North Solar Project, have been firmly identified.

Some number of the other 12 pending solar applications in the region could also contribute to cumulative effects.

No surface water bodies, wetlands, or perennial streams are present within the boundaries of the proposed SEZ. The portion of the intermittent/ephemeral Amargosa River that lies in Nevada, including that which crosses the SEZ, is typically dry and flows only after precipitation. Thus, aquatic habitat and biota are not likely to be present within the SEZ (Section 11.1.11.4). However, potential contributions to cumulative impacts on aquatic biota and habitats resulting from groundwater drawdown or soil transport to surface streams from solar facilities within the SEZ and within the geographic extent of effects are possible. Such effects on the spring-fed Ash Meadows NWR and Devils Hole in Nevada and on perennial reaches of the Amargosa River ACEC in California are of particular concern. The magnitude of cumulative impacts on aquatic species will depend on the extent of eventual solar and other development in the region and on cooling technologies employed by solar facilities.

11.1.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

On the basis of natural heritage records and the presence of potentially suitable habitat, as many as 52 special status species could occur within the Amargosa Valley SEZ or could be affected by groundwater use there. Seven of these species have been recorded within or near the SEZ: Ash Meadows buckwheat, Big Dune miloderes weevil, an endemic ant (*Neivamyrex nyensis*), Giulianis's dune scarab, large aegilian scarab, desert tortoise, and Nelson's bighorn sheep. The desert tortoise is listed as threatened under the ESA, and the Giuliani's dune scarab and large aegialian scarab are under review for listing under the ESA. There are 25 groundwater-dependent species known to occur within the Ash Meadows NWR and other portions of the SEZ region that utilize groundwater from the Amargosa Basin. Numerous additional species that occur on or in the vicinity of the SEZ are listed as threatened or endangered by the states of Nevada and California or listed as a sensitive species by the BLM (Section 11.1.12.1). Design features to be used to reduce or eliminate the potential for effects on these species from the construction and operation of utility-scale solar energy projects in the SEZs and related developments (e.g., access roads and transmission line connections) outside the SEZ include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. Ongoing effects on special-status species include those from roads, transmission lines, agriculture, and industrial and recreational activities in the area, while foreseeable and potential actions are dominated by proposed solar projects in the Amargosa Valley. Many of the special status species present on the SEZ are also likely to be present at the locations of these other foreseeable or potential actions where the same habitats exist. Cumulative impacts on protected species within the geographic extent of effects, including within spring-fed wetland areas that could be affected by water use by future solar facilities, would depend on the number, location, and cooling technologies of projects that are actually built. Projects would employ mitigation measures to limit effects.

11.1.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other nearby projects outside the proposed SEZ or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. The dust generation from the construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment.

Because the area proposed for the SEZ is rural and undeveloped land, there are no significant industrial sources of air emissions in the area. The only type of air pollutant of concern is dust generated by winds. Because the number of other major foreseeable actions that could produce fugitive dust emissions is small (the Amargosa Farm Road Solar Energy Project and the Amargosa North Solar Project) and because potential projects are unlikely to overlap in both time and affected area, cumulative air quality effects due to dust emissions during any overlapping construction periods would be small.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as coal, oil, and natural gas. As discussed in Section 11.1.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the Amargosa Valley SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 23% of all emissions from the current electric power systems in Nevada.

11.1.22.4.13 Visual Resources

The proposed Amargosa Valley SEZ is located within the flat, treeless plain of the Amargosa Desert floor. The SEZ is visible from the Big Dune SRMA and ACEC, about 0.5 mi (0.8 km) and 2 mi (3 km) east of the southern boundary of the SEZ, respectively, and from mountains in the Death Valley NP and WA, 0.7 mi (1.1 km) southwest of the SEZ. More distant views of the SEZ include the Funeral Mountains WA, about 18 mi (29 km) south, and Ash Meadows NWR, about 16.4 mi (26.4 km) southeast of the SEZ. The CDCA is 0.9 mi (1.5 km) southwest of the SEZ. The area is sparsely inhabited, remote, and rural. The Amargosa Valley and nearby Death Valley National Park are noted for their unusually dark night skies.

The VRI values for the SEZ and immediate surroundings are VRI Class IV, indicating low relative visual values. The inventory indicates low scenic quality for the SEZ and its immediate surroundings. Cultural modifications in the vicinity of the SEZ include U.S. 95, a two-lane highway that passes through the northeast portion of the SEZ, existing transmission lines, dirt roads, and areas with visible tracking from OHVs (Section 11.1.14.1).

Construction of utility-scale solar facilities on the SEZ and associated transmission lines outside the SEZ would significantly alter the natural scenic quality of the area. Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Other reasonably foreseeable and potential solar and wind projects would cumulatively affect the visual resources in the area. Additional impacts would result from the construction of related access roads and transmission line connections.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area. The Amargosa Farm Road Solar Energy Project, which has an ongoing fast-track solar application, would be located about 8 mi (13 km) to the southeast of the SEZ; the Amargosa North Solar Project would be located on the eastern boundary of the SEZ; and the existing US Ecology-Nevada hazardous waste facility lies adjacent to the SEZ. There are also 12 other pending solar applications and 3 wind site testing applications on public lands within 50 mi (80 km) of the SEZ; these represent additional potential projects (Figure 11.1.22.2-1). While the contribution to cumulative impacts in the area of these potential projects would depend on the number and location of facilities that are actually built, it may be concluded that the general visual character of the landscape within this distance could be altered from what is currently rural desert by the presence of solar facilities and windmills. Because of the topography of the region, solar facilities within the SEZ and wind facilities located in basin flats would be visible at great distances from surrounding mountains, which include sensitive viewsheds. It is possible that two or more facilities might be viewable from a single location. In addition, facilities would be located near major roads and thus would be viewable by motorists, who would also be viewing transmission line corridors, towns, and other infrastructure, as well as the road system itself.

As additional facilities are added, several projects might become visible from one location, or in succession, as viewers move through the landscape, driving on local roads. In general, the new projects would not be expected to be consistent in terms of their appearance, and depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. On the basis of all of the above, the overall cumulative visual impacts within the geographic extent of effects from solar, wind, and other projects could be in the range of small to moderate.

11.1.22.4.14 Acoustic Environment

The areas around the proposed Amargosa Valley SEZ are relatively quiet. The existing noise sources around the SEZ include road traffic, aircraft flyover, agricultural activities, industrial activities, and community activities and events. Other noise sources are associated with current land use around the SEZ, including outdoor recreation and OHV use. The construction of solar energy facilities could increase the noise levels periodically for up to 3 years per facility, but there would be little or minor noise impacts during operation of solar facilities, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES, which could affect nearby residences.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZs are described in Section 11.1.22.2. Because proposed projects are relatively far from the SEZ with respect to noise impacts and the area is sparsely populated, cumulative noise effects during the construction or operation of solar facilities are unlikely.

11.1.22.4.15 Paleontological Resources

The proposed Amargosa Valley SEZ has low potential for the occurrence of significant fossil material (Section 11.1.16.1). While impacts on significant paleontological resources are unlikely to occur in the SEZ, the specific sites selected for future projects would be investigated to determine whether a paleontological survey is needed. Any paleontological resources encountered would be mitigated to the extent possible. No significant cumulative impacts on paleontological resources are expected.

11.1.22.4.16 Cultural Resources

The Amargosa Valley is rich in cultural history, with settlements dating as far back as 12,000 years. The area covered by the proposed Amargosa Valley SEZ has the potential to contain significant cultural resources, especially dune areas within the SEZ. At least 17 cultural resource surveys have been conducted in the Amargosa Valley SEZ, and another 53 surveys have been conducted within 5 mi (8 km) of the SEZ, resulting in the recording of 4 sites within SEZ and at least 60 sites located within 5 mi (8 km) of the SEZ (Section 11.1.17.1). It is possible, but unlikely, that the development of utility-scale solar energy projects in the SEZ, when added to other potential projects likely to occur in the area, could contribute cumulatively to cultural resource impacts occurring in the region. However, only the existing US Ecology-Nevada hazardous waste facility and the foreseeable Amargosa Farm Road Solar Energy Project and Amargosa North Solar Project applications lie within the 25-mi (40-km) geographic extent of effects. Other potential projects within this distance include 12 other pending solar applications and 3 wind site testing applications. While any future solar projects would disturb large areas, the specific sites selected for future projects would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Nevada SHPO and appropriate Native American governments, it is likely that most adverse effects on significant resources in the region could be mitigated to some degree. It is unlikely that any sites recorded in the SEZ would be of such individual significance that, if properly mitigated, development would cumulatively cause an irretrievable loss of information about a significant resource type, but this would depend on the results of the future surveys and evaluations.

11.1.22.4.17 Native American Concerns

Major Native American concerns in arid portions of the Great Basin include water and water rights, culturally important plant and animal resources, and culturally important landscapes. The development of utility-scale solar energy facilities within the SEZ in combination with the foreseeable development of the adjacent Amargosa North Solar Project and the nearby Amargosa Farm Road Solar Energy Project and any of the 12 other less likely energy projects could cumulatively contribute to effects on these resources. Incrementally increased groundwater drawdown could affect culturally important springs, such as Ash Meadows. Development of the SEZ would result in the elimination of plant species, including some of cultural importance. However, the primary species that would be affected are abundant in the region. Likewise, habitat for important species such as the black-tailed jack rabbit would be reduced; however, extensive habitat is available. The SEZ is bordered by culturally important mountains; the view from these features can be an important part of their cultural integrity. The degree of impact on these resources of development at specific locations must be determined in consultation with the Native American Tribes whose traditional use area includes the SEZ. Government-to-government consultation is underway with federally recognized Native American Tribes with possible traditional ties to the Amargosa Valley area. All federally recognized Tribes with Western Shoshone, Southern Paiute, or Owens Valley Paiute roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. To date, no specific concerns have been raised to the BLM regarding the proposed Amargosa Valley SEZ. However, during scoping of the PEIS, the Big Pine Paiute Tribe of the Owens Valley recommended that the BLM preserve undisturbed lands intact and that recently disturbed lands, such as abandoned farm fields, rail yards, mines, and airfields, be given primary consideration for solar energy development. The SEZ is largely undeveloped, suggesting that development there may be viewed negatively by the Tribes. Continued discussions with the area Tribes through government-to-government consultation is necessary to determine the extent to which the cumulative effects of solar development in the Amargosa Valley can be addressed.

11.1.22.4.18 Socioeconomics

Solar energy development projects in the proposed Amargosa Valley SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services in combination with temporary workers involved in other new projects in the area, including other renewable energy development. The number of workers involved in the construction of solar projects in the peak construction year (including the transmission lines) could range from about 260 to 3,500 depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 460 (solar PV) to as high as 6,000 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-yr or more solar development period.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-yr duration and could combine with those from other new projects in the area, including the proposed Amargosa Farm Road Solar Energy Project and the Amargosa North Solar Project. The number of workers needed at the solar facilities would be in the range of 55 to 1,100, with approximately 70 to 1,650 total jobs created in the region, assuming full build-out of the SEZ (Section 11.1.19.2.2). Population increases would contribute to general upward trends in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

11.1.22.4.19 Environmental Justice

Any impacts from solar development could have cumulative impacts on minority and low-income populations within 50 mi (80 km) of the proposed SEZ in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual impacts, noise, and exposure to fugitive dust. Actual impacts would depend on where low-income populations are located relative to solar and other proposed facilities and on the geographic range of effects. Overall, effects from facilities within the SEZ are expected to be small, while other major foreseeable actions would not likely combine with effects from the SEZ on minority and low-income populations. If needed, mitigation measures can be employed to reduce the impacts on these populations in the vicinity of the SEZ. Thus, it is not expected that the proposed Amargosa Valley SEZ would contribute to cumulative impacts on minority and low-income populations.

11.1.22.4.20 Transportation

U.S. 95 runs along the northeast border of the proposed Amargosa Valley SEZ. The closest airport is Nye County Airport at Beatty, and the closest railroad access is the UP Railroad stop in Las Vegas. During construction of utility-scale solar energy facilities, there could be up to 1,000 workers commuting to the construction site at the SEZ, which could increase the AADT on these roads by 2,000 vehicle trips, an increase in traffic of about two-thirds in the area of the SEZ (Section 11.1.21.2). This increase in highway traffic from construction workers could have moderate cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area, should construction schedules overlap. Local road improvements may be necessary on portions of U.S. 95 near the proposed SEZ. Any impacts during construction activities would be temporary. The impacts can also be mitigated to some degree by staggered work schedules and ride-sharing programs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate the solar facilities and would have little contribution to cumulative impacts.

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11.1.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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11.2 DELAMAR VALLEY

11.2.1 Background and Summary of Impacts

11.2.1.1 General Information

The proposed Delamar Valley SEZ is located in Lincoln County in southeastern Nevada about 21 mi (34 km) south of the proposed Dry Lake Valley North SEZ (Figure 11.2.1.1-1). The SEZ has a total area of 16,552 acres (67 km^2). In 2008, the county population was 4,643, while adjacent Clark County to the south had a population of 1,879,093. The largest nearby town is Alamo, Nevada, about 11 mi (18 km) west in Lincoln County. The town of Panaca is located about 33 mi (53 km) northeast. Las Vegas lies about 90 mi (145 km) to the south.

The nearest major road access to the SEZ is via U.S. 93, which runs north–south, approximately 8 to 14 mi (13 to 23 km) to the west of the Delamar Valley SEZ and also east–west, approximately 8 mi (13 km) to the north of the SEZ. State Route 317 passes from the north to the south approximately 16 to 21 mi (26 to 34 km) east of the SEZ. The nearest railroad stop is in Caliente, 22 mi (35 km) away, while Lincoln County Airport is located 15 mi (24 km) north of Caliente in Panaca.

A 69-kV transmission line passes through the SEZ. It is assumed that this existing transmission line could potentially provide access from the SEZ to the transmission grid (see Section 11.2.1.1.2).

As of March 2010, there were two ROW applications for solar projects and one application for a wind project that would be located within 50 mi (80 km) of the SEZ. These applications are discussed in Section 11.2.22.2.1.

The proposed Delamar Valley SEZ is isolated and undeveloped. The SEZ is located in Delamar Valley, a north trending closed basin within the Basin and Range physiographic province immediately south of Dry Lake Valley and lying between the South Pahroc Range to the west and the Delamar Mountains to the east and southeast. Land within the SEZ is undeveloped scrubland characteristic of a high-elevation, semiarid basin.

The proposed Delamar Valley SEZ in Nevada and other relevant information are shown in Figure 11.2.1.1-1. The criteria used to identify the proposed Delamar Valley SEZ as an appropriate location for solar energy development included proximity to existing transmission or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed SEZ, other restrictions might be appropriate. The analyses in the following sections address the affected environment and potential impacts associated with utility-scale solar energy

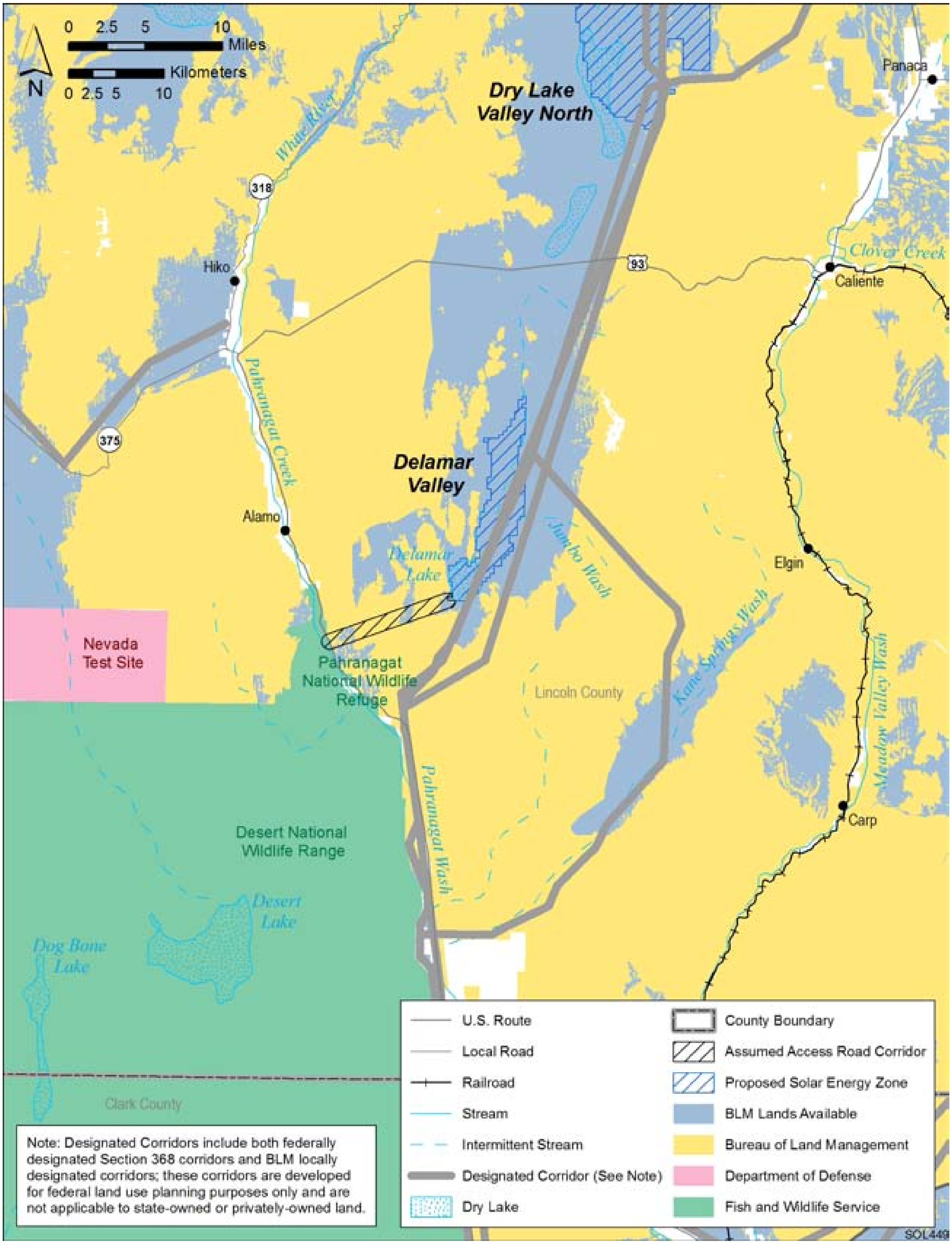

FIGURE 11.2.1.1-1 Proposed Delamar Valley SEZ

development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Delamar Valley SEZ encompassed 17,932 acres (73 km^2). Subsequent to the study area scoping period, the boundaries of the proposed Delamar Valley SEZ were altered somewhat to facilitate the BLM's administration of the SEZ area. The revised SEZ is approximately 1,380 acres (6 km^2) smaller than the original SEZ as published in June 2009.

11.2.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the proposed Delamar Valley SEZ is assumed to be 80% of the SEZ area over a period of 20 years, a maximum of 13,242 acres (54 km^2). These values are shown in Table 11.2.1.2-1, along with other development assumptions. Full development of the Delamar Valley SEZ would allow development of facilities with an estimated total of 1,471 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required and an estimated 2,648 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 69-kV line that runs through the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 69-kV capacity of that line would be inadequate for 1,471 to 2,648 MW of new capacity (note: a 500 kV line can accommodate approximately the load of one 700 MW facility). At full build-out capacity, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Delamar Valley SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in the PEIS, it was assumed that an existing 69-kV transmission line which intersects the SEZ could provide initial access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed. Access to the existing 69-kV transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different, offsite, grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they are needed.

An additional 58 acres (0.2 km^2) was assumed to be needed for new road access to support solar development in the Delamar Valley SEZ, as summarized in Table 11.2.1.2-1. This

TABLE 11.2.1.2-1 Proposed Delamar Valley SEZ—Assumed Development Acreages, Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Area of Assumed Transmission Line and Road ROWs	Distance to Nearest Designated Corridor[e]
16,552 acres and 13,242 acres[a]	1,471 MW[b] and 2,648 MW[c]	State Route 93 9 mi[d]	0 mi and 69 kV	0 acres and 58 acres	Adjacent

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] To convert mi to km, multiply by 1.609.

[e] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

estimate was based on the assumption that a new 8-mi (13-km) access road to the nearest major road, U.S. 93, would support construction and operation of solar facilities. While there are existing dirt/ranch roads within the SEZ, additional internal road construction may be required to support solar facility construction.

11.2.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 11.2.2 through 11.2.21 for the proposed Delamar Valley SEZ are summarized in tabular form. Table 11.2.1.3-1 is a comprehensive list of impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 11.2.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Delamar Valley SEZ are included in Sections 11.2.2 through 11.2.21 and in the summary table. The programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 11.2.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Delamar Valley SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the proposed Delamar Valley SEZ could disturb up to 13,242 acres (54 km^2). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and isolated, utility-scale solar energy development would be a new and discordant land use to the area.	None.
	The locally designated transmission corridor located within the SEZ occupies about 2,919 acres (12 km^2) (22%) of the proposed SEZ. The proposed SNWA pipeline ROW would also make additional land in the SEZ unavailable for solar energy development. Both of these ROWs would limit future solar development within the corridor, or alternatively, solar energy development in the SEZ could reduce corridor capacity..	Consideration should be given to relocating the existing transmission corridor and proposed SNWA ROW outside of the SEZ.
	Because of the 14-mi (23-km) length of the SEZ, east–west travel across the valley could be cut-off, requiring extensive detours for public land users.	None.
	A new 8-mi (13-km) access road would be constructed from the northern end of the SEZ to connect to U.S. 93, resulting in the surface disturbance of about 58 acres (0.2 km^2) of public land.	Priority consideration should be given to utilizing/improving existing roads to provide construction and operational access to the SEZ.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Specially Designated Areas and Lands with Wilderness Characteristics	Visual impacts of solar energy development would have the potential to affect wilderness characteristics of the Delamar Mountains and South Pahroc WAs.	The design features for visual resources should be adopted to minimize impacts on wilderness characteristics.
	Solar development of the SEZ could adversely affect the quality of the night sky environment in adjacent specially designated areas.	None.
Rangeland Resources: Livestock Grazing	Grazing would be precluded from areas developed for solar energy production. If full solar development would occur in the SEZ, the federal grazing permit for the Buckhorn allotment would be reduced in area by about 18%, and about 606 AUMs would be lost.	None.
Rangeland Resources: Wild Horses and Burros	About 33,140 acres (134.4 km^2) or 17.8% of the Delamar Mountains HA would be in the area of indirect impact for the Delamar Valley SEZ. However, with implementation of design features, indirect impacts on wild horses are expected to be negligible.	None.
Recreation	Recreation use would be eliminated from portions of the SEZ that would be developed for solar energy production.	None.
	Because the SEZ sits astride numerous roads and trails, construction of solar energy facilities could cause a major impact on existing recreation travel.	None.
Military and Civilian Aviation	The military has expressed serious concern over construction of solar energy facilities within the SEZ, and Nellis Air Force Base has indicated that any facilities more than 100 ft (30 m) may be incompatible with low-level aircraft use of the MTR. Further, the NTTR has indicated that solar technologies requiring structures higher than 50 ft (15 m) above ground level may present unacceptable electromagnetic compatibility concerns for their test mission.	None.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation). Delamar Lake may not be a suitable location for construction.	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.
Water Resources	Ground disturbance activities (affecting 36% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 2,814 ac-ft (3.5 million m^3) of water during the peak construction year. Construction activities would generate as high as 148 ac-ft (182,600 m^3) of sanitary wastewater. Assuming full development of the SEZ, operations would use the following amounts of water: • For parabolic trough facilities (2,648-MW capacity), 1,891 to 4,009 ac-ft/yr (2.3 million to 4.9 million m3/yr) for dry-cooled systems; water requirements for wet-cooled systems exceed the perennial yield of the basin.	Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures. Land disturbance activities should avoid impacts to the extent possible in the vicinity of the intermittent streams, ephemeral washes, and the dry lake present on the site. Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters. Groundwater rights must be obtained from the NDWR (dry-cooling and dish engine technologies may have to negotiate with the SNWA for water rights).

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	• For power tower facilities (1,471-MW capacity), 1,046 to 2,223 ac-ft/yr (1.3 million to 2.7 million m3/yr) for dry-cooled systems; water requirements for wet-cooled systems • For dish engine facilities (1,471-MW capacity), 752 ac-ft/yr (927,600 m3/yr). • For PV facilities (1,471-MW capacity), 76 ac-ft/yr (93,700 m3/yr). Assuming full development of the SEZ, operations would generate up to 37 ac-ft/yr (45,600 m^3/yr) of sanitary wastewater and up to 752 ac-ft/yr (927,600 m^3/yr) of blowdown water.	Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection. Groundwater monitoring and production wells should be constructed in accordance with state standards. Water for potable uses would have to meet or be treated to meet water quality standards according to *Nevada Administrative Code*.
Vegetation[b]	Up to 13,242 acres (54 km^2) of the SEZ would be cleared of vegetation. Because of the arid conditions, re-establishment of shrub, shrub steppe, or grassland communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as halogeton or tumbleweed. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. Dry washes, Delamar Lake playa, and the nearby marsh should be avoided to the extent practicable, and any impacts minimized and mitigated. Appropriate engineering controls should be used to

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*	The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Vegetation communities associated with Delamar Lake and other playa habitats, Jumbo Wash and the unnamed intermittent stream, greasewood flats communities, riparian habitats, marshes, or other intermittently flooded areas within or downgradient from solar projects or the access road could be affected by ground-disturbing activities. Joshua tree communities within the northern portion of the SEZ and within the assumed access road corridor could be directly or indirectly affected. The use of groundwater within the proposed Delamar Valley SEZ for technologies with high water requirements, such as wet-cooling systems, could disrupt the groundwater flow pattern and adversely affect the springs and wetlands within the Pahranagat NWR, located southwest of the SEZ.	minimize impacts on wetlands within the assumed access road corridor, as well as dry washes, Delamar Lake and other playas, and riparian, marsh, and greasewood flat habitats within the SEZ and corridor, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition. All wetland, dry wash, and riparian habitats within the assumed access road corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetlands, playas, dry washes, and riparian areas to reduce the potential for impacts. Appropriate buffers and engineering controls would be determined through agency consultation. Joshua tree communities are protected by the State of Nevada and should be avoided in the northern areas of the SEZ and along the assumed access road corridor. Any Joshua trees in areas of direct impacts should be salvaged. Cactus species, including cholla, or ocotillo should be avoided. Any cacti that cannot be avoided should be salvaged. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on springs and wetlands in the vicinity of the SEZ, at Pahranagat NWR. Potential impacts on springs should be determined through hydrological studies.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Wildlife: Amphibians and Reptiles[b]	Direct impacts on representative amphibian and reptile species from SEZ development would be small (i.e., loss of ≤1% of potentially suitable habitats). With implementation of proposed design features, indirect impacts would be expected to be negligible.	Delamar Lake, Jumbo Wash, and the unnamed wash should be avoided.
Wildlife: Birds[b]	Direct impacts on the killdeer would be moderate (i.e., loss of >1.0 to ≤10% of potentially suitable habitats). Impacts on all other representative bird species from SEZ development would be small (i.e., loss of ≤1% of potentially suitable habitats). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These indirect impacts are expected to be negligible with implementation of design features.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act. Delamar Lake, Jumbo Wash, and the unnamed wash should be avoided.
Wildlife: Mammals[b]	Based on land cover analyses direct impacts on mammal species would be small (i.e., loss of ≤1% of potentially suitable habitats). However, based on mapped ranges of big game species, direct impacts on pronghorn could be moderate (i.e., loss of >1.0 to ≤10% of its mapped range). In addition to habitat loss, other direct impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences). Indirect impacts on mammals could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with the implementation of design features.	The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. Delamar Lake and the unnamed wash should be avoided.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Aquatic Biota[b]	No permanent water bodies or streams are present within the area of direct or indirect effects associated with the Delamar Valley SEZ. The nearest perennial surface waters are located more than 8 mi (13 km) from the SEZ, and the intermittent streams in the SEZ do not drain into any permanent surface waters. Therefore, no direct impacts on perennial aquatic habitat are expected to result from solar development activities within the SEZ. Ground disturbance related to the presumed new access road terminates at U.S. 93, less than 1 mi (2 km) from Pahranagat Creek. Therefore, indirect impacts on the creek may result from the deposition of fugitive dust following ground disturbance.	Appropriate engineering controls should be implemented to minimize the amount of contaminants and sediment entering washes and Delamar Lake and Pahranagat Creek.
Special Status Species[b]	Potentially suitable habitat for 49 special status species occurs in the affected area of the Delamar Valley SEZ. For most of these special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects. For one species, up to 4% of the potentially suitable habitat in the region occurs in the area of direct effects. There are 15 groundwater dependent species that occur outside of the areas of direct and indirect effects. Potential impacts on these species could range from small to large depending on the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals.	Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible for some species, translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Consultation with the USFWS and NDOW should be conducted to address the potential for impacts on the following five species currently listed as threatened

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		or endangered under the ESA: Hiko White River springfish, Pahranagat roundtail chub, White River springfish, desert tortoise, and southwestern willow flycatcher. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Coordination with the USFWS and NDOW should be conducted to address the potential for impacts on the following four species under review for listing under the ESA that may be affected by solar energy development on the SEZ: grated tryonia, Hubbs springsnail, Pahranagat pebblesnail, and northern leopard frog. Coordination would identify an appropriate survey protocol, and mitigation requirements, which may include avoidance, minimization, translocation, or compensation. Avoiding or minimizing disturbance to riparian, desert wash, playa, cliff, and rock outcrop habitats on the SEZ could reduce or eliminate impacts on 13 special status species. Avoidance or minimization of groundwater withdrawals to serve solar energy development on the SEZ could reduce or eliminate impacts on 15 special status species. In particular, impacts on aquatic and riparian habitat in the Pahranagat Valley should be avoided.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.
Air Quality and Climate	*Construction*: Predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could temporarily exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities; higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Modeling indicates that Class I PSD PM_{10} increments at the nearest federal Class I area (Zion NP) would not be expected to be exceeded. Construction emissions from the engine exhaust from heavy equipment and vehicles could cause some short-term impacts on AQRVs (e.g., visibility and acid deposition) at the nearest federal Class I areas. *Operations*: Positive impact due to avoided emission of air pollutants from combustion-related power generation: 6.8 to 12% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada (up to 6,546 tons/yr SO_2, 5,615 tons/yr NO_x, 0.037 tons/yr Hg, and 3,604,000 tons/yr CO_2).	None.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Visual Resources	The SEZ is in an area of low scenic quality, with cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ. Solar development could produce large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape. The SEZ is located 1.8 mi (2.9 km) from the Delamar Mountains WA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by WA visitors. The SEZ is located 3.6 mi (5.8 km) from the South Pahroc Range WA. Because of the open views of the SEZ and elevated viewpoints, weak to strong visual contrasts could be observed by WA visitors. The SEZ is located 3.3 mi (5.3 km) from the North Delamar SRMA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by SRMA visitors. The SEZ is located 2.7 mi (4.4 km) from the Pahranagat SRMA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by SRMA visitors.	Within the SEZ, in areas visible from and within 3 mi (4.8 km) of the boundary of the Delamar Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by the BLM) within the WA. In areas visible from between 3 and 5 mi (4.8 and 8 km), visual impacts should be consistent with VRM Class III management objectives. The VRM Class II consistency mitigation would affect approximately 2,080 acres (8.417 km^2) within the western portion of the SEZ. The VRM Class III consistency mitigation would affect approximately 5,485 additional acres (22.2 km^2). Within the SEZ, in areas visible from between 3 and 5 mi (4.8 and 8 km) of the boundary of the South Pahroc Range WA, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives, as experienced from KOPs (to be determined by the BLM) within the WA. The VRM Class III consistency mitigation would affect approximately 4,921 acres (19.9 km^2).

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction*. For construction activities occurring near the southern SEZ boundary, estimated noise levels at the nearest residences (about 9 mi [14 km] west of that boundary) would be about 17 dBA, which is well below a typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn} at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas. *Operations* Noise levels at the nearest residences from a parabolic trough or power tower facility would be about 23 dBA, which is much lower than the typical daytime mean rural background level of 40 dBA. For 12-hour daytime operation, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated for the nearest residences, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. In the case of 6-hour TES, the estimated nighttime noise level at the nearest residences would be would be 33 dBA, which is a little higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level at the nearest residences, about 9 mi (14 km) from the SEZ boundary, would be about 34 dBA, which is below the typical daytime mean rural background level of 40 dBA. Assuming 12-hour daytime operation, the estimated 41 dBA L_{dn} at these residences would be well below the EPA guideline of 55 dBA L_{dn} for residential areas.	None.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Paleontological Resources	Few, if any, impacts on significant paleontological resources are likely to occur in 73% of the proposed Delamar Valley SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above, further assessment of paleontological resources in most of the SEZ is not likely to be necessary. The potential for impacts on significant paleontological resources in the remaining 27% of the SEZ is unknown. A more detailed investigation of the playa deposits is needed prior to project approval. A paleontological survey will likely be needed.	The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations.
Cultural Resources	The Delamar Valley SEZ has a high potential for containing prehistoric sites, especially in the dry lake area at the southern end of the SEZ. The potential for historic sites also exists in the area. Thus, direct impacts on significant cultural resources could occur in the proposed Delamar Valley SEZ; however, further investigation is needed at the project-specific level. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. Indirect impacts on cultural resources outside of the SEZ boundary, such as through looting or vandalism, are possible in rock shelter and petroglyph sites immediately west of the SEZ. Visual impacts on areas of traditional cultural importance if identified either in the Pahroc Range or in the Delamar Mountains, would occur.	Avoidance of significant resources clustered in specific areas within the proposed SEZ, especially in the vicinity of the dry lake, is recommended. Other SEZ-specific design features would be determined through consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Native American Concerns	While no comments specific to the proposed Delamar Valley SEZ have been received from Native American Tribes to date, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. When commenting on past projects in the Delamar Valley, the Southern Paiute have expressed concern over adverse effects of other energy projects on a wide range of resources. As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that there will be additional Native American concerns expressed over potential visual and other effects on specific resources and any culturally important landscapes within or adjacent to the proposed SEZ.	The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with the affected Tribes
Socioeconomics	*Livestock grazing:* Construction and operation of solar facilities could decrease the amount of land available for livestock grazing in the SEZ, resulting in the loss of four jobs (total) and $0.1 million (total) in income in the ROI. *Construction:* 457 to 6,048 total jobs; $27.9 million to $369.5 million income in ROI. *Operations:* 39 to 890 annual total jobs; $1.4 million to $33.6 million annual income in the ROI. Construction of new access road: 169 jobs; $6.7 million income in ROI.	None.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Environmental Justice	Although impacts are likely to be small, both minority and low-income populations, as defined by CEQ guidelines, occur within 50 mi (80 km) of the boundary of the SEZ; this means that any adverse impacts of solar projects could disproportionately affect minority and low-income populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum) or possibly 4,000 vehicle trips per day if two larger projects were developed at the same time. The additional traffic on U.S. 93 west of the SEZ would represent an increase in traffic volume of about 100 or 200% for one or two projects, respectively, should all traffic access the SEZ in that area. Such traffic levels would also represent an increase of about 250% or 500% of the traffic currently encountered on the east–west portion of U.S. 93 north of the SEZ for one or two projects, respectively.	None.

Abbreviations: AQRV = air quality-related value; AUM = animal unit month; BLM = Bureau of Land Management; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; dBA = A-weighted decibel; DoD = U.S. Department of Defense; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; HA = herd area; Hg = mercury; KOP = key observation point; L_{dn} = day-night average sound level; MTR = military training route; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NO_x = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; NTTR = Nevada Test and Training Range; NWR = National Wildlife Refuge; PEIS = programmatic environmental impact statement; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 µm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 µm or less; PSD = prevention of significant deterioration; PV= photovoltaic; ROI = region of influence; SEZ = solar energy zone; SNWA = Southern Nevada Water Authority; SO_2 = sulfur dioxide; SRMA = Special Recreation Management Area; USFWS = U.S. Fish and Wildlife Service; VRM = visual resource management; WA = Wilderness Area.

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Delamar Valley SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 11.2.10 through 11.2.12.

11.2.2 Lands and Realty

11.2.2.1 Affected Environment

The proposed Delamar Valley SEZ is a large and very well-blocked area of BLM-administered public land. The overall character of the land in and around the SEZ area is isolated and undeveloped. The southwestern portion of the SEZ includes part of a playa lake. U.S. 93 provides access to the southern end of the SEZ via a 12-mi (19-km) connecting dirt road that leaves the highway near Alamo, Nevada. Another dirt road connects to U.S. 93 and provides a 15-mi (24-km) access to the northern portion of the SEZ. Numerous dirt roads cross the SEZ or access livestock facilities in the area.

There are two locally designated transmission corridors in the area; one passes north–south through the eastern side of the SEZ, and the other is just outside the eastern boundary of the SEZ (see Figure 11.2.1.12-1). The former corridor is part of the route of a designated Section 368 (of the Energy Policy Act of 2005) energy corridor. Within this corridor, a permitted 500-kV SWIP transmission line has been approved for construction but has not yet been built. A 69-kV transmission line with a service road is located in the local corridor within the SEZ.

The SNWA has a ROW application for a pipeline that would pass through the middle of the proposed Delamar Valley SEZ. The pipeline has been proposed to convey water from northern Nevada to the Las Vegas area.

As of February 2010, there were no ROW applications for solar energy facility development within the proposed Delamar Valley SEZ.

11.2.2.2 Impacts

11.2.2.2.1 Construction and Operations

Full development of the proposed Delamar Valley SEZ could disturb up to 13,242 acres (54 km^2) (Table 11.2.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and isolated, utility-scale solar energy development would be a new and discordant land use to the area.

Existing ROW authorizations on the SEZ would not be affected by solar energy development since they are prior rights. Should the proposed SEZ be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development. Because the area currently has so few ROWs present, and because of additional BLM administered lands around the SEZ, it is not anticipated that approval of solar energy development would have a significant impact on future ROW availability in the area.

The designated local transmission corridor located within the SEZ occupies about 2,919 acres (12 km^2) (22%) of the proposed SEZ and could limit future solar development within the corridor. The proposed SNWA corridor would also limit future solar development within the SEZ. To avoid technical or operational interference between transmission and pipeline facilities and other solar energy facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. The transmission corridor and the SNWA ROW could be relocated outside the SEZ to allow full solar development within the SEZ. Alternatively, capacity of the corridor could be restricted to allow maximum solar development within the SEZ. Transmission capacity is becoming a more critical factor, and reducing corridor capacity in this SEZ may have future, but currently unknown, consequences. This is an administrative conflict that the BLM can address through its planning process, but there would be implications for the amount of potential solar energy development that could be accommodated within the SEZ if the existing corridor and SNWA ROW alignments are retained.

The existing roads and trails in the SEZ would be closed wherever solar energy facilities are developed. Because of the 14-mi (23-km) length of the SEZ, if east–west travel across the SEZ were prevented by solar energy development, a long detour around the site could be required. Additionally, the major road through the Delamar Valley provides access to areas around the SEZ. Any obstruction of existing access routes would adversely affect a wide range of public land users.

11.2.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 69-kV transmission line runs through the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

U.S. 93 is the closest highway to the SEZ, both north and southwest of the SEZ, and it is assumed for analysis purposes that a new 8-mi (13-km) road would be constructed from the highway to the southwest end of the SEZ. This would result in the surface disturbance of about 58 acres (0.2 km^2) of public land. Alternative or additional access to the SEZ could be provided to the northern end of the SEZ to connect from U.S. 93. Roads and transmission lines would be constructed within the SEZ as part of the development of the area.

11.2.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide mitigation for some identified impacts. The exceptions may be the development of the SEZ would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity and, utility-scale solar energy development would be a new and discordant land use to the area.

Proposed design features specific to the Delamar Valley SEZ include:

- Priority consideration should be given to utilizing/improving existing roads to provide construction and operational access to the SEZ.

- Consideration should be given to relocating the existing transmission corridor and proposed SNWA ROW outside of the SEZ.

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11.2.3 Specially Designated Areas and Lands with Wilderness Characteristics

11.2.3.1 Affected Environment

Fifteen specially designated areas occur within 25 mi (40 km) of the proposed Delamar Valley SEZ that potentially could be affected by solar energy development within the SEZ. These include one ACEC, six designated WAs, three SRMAs, the congressionally designated Silver State Off-Highway Vehicle Trail and Backcountry Byway, the Highway 93 State-designated Scenic Byway, Highway 375—the Extraterrestrial Highway, and two NWRs (see Figure 11.2.3.1-1).

Areas Located between 0 and 5 mi (0 and 8 km) from the SEZ

Delamar Mountains WA
South Pahroc WA
Pahranagat SRMA
North Delamar SRMA

Areas Located between 5 and 15 mi (8 and 24 km) from the SEZ

Big Rocks WA
Kane Springs ACEC
Highway 93 Scenic Byway
Silver State Off-Highway Vehicle Trail and Backcountry Byway
State Highway 375—the Extraterrestrial Highway
Chief Mountain SRMA
Pahranagat NWR
Desert National Wildlife Range

Areas Located between 15 and 25 mi (24 and 40 km) from the SEZ

Clover Mountains WA
Meadow Valley Range WA
Mount Irish WA

Viewshed analysis shows that the Clover Mountains and Meadow Valley Range WAs, State Highway 375—the Extra-Terrestrial Highway, and the Kane Springs ACEC would have no visibility of solar development within the SEZ and therefore would not be affected by development in the SEZ; thus they are not considered further. In addition, because such small portions of the Mount Irish WA and the Pahranagat NWR have any potential visibility of the SEZ, they are also not considered further. No lands near the SEZ and outside of designated WSAs have been identified by BLM to be managed to protect wilderness characteristics.

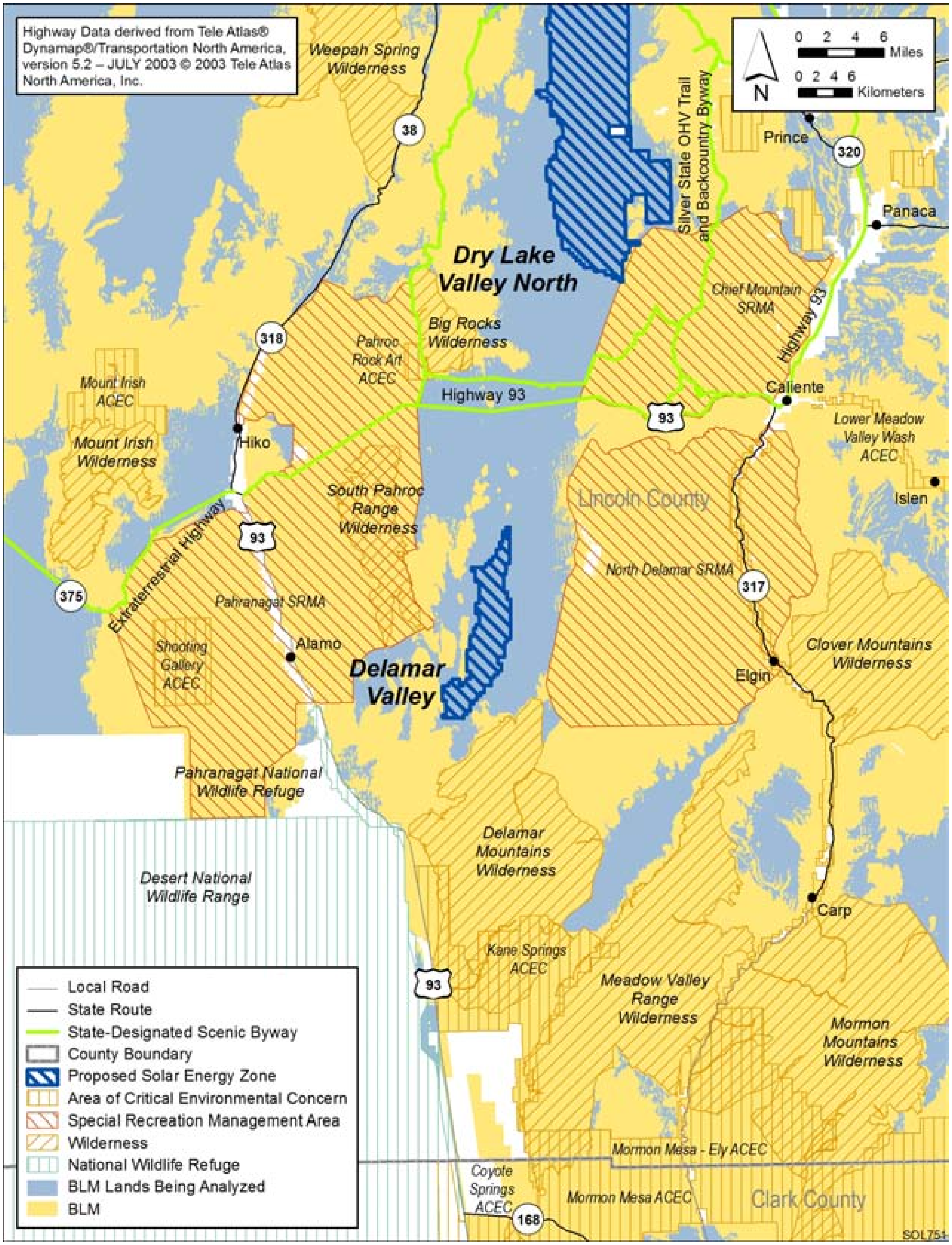

FIGURE 11.2.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Delamar Valley SEZ

11.2.3.2 Impacts

11.2.3.2.1 Construction and Operations

The primary potential impacts of solar energy development of the SEZ on the nine remaining specially designated areas near the SEZ would be from visual impacts or from obstruction of access on existing roads that could affect access and scenic, recreational, or wilderness characteristics of the areas. The visual impact on specially designated areas is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be a factor in the viewshed from portions of these specially designated areas, as summarized in Table 11.2.3.2-1. The data provided in the table assume the use of the power tower solar energy technology, which because of the potential height of these facilities, could be visible from the largest amount of land of the technologies being considered in the PEIS. Viewshed analysis for this SEZ has shown that the visual impacts of shorter solar energy facilities would be slightly less than for power tower technology (See Section 11.2.14 for more detail on all viewshed analysis discussed in this section). Assessment of the visual impact of solar energy projects must be conducted on a site-specific and technology-specific basis to accurately identify impacts.

In general, the closer a viewer is to solar development, the greater the impact on an individual's perception. From a visual analysis perspective, the most sensitive viewing distances generally are from 0 to 5 mi (0 to 8 km). The viewing height above a solar energy development area, the size of the solar energy development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness or scenic experience within these areas could be expected to be more adversely affected than those simply traveling along a highway with another destination in mind. In the case of the Delamar Valley SEZ, the low-lying location of the SEZ in relation to some of the surrounding specially designated areas, especially the South Pahroc Range and Delamar Valley WAs, would highlight the industrial-like development in the SEZ. In addition, because of the generally undeveloped nature of the whole area and the potential for a very large area of solar development, impacts on wilderness characteristics may be more significant than in other areas that are less pristine.

The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas that were used to assess potential impacts on specially designated areas do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

Access to much of the land around the SEZ, including the North Delamar and Pahranagat SRMAs and the South Pahroc Range and Delamar Mountains WAs, is on existing roads through the SEZ. Solar development of the SEZ may result in the closure or rerouting of some access roads that could have impacts on visitors' ability to reach these areas.

TABLE 11.2.3.2-1 Potentially Affected Specially Designated Areas within a 25-mi (40-km) Viewshed of the Proposed Delamar Valley SEZ, Assuming Power Tower Solar Technology with a Height of 650 ft (198.1 m)

		Feature Area or Highway Length[c]		
			Visible between	
Feature Type	Feature Name (Total Acreage/ Highway Length)[a]	Visible within 5 mi	5 mi and 15 mi	15 mi and 25 mi
WAs	Big Rocks (12,929 acres)	0 acres	2,531 acres (20%)	3 acres (0.2%)[b]
	Delamar Mountains (111,060 acres)	5,179 acres (5%)	663 acres (0.6%)	0 acres
	Mount Irish (28,283 acres)	0 acres	0 acres	198 acres (0.7%)
	South Pahroc Range (25,674 acres)	1,566 acres (6%)	4,846 acres (19%)	36 acres (0.1%)
National Wildlife Range	Desert (1,626,903 acres)	0 acres	4,948 acres (0.3%)	14,463 acres (0.9%)
NWR	Pahranagat (5,540 acres)	0 acres	10 acres (0.2%)	0 acres
SRMAs	Chief Mountain (111,151 acres)	0 acres	222 acres (0.2%)	1,549 acres (1.4%)
	North Delamar (202,839 acres)	9,947 acres (4.9%)	27,700 acres (13.7%)	0 acres
	Pahranagat (298,567 acres)	3,504 acres (1.2%)	35.341 acres (11.9%)	10,270 acres (3.4%)
Scenic Highways	Highway 93 (149 mi)	0 mi	8.8 mi (14.2 km)	0 mi
	Silver State Trail (240 mi)	0 mi	12 mi (5%)	0 mi
	Highway 375 — Extra-Terrestrial Highway (98 mi)	0 mi	0 mi	0 mi

a To convert acres to km^2, multiply by 0.004047; to convert mi to km, multiply by 1.609.

b Percentage of total feature acreage or road length viewable.

Because of the lack of development in the immediate region of the proposed Delamar Valley SEZ, the night sky is very dark, and night sky viewing is one of the attractions of camping in the area. Solar development of the SEZ could adversely affect the quality of the night sky environment. The amount of light that could emanate from solar facilities is not known, but it could adversely affect lands adjacent to the SEZ, including nearby WAs.

Delamar Mountains and South Pahroc Range Wilderness Areas

Solar development within the SEZ, especially full development, would be readily visible from portions of these two areas. The northern border of the Delamar Mountains WA boundary at its closest is within 2 mi (1.2 km) of the SEZ. Because of the steep rise of the mountains from the valley floor, it is the northern area of the WA that would be most heavily affected. Wilderness characteristics in the 5,178 acres (21 km^2) within 5 mi (8 km) of the SEZ would be adversely affected. On the basis of visual analysis, a relatively small amount of additional land, mainly scattered higher elevation areas located between 5 and 7 mi (8 and 11 km), would also have views of the SEZ if power tower technology were employed in the SEZ and wilderness characteristics there would also be adversely affected. Overall, visual analysis indicates that wilderness characteristics in 5% to 6% of the Delamar Mountains WA would be adversely affected depending upon the solar technology deployed in the SEZ.

It is largely the southern end and the eastern boundary of the South Pahroc Range WA that would be affected by solar development within the SEZ. Most of the affected acreage within the WA is from 3 to 8 mi (5 to 13 km) from the SEZ, and these areas would have a dominating view of development within the SEZ. Wilderness characteristics within this zone would be adversely affected. As distances from the SEZ increase in the northern portion of the WA, impacts on wilderness characteristics would decrease. Overall, visual analysis indicates that wilderness characteristics in 25% of the South Pahroc Range WA would be adversely affected depending upon the solar technology deployed in the SEZ.

Big Rocks Wilderness Area

The Big Rocks WA is located about 12 mi (19 km) north of the SEZ. Based on visual analysis, about 2,531 acres (10 km^2) of the WA would have limited visibility of the SEZ along its narrow axis from a distance of between 12 and 14 mi (19 and 22 km). About 20% of the WA would have long distance views of the SEZ. Because of the distance and limited width of the SEZ as seen from the WA, and the view of U.S. 93, there is expected to be no significant impact on wilderness characteristics in the Big Rocks Wilderness.

Pahranagat, North Delamar, and Chief Mountain SRMAs

These SRMAs are managed for a broad recreation opportunity spectrum to ensure a balance of recreation experiences. A wide range of activities occur within the SRMAs, including backcountry driving, hunting, OHV use, competitive racing, heritage tourism, and hiking as directed in the Ely Resource Management Plan (BLM 2008a). Small portions of both the Pahranagat and North Delamar SRMAs are within 5 mi (8 km) of the SEZ, and the SEZ would be visible from portions of all three SRMAs. While scenery is an important component of many recreational uses, the relatively limited near distance views of the SEZ from the SRMAs would limit the potential impact of solar development on the SRMAs. It is anticipated that there would not be a significant impact on these SRMAs from development of the proposed Delamar Valley SEZ.

Highway 93 State Scenic Byway

Viewshed analysis of the scenic byway shows that the views travelers on Highway 93 would have of the Delamar Valley SEZ would be from the north and at a distance of about 8 to 10 mi (13 to 16 km). The highway is slightly elevated above the level of the SEZ, and travelers would have periodic views of development within the SEZ along about 10 mi (16 km) of the highway. However, because of the distance to the SEZ, the relatively narrow view of the SEZ (only the narrow dimension of the SEZ would be exposed), and the nature of highway travel, it is not anticipated that there would be any adverse impact on the use of the scenic byway.

Silver State Off-Highway Vehicle Trail and Backcountry Byway

The trail/byway is about 10 mi (16 km) north of the SEZ and north of U.S. 93. The route of the trail is largely screened by topography, and views of development of the SEZ are expected to be minimal. It is not anticipated that there would be any impact on the use of the trail/byway.

Desert National Wildlife Range

The Desert National Wildlife Range's primary focus is the management of desert bighorn sheep, but numerous recreation opportunities exist in the area (USFWS 2010a). Although the nearest boundary of the Wildlife Range is about 9 mi (14 km) from the SEZ, intervening topography restricts views of solar energy facilities to power tower facilities, and in that instance, only the tower tops could be seen. Between 9- and 25-mi (14- and 40-km) views of tall solar facilities in the SEZ might be possible from about 20,000 acres (81 km^2) of the 1.5 million-acre (6,070-km^2) refuge. This amounts to about 1% of the refuge area. It is only at about 17 mi (27 km) that views of ground development within the SEZ would be possible. At this distance, there would be minimal visibility of SEZ facilities, and no adverse impacts on the NWR are anticipated.

11.2.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line, no additional construction of transmission facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts to specially designated areas. See Section 11.2.2.2 for a description of the analysis assumptions for transmission facilities.

Construction of an access road southwest from the SEZ to U.S. 93 would add about 58 acres (0.2 km^2) of surface disturbance to public land. This disturbance would not likely cause significant additional adverse impacts on specially designated areas.

11.2.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide some mitigation for some identified impacts. The exceptions may be the adverse impacts that would occur on wilderness characteristics in the South Pahroc and Delamar Mountains WAs and that would not be completely mitigated.

A proposed design feature specific to the Delamar Valley SEZ includes the following:

- The design features for visual resources included in Section 11.2.14.3 should be adopted to minimize impacts on wilderness characteristics.

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11.2.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros, both of which are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Delamar Valley SEZ are discussed in Sections 11.2.4.1 and 11.2.4.2.

11.2.4.1 Livestock Grazing

11.2.4.1.1 Affected Environment

The proposed Delamar Valley SEZ contains portions of two perennial grazing allotments; the Buckhorn and Oak Springs allotments. See Table 11.2.4.1-1 for a summary of key information regarding the allotments. There are numerous livestock water facilities located within the area of the proposed SEZ.

11.2.4.1.2 Impacts

Construction and Operations

Should utility-scale solar development occur in the proposed Delamar Valley SEZ, grazing would be excluded from the areas developed as provided for in the BLM grazing

TABLE 11.2.4.1-1 Grazing Allotments within the Proposed Delamar Valley SEZ

Allotment	Total Acres[a]	% of Acres in SEZ[b]	Active BLM AUMs	No. of Permittees[c]
Oak Springs	195,049	<1	9,268	1
Buckhorn	82,968	18	3,370	1

[a] Includes public, private, and state lands included in the allotment based on the Allotment Master Reports included in the BLM's Rangeland Administration System (BLM 2009a).

[b] This is the percentage of the total allotment acreage of public lands located in the SEZ.

[c] The same permittee uses both allotments.

regulations (43 CFR Part 4100). This would include reimbursement of the permittee for their portion of the value for any range improvements in the area removed from the grazing allotment. The impact of this change in the grazing permits would depend on several factors, including (1) how much of an allotment the permittee might lose to development, (2) how important the specific land lost is to the permittee's overall operation, and (3) the amount of actual forage production that would be lost by the permittee. The public lands in this SEZ include a minimal amount of the Oak Springs allotment, and loss of this portion of the allotment is anticipated to have no impact on the overall operation. No loss of AUMs is anticipated in this allotment. See Table 11.2.4.1-1 for a summary of the key information for the allotments.

If full solar development would occur in the SEZ, the federal grazing permit for the Buckhorn allotment would be reduced in area by about 18%. Using a simplified assumption that the grazing capacity of the allotment would be reduced by the same percentage as the reduction in acreage, 606 AUMs would be lost. This is considered to be a small impact for the permittee. A quantification of the impact on the grazing allotments and permittees would require a specific analysis involving, at a minimum, the three factors identified at the beginning of this section. The level of impact on the Buckhorn allotment permittee would also be affected by any mitigation of the loss (e.g., through installation of new range improvements) that could be accomplished on the remaining public lands in the allotment.

For the purposes of this PEIS and assuming a loss of the 606 AUMs as described above, there would be a minimal impact on livestock use within the Caliente Field Office from the designation and development of the proposed Delamar Valley SEZ. This conclusion was derived from comparing the loss of the 606 AUMs with the total BLM-authorized AUMs in the Caliente Field Office for grazing year 2009, which totaled 43,255 AUMs. This represents a loss of about 1.4%.

Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of a major transmission line in the SEZ, and assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of such activities outside of the SEZ was conducted See Section 11.2.2.2 for a description of the analysis assumptions for transmission facilities.

It is assumed that a new 8-mi (13-km) access road connecting to U.S. 93 to the southwest would be required to provide adequate access to the SEZ. Construction of this road would disturb about 58 acres (0.2 km^2) located in the Buckhorn and Lower Lake East allotments. This would not create a significant additional impact on grazing in either of these allotments.

11.2.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features were identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide some mitigation for identified impacts. The exceptions would be there would be a loss of grazing capacity within the Buckhorn allotment that would not be mitigated and there would be an adverse economic impact on the grazing permittee.

11.2.4.2 Wild Horses and Burros

11.2.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nearly 100 wild horse and burro herd management areas (HMAs) occur within Nevada (BLM 2009b). Portions of the Silver King and Eagle HMAs occur within the 50-mi (80-km) SEZ region for the proposed Delamar Valley SEZ (Figure 11.2.4.2-1). Neither HMA occurs within the SEZ or indirect impact area of the SEZ.

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah, and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to the proposed Delamar Valley SEZ is the Quinn Territory located within a portion of the Humboldt National Forest. This territory is located more than 50 mi (80 km) northwest of the SEZ (Figure 11.2.4.2-1).

11.2.4.2.2 Impacts

Because the Delamar Valley SEZ is about 16 mi (26 km) or more from any wild horse and burro HMA managed by the BLM and more than 50 mi (80 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly affect wild horses and burros that are managed by these agencies.

11.2.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features for solar development within the proposed Delamar Valley SEZ would be necessary to protect or minimize impacts on wild horses and burros.

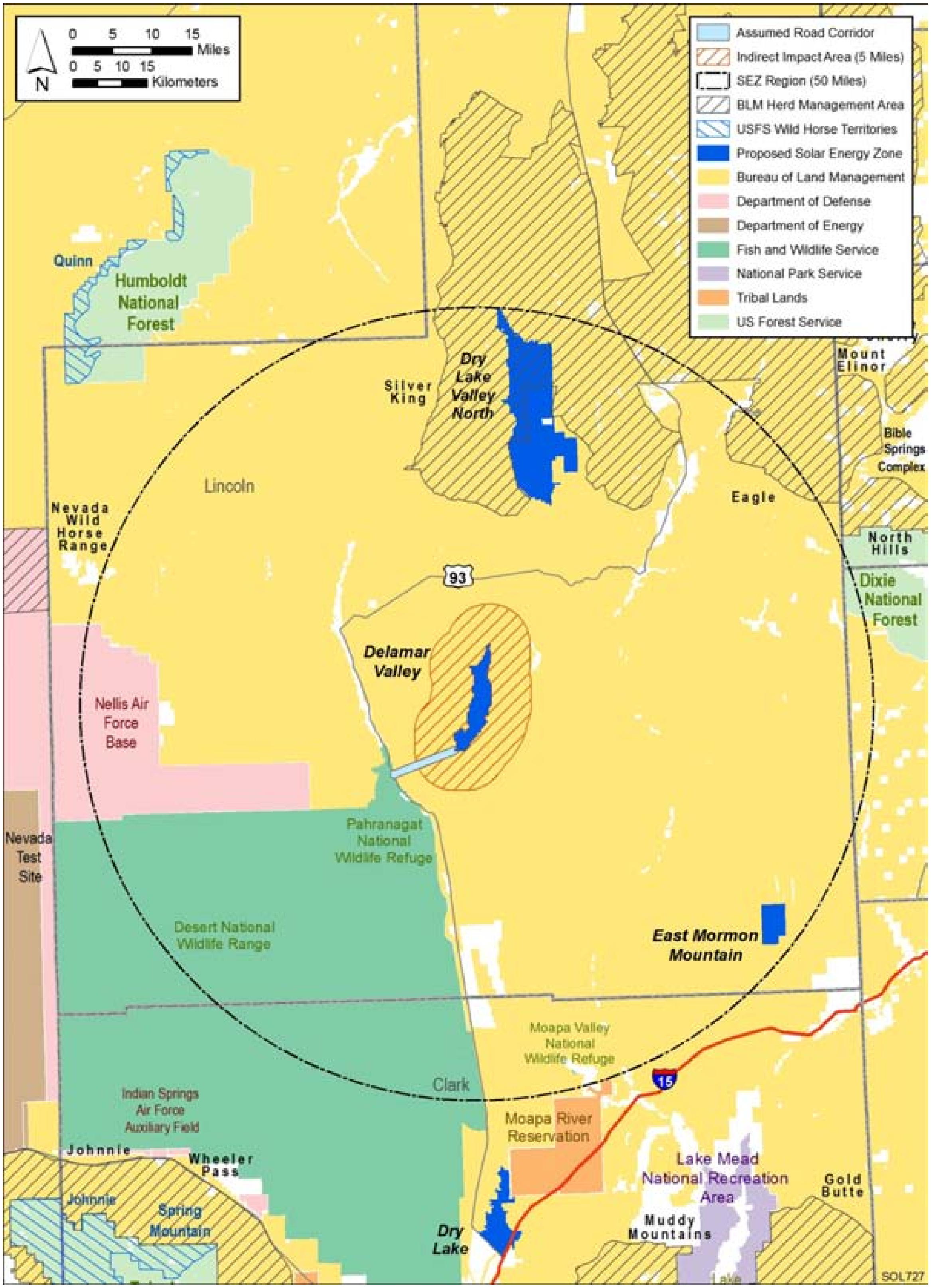

FIGURE 11.2.4.2-1 Wild Horse and Burro Herd Management Areas and Territories within the Analysis Area for the Proposed Delamar Valley SEZ (Sources: BLM 2010a; USFS 2007)

11.2.5 Recreation

11.2.5.1 Affected Environment

The site of the proposed Delamar Valley SEZ is a remote area that is flat with numerous roads and trails that provide access into and through the area. The main road in the valley passes through the SEZ. Backcountry driving, OHV use, and competitive truck, buggy, and motorcycle races that take place on the roads and trails in the areas surrounding the SEZ are important recreational activities. Camping and hunting opportunities are also available in and around the area. The general area attracts visitors from Las Vegas, about 80 mi (129 km) away. Native American petroglyphs as well as the deserted mining town of Delamar attract visitors to the area. The south end of the SEZ on the dry lakebed is popular for racing, and model rocket launching and for setting off pyrotechnics and is where much of the recreation in the area occurs. Two SRMAs are within 5 mi (8 km) of the SEZ, and a third SRMA is about 10 mi (16 km) north of the SEZ (see the brief description of the SRMAs in Section 11.2.3.2). OHV use in the SEZ and surrounding area has been designated as “Limited to travel on designated roads and trails” (BLM 2010c).

11.2.5.2 Impacts

Construction and Operations

Recreational use would be eliminated from portions of the SEZ developed for solar energy production. Although there are no recreational use figures for the general area, it is a common destination for a wide range of recreation visitors, and it is not clear what impact development of the valley bottom for solar energy use would have on the recreational use. Development of the southern end of the SEZ on the playa would curtail most of the use that occurs within the SEZ itself. The area contains numerous roads and trails that access areas around the SEZ, and the potential exists for some of these roads to be closed. In addition, the SEZ is about 15 mi (24 km) long and if east–west travel across the SEZ were prevented by solar energy development, a long detour around the site could be required. This would adversely affect recreation and other public land users. Whether recreational visitors would continue to use any remaining undeveloped portions of the SEZ, or how recreational use of areas surrounding the SEZ would change, is unknown.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If open OHV routes within the SEZ were identified during project-specific analyses, they would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line, no additional construction of transmission or road facilities was assessed. See Section 11.2.2.2 for a description of the analysis assumptions for transmission facilities.

It is assumed that a new 8-mi (13-km) access road connecting to U.S. 93 to the southwest would be required to provide adequate access to the SEZ. Construction of this road would disturb about 58 acres (0.2 km^2) but would not have a significant additional impact on recreation use.

11.2.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features were identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide mitigation for some identified impacts. The exceptions would be the loss of recreational use of the area developed for solar energy production that would not be mitigable.

11.2.6 Military and Civilian Aviation

11.2.6.1 Affected Environment

The Delamar Valley SEZ is crossed by one MTR with a 100 ft (30 m) AGL operating limit. Supersonic speeds are authorized at and above 5,000 ft AGL (1,524 m) in the NTTR in this area. The area is completely included within the boundary of the NTTR airspace. The closest military installations to the proposed SEZ are the NTTR, which is located about 50 mi (80 km) west of the SEZ, and Nellis Air Force Base, which is located about 70 mi (113 km) south of the area.

The nearest public airport is the Alamo Landing Field Airport located near the town of Alamo, about 13 mi (21 km) northwest of the closest boundary of the SEZ. The second closest public airport is the Lincoln County Airport, a small local airport about 32 mi (51 km) northeast of the SEZ. The Alamo Landing Field Airport and Lincoln County Airport do not have any scheduled commercial passenger or freight service.

11.2.6.2 Impacts

The military has expressed serious concern over solar energy facilities being constructed within the proposed Delamar Valley SEZ. Nellis Air Force Base has indicated that any facilities higher than 100 ft (30 m) may be incompatible with low-level aircraft use of the MTR. Additionally, the NTTR has indicated that solar technologies requiring structures higher than 50 ft (15 m) may present unacceptable electromagnetic compatibility concerns for its test mission. The NTTR maintains that a pristine testing environment is required for the unique national security missions conducted on the NTTR and that solar energy facilities could cause potential electromagnetic interference with those testing activities. Potential for electromagnetic interference, coupled with potential training route obstructions created by taller structures, make it possible that solar facilities could significantly affect military operations.

The Alamo Landing Field and Lincoln County Airports are located far enough from the SEZ that there would be no effect on their operations.

11.2.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features were identified. The programmatic design features described in Appendix A, Section A.2.2, would require early coordination with the DoD to identify and mitigate, if possible, potential impacts on the use of MTRs.

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11.2.7 Geologic Setting and Soil Resources

11.2.7.1 Affected Environment

11.2.7.1.1 Geologic Setting

Regional Setting

The proposed Delamar Valley SEZ is located in Delamar Valley, a north-trending closed basin within the Basin and Range physiographic province in southern Nevada. The valley lies immediately south of Dry Lake Valley (north). It is bounded on the west by the South Pahroc Range and on the east and southeast by the Delamar Mountains (Figure 11.2.7.1-1). Delamar Valley is one of many structural basins (grabens) typical of the Basin and Range province.

Exposed sediments in Delamar Valley consist mainly of modern alluvial and eolian deposits (Figure 11.2.7.1-2). Fan deposits consist of poorly sorted gravel, gravelly sand, and sand. Playa lake sediments at Delamar Lake (Qp) occur in the southern part of the valley and cover about 14% of the SEZ. The surrounding mountains are composed mainly of Late Proterozoic and Cambrian metamorphic rocks overlain by Paleozoic carbonate and shale and capped by late-Tertiary ash-flow tuffs from the Caliente caldera complex, one of a series of Tertiary caldera complexes in the Delamar Mountains to the east (Mankinen et al. 2008; Scott et al. 1992). The oldest rocks exposed in the region are the Late Proterozoic to Cambrian metamorphic rocks (CZq) that occur in the central part of the Delamar Mountains, near the Delamar mining district (Mankinen et al. 2008).

Semiconsolidated to unconsolidated basin-fill deposits are estimated to be about 0.6 to 1.2 mi (1 to 2 km) thick across most of Delamar Valley; estimates of the basin's maximum depth range from 2.5 to 4 mi (4 to 6.5 km) in the area just west of the southern part of the valley (depending on basin fill density assumptions; Scheirer 2005). Shallow basin-fill aquifers occur in the sand and gravel deposits. Most of these aquifers are hydraulically isolated from similar aquifers in adjacent valleys, but some are connected by flow through the underlying carbonate-rock aquifer (Mankinen et al. 2008).

Topography

The Delamar Valley is an elongated basin, about 25 mi (40 km) long and 8 to 12 mi (13 to 19 km) wide. It is south of Dry Lake Valley (south of U.S. 93). Elevations along the valley axis range from about 4,920 ft (1,500 m) at the northern end and along the valley sides to about 4,540 ft (1,380 m) at the Delamar Flat Reservoir at the southern end. Coalescing alluvial fans form continuous fan aprons along the mountain fronts on both sides of Delamar Valley; aprons on the east side of the valley are more deeply dissected and younger fans are more deeply inset into older fans (Swadley et al. 1992). The valley is drained by several unnamed ephemeral

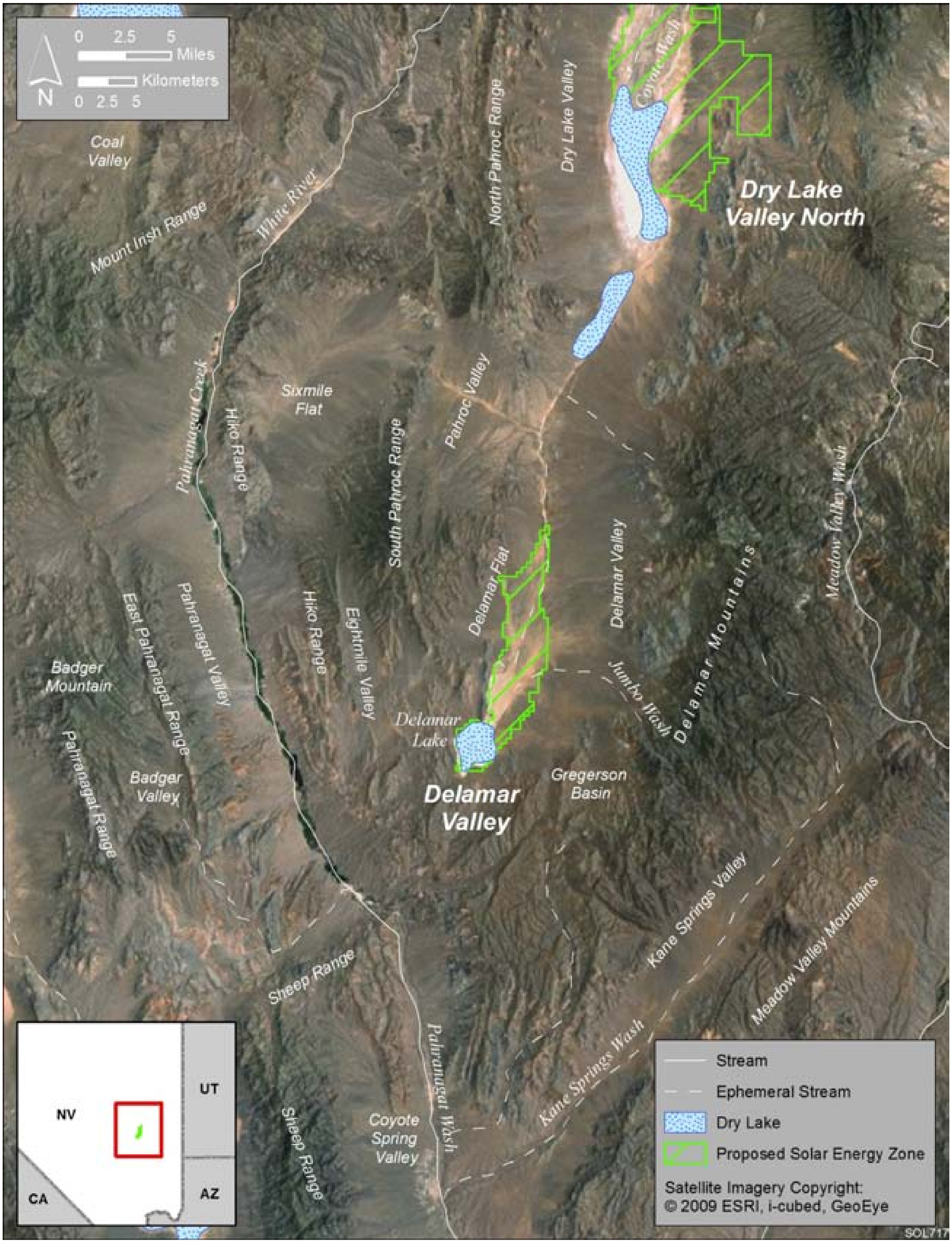

FIGURE 11.2.7.1-1 Physiographic Features of the Delamar Valley Region

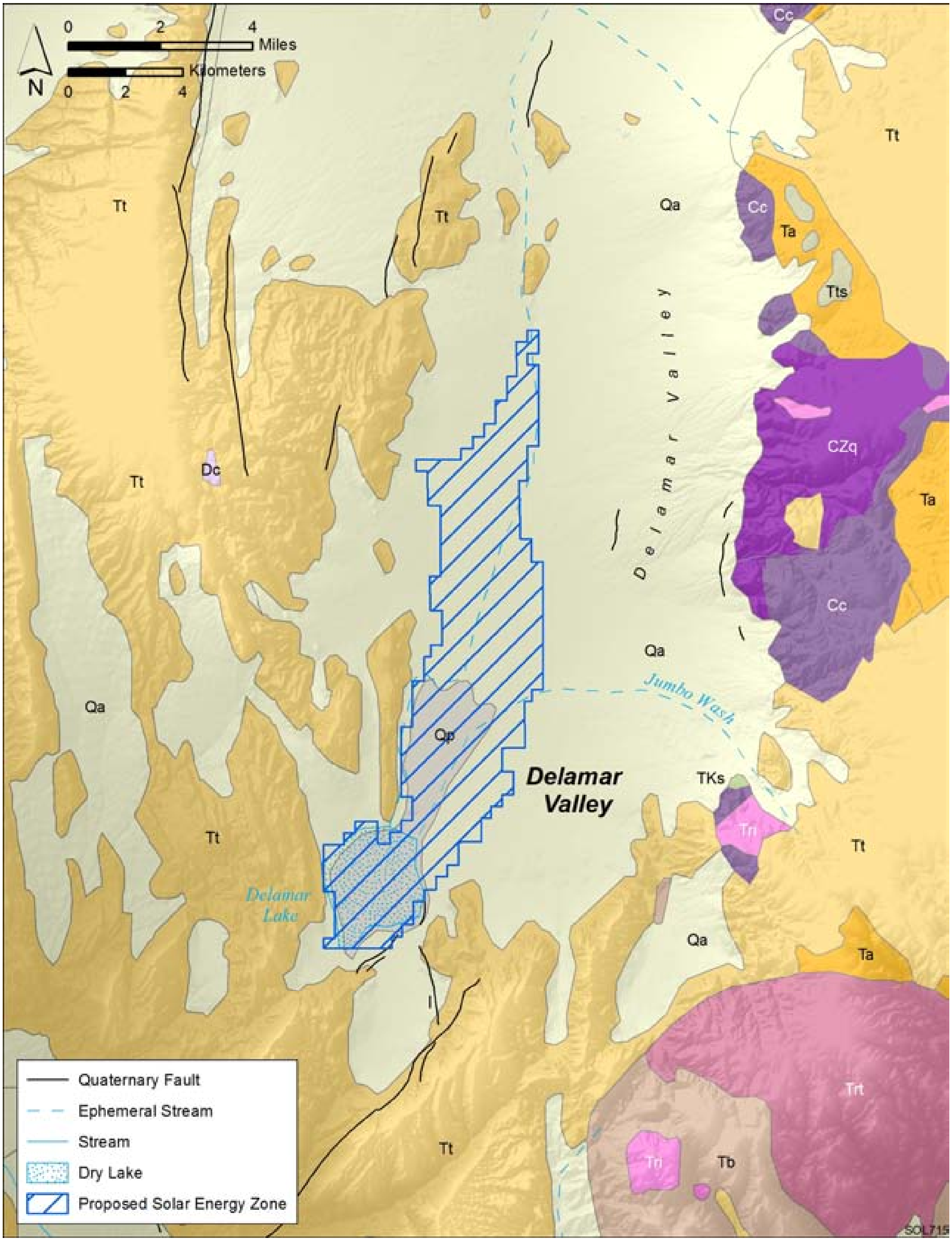

FIGURE 11.2.7.1-2 Geologic Map of the Delamar Valley Region (Ludington et al. 2007; Stewart and Carlson 1978)

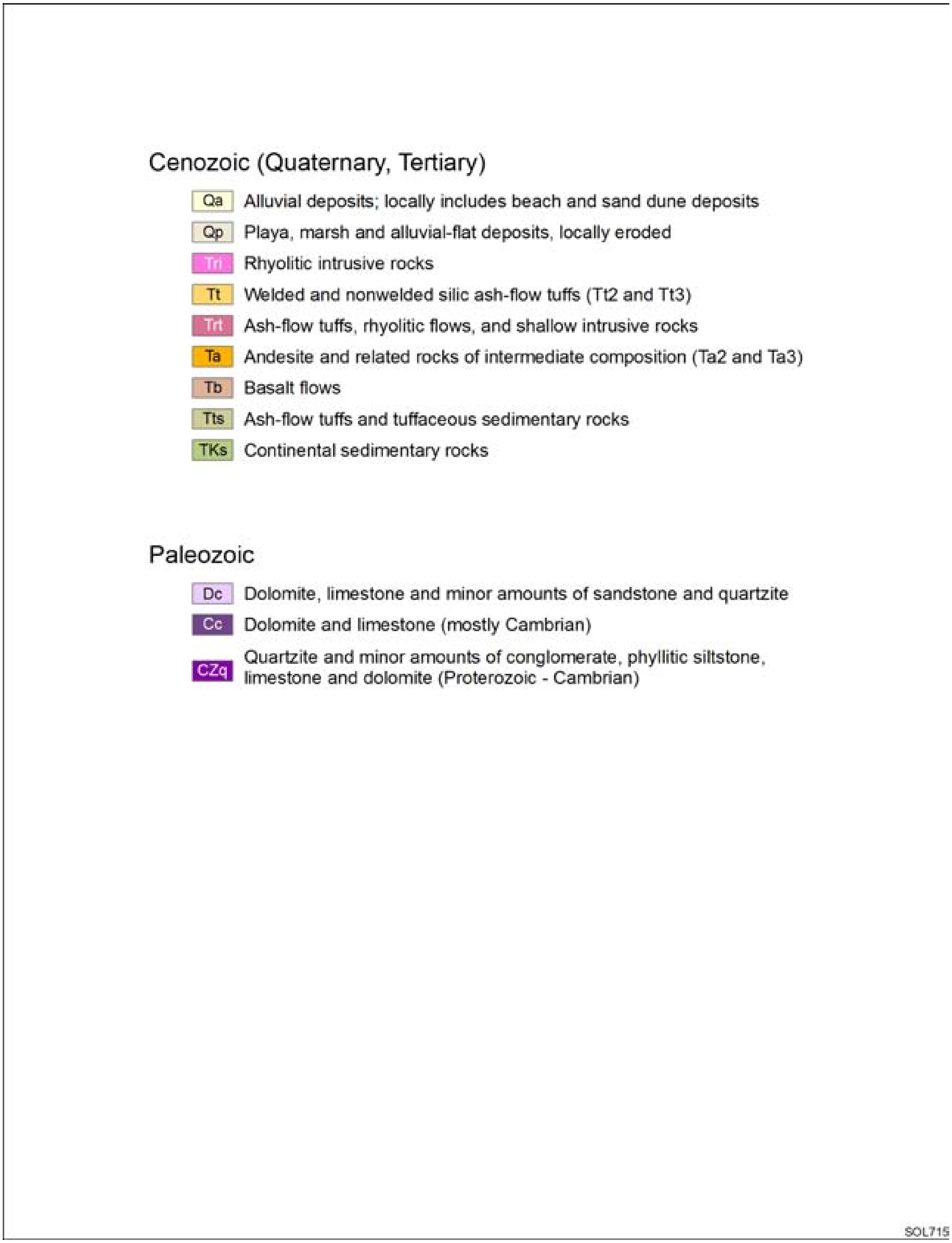

FIGURE 11.2.7.1-2 (Cont.)

streams that terminate at Delamar Lake, a playa in the southern part of the valley. The main topographic features in the valley are low volcanic hills in the northern part of the valley and the range front alluvial fans.

The proposed Delamar Valley SEZ is located in the southern part of Delamar Valley, between the South Pahroc Range to the west and the Delamar Mountains to the east. Its terrain slopes gently to the south. Elevations range from about 4,760 ft (1,450 m) in the northwest corner to 4,530 ft (1,380 m) near the SEZ's southwest end at Delamar Lake (Figure 11.2.7.1-3).

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Delamar Valley SEZ. Solar project developers may need to conduct a geotechnical investigation to identify and assess geologic hazards locally and to better identify facility design criteria and site-specific design features to minimize their risk.

Seismicity. Delamar Valley is located within the Southern Nevada Seismic Belt (also called the Pahranagat Shear Zone), a south–southwest trending zone of seismic activity characterized mainly by background earthquakes (i.e., earthquakes not associated with surface expression) (DePolo and DePolo 1999). The seismic zone is not well understood because it does not follow the dominant strike (north–south) of faulting in southern Nevada, but is thought to accommodate strain between an area of extension to the south (Mojave Desert) and the much more rigid area of the central Great Basin to the north (Kreemer et al. 2010). Faults within the Pahranagat Shear Zone are estimated to exhibit as much as 10 to 12 mi (16 to 19 km) of left-lateral movement (Tschanz and Pampeyan 1970). The proposed Delamar Valley SEZ lies to the north of the Maynard Lake fault. The Pahroc and Delamar Valley faults are to the northwest of the SEZ; the Delamar Mountains fault is to the east (Figure 11.2.7.1-4).

The northeast-trending Maynard Lake fault is located about 3 mi (5 km) south of the Delamar Valley SEZ. The fault extends to the southwest from the Delamar Lake area along bedrock ridges that cross the valley between the Delamar Mountains to the east and the Sheep Range to the southwest. Although the Maynard fault is part of a zone of left-lateral strike-slip faults, Quaternary displacement along it is vertical (normal). With the age of offset sediments (Late Pleistocene), the most recent movement along the fault is estimated at less than 130,000 years ago. The slip rate along this fault is estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Anderson 1999a).

The Pahroc and Delamar Valley faults together compose a group of discontinuous north-trending normal faults northwest of the Delamar Valley SEZ along the South Pahroc Range (Pahroc faults) and the low volcanic hills in the north part of the valley (Delamar Valley faults). Movement along the Pahroc fault is down to the east; east-facing scarps separate the main part of the South Pahroc Range from the alluvial flats and volcanic hills to the east. The Delamar Valley

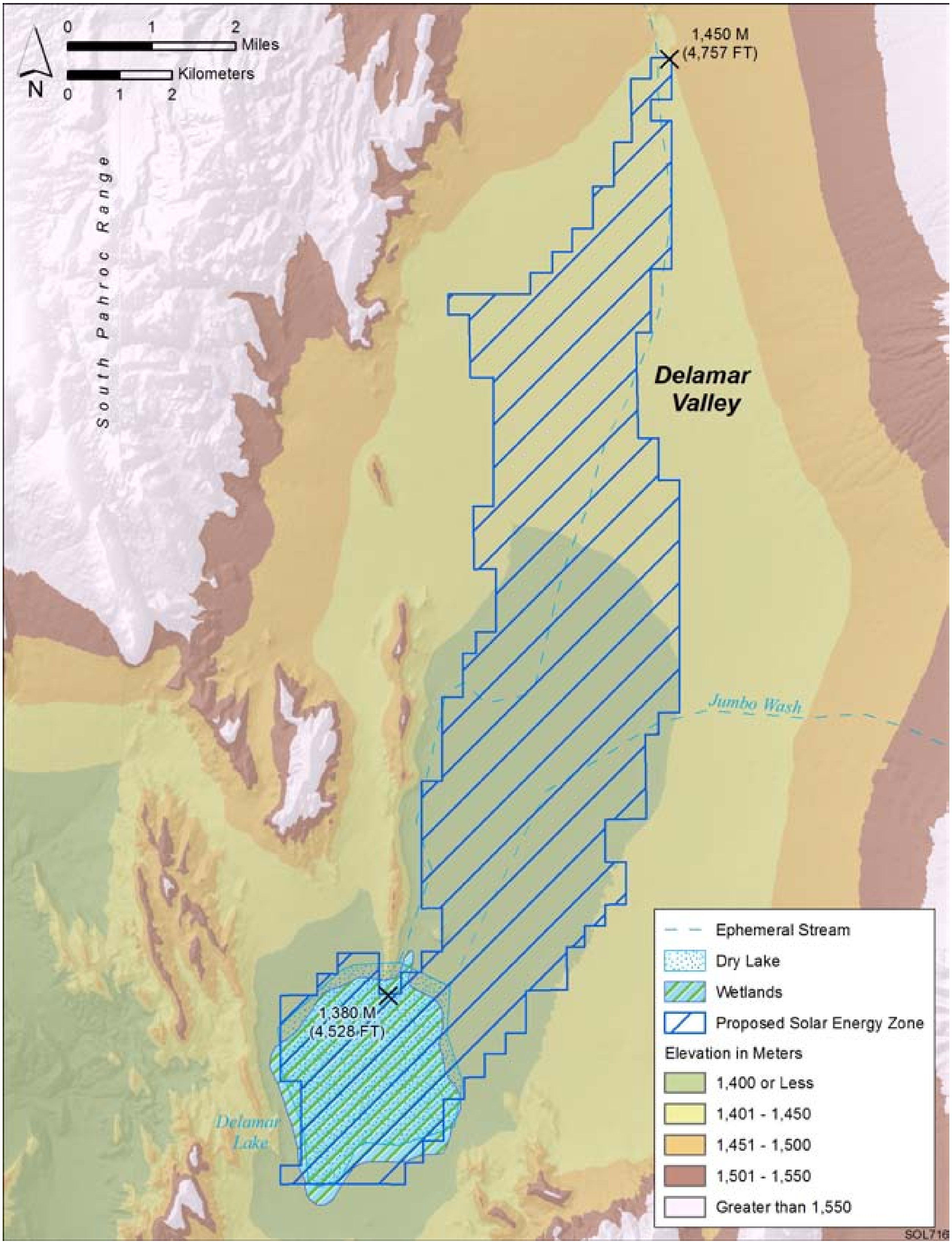

FIGURE 11.2.7.1-3 General Terrain of the Proposed Delamar Valley SEZ

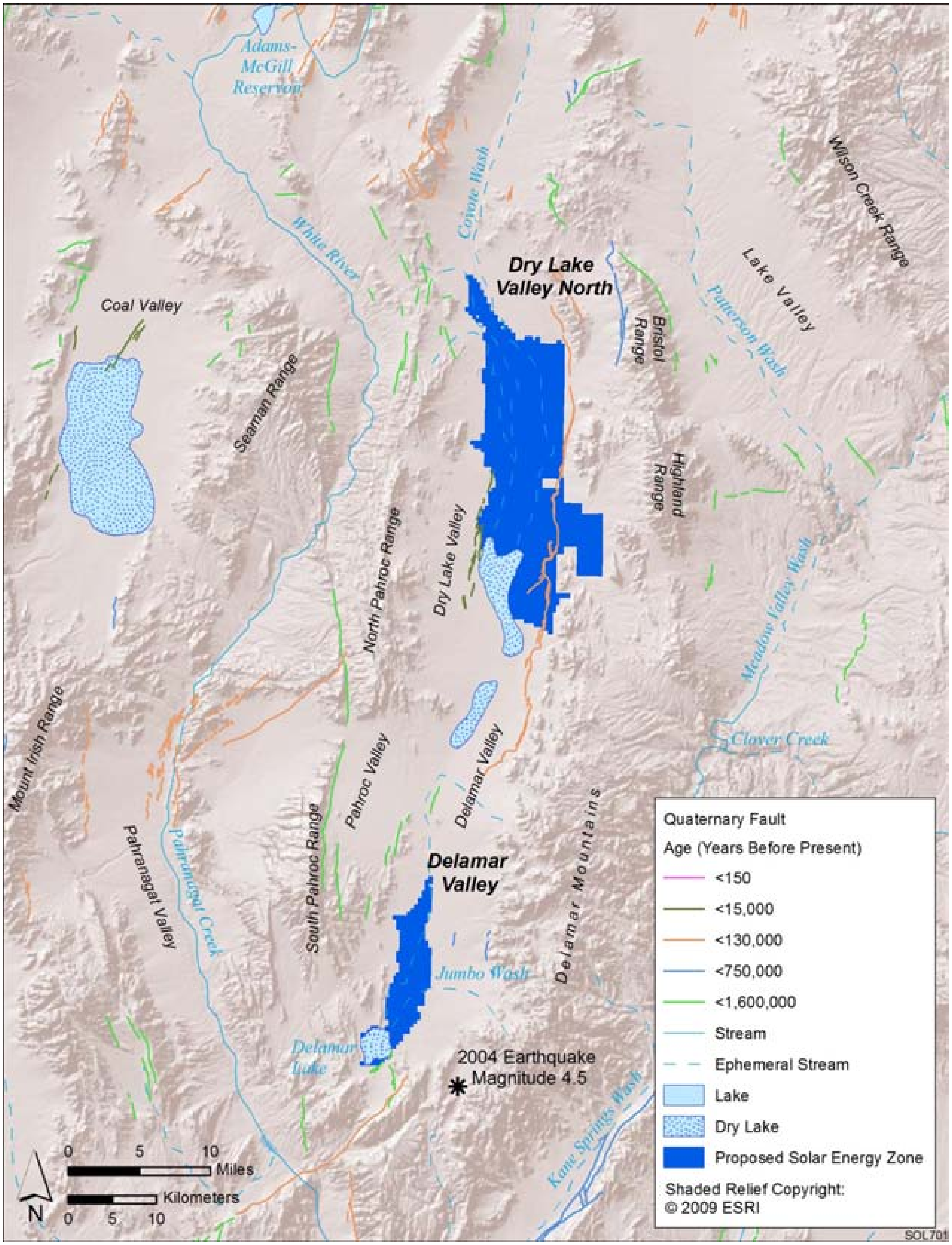

FIGURE 11.2.7.1-4 Quaternary Faults in the Delamar Valley Region (USGS and NBMG 2010; USGS 2010c)

fault is marked by west-facing scarps, indicating down-to-the-west movement. With offsets of middle to early Pleistocene sediments, the most recent activity on both these fault systems is estimated at less than 1.6 million years ago. Recurrence and slip rates have not been estimated, but the slip rates are thought to be low since these faults are "post-tectonic" (Anderson 1999b,c; Ertec Western, Inc. 1981).

The discontinuous group of north-trending normal faults making up the Delamar Mountains fault lies to the east of the Delamar Valley SEZ. These faults are part of a larger fault system of west-facing scarps, marking the boundary between the valley and the western base of the Delamar Mountains. With offsets of Pleistocene to Pliocene sediments, the most recent movement along the fault is estimated at less than 750,000 years ago. The slip rate along this fault is estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Anderson 1999d).

From June 1, 2000 to May 31, 2010, 57 earthquakes were recorded within a 61-mi (100-km) radius of the proposed Delamar Valley SEZ. The largest earthquake during that period occurred on May 16, 2004. It was located about 5 mi (8 km) southeast of the SEZ in the Gregerson Basin (near the Delamar Mountains) and registered a Richter scale magnitude (ML[1]) of 4.5 (Figure 11.2.7.1-4). During this period, 32 (56%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0; none were greater than 4.5 (USGS 2010c).

Liquefaction. The proposed Delamar Valley SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.10 and 0.15 g. Shaking associated with this level of acceleration is generally perceived as strong; however, potential damage to structures is light (USGS 2008). Given the deep water table (from 300 ft [90 m] in the north to 1,000 ft [305 m] below Delamar Lake [Ertec Western, Inc. 1981]) and the low intensity of ground shaking estimated for Delamar Valley, the potential for liquefaction in Delamar Valley sediments is likely to be low.

Volcanic Hazards. Several calderas in southern Nevada are the sources of voluminous and widespread Tertiary volcanic deposits throughout the region. These include the Indian Peak caldera complex to the northeast of Delamar Valley, between the Highland Range and the Nevada-Utah border; the Caliente caldera complex, also to the east, in the northern Delamar and Clover Mountains and extending into western Utah; the smaller Kane Springs Wash caldera in the southern Delamar Mountains; and the Central Nevada caldera complex to the northwest of Delamar Valley (Scott et al. 1992). Tertiary volcanism overlaps periods of extension in southern

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1 Richter scale magnitude (ML) was the original magnitude defined by Richter and Gutenberg for local earthquakes in 1935. It was based on the maximum amplitude recorded on a Wood-Anderson torsion seismograph but is currently calculated for earthquakes with magnitudes ranging from 2 to 6, using modern instruments with adjustments (USGS 2010d).

Nevada and occurred as recently as 2.6 million years ago (late Pliocene) (Noble 1972); however, there is no evidence of more recent volcanic activity associated with these complexes.

Delamar Valley is located about 80 mi (130 km) east–northeast of the southwestern Nevada volcanic field, which consists of volcanic rocks (tuffs and lavas) of the Timber Mountain-Oasis Valley caldera complex and Silent Canyon and Black Mountain calderas (Figure 11.2.7.1-4). The area has been studied extensively because of its proximity to the NTS and Yucca Mountain repository. Two types of fields are present in the region: (1) large-volume, long-lived fields with a range of basalt types associated with more silicic volcanic rocks produced by melting of the lower crust, and (2) small-volume fields formed by scattered basaltic scoria cones during brief cycles of activity, called rift basalts because of their association with extensional structural features. The basalts of the region typically belong to the second group; examples include the basalts of Silent Canyon and Sleeping Butte (Byers et al. 1989; Crowe et al. 1983).

The oldest basalts in the region were erupted during the waning stages of silicic volcanism in the southern Great Basin in the Late Miocene and are associated with silicic volcanic centers like Dome Mountain (the first group). Rates of basaltic volcanic activity in the region have been relatively constant but generally low. Basaltic eruptions occurred from 1.7 million to 700,000 years ago, creating the cinder cones within Crater Flat (Stuckless and O'Leary 2007). The most recent episode of basaltic eruptions occurred at the Lathrop Wells Cone complex about 80,000 years ago (Stuckless and O'Leary 2007). There has been no silicic volcanism in the region in the past 5 million years. Current silicic volcanic activity occurs entirely along the margins of the Great Basin (Crowe et al. 1983).

Crowe et al. (1983) determined that the annual probability of a volcanic event for the region is very low (3.3×10^{-10} to 4.7×10^{-8}), similar to the probability of 1.7×10^{-8} calculated for the proposed Yucca Mountain repository (Cline et al. 2005). The volcanic risk in the region is associated only with basaltic eruptions; the risk of silicic volcanism is negligible. Perry (2002) cites geologic data that could increase the recurrence rate (and thus the probability of disruption). These include hypothesized episodes of an anomalously high strain rate, the hypothesized presence of a regional mantle hot spot, and new aeromagnetic data that suggest that previously unrecognized volcanoes may be buried in the alluvial basins in the region.

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to facilities on the relatively flat terrain of valley floors like the Delamar Valley, if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

Other Hazards. Other potential hazards at the proposed Delamar Valley SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactible or collapsible soil (settlement). Disturbance of soil crusts and desert pavement on soil surfaces may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those found in the Delamar Valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) depends on the specific morphology of the fan) (National Research Council 1996). Section 11.2.9.1.1 provides further discussion of flood risks within the Delamar Valley SEZ.

11.2.7.1.2 Soil Resources

Soils within the proposed Delamar Valley SEZ are sandy loams and silt loams of the Geer, Penoyer, Koyen, Keefa, and Slaw Series, which together make up about 81% of the soil coverage at the site (Figure 11.2.7.1-5). Soil map units within the Delamar Valley SEZ are described in Table 11.2.7.1-1. These level to nearly level soils are derived from alluvium from mixed sources, typical of soils on alluvial fans and fan remnants. They are characterized as very deep and well drained. Most soils on the site have moderate surface runoff potential and moderate to moderately rapid permeability (except for the Slaw silt loam and playa soils which have slow permeability). The natural soil surface is suitable for roads with a slight to moderate erosion hazard when used as roads or trails. The Slaw silt loam along Jumbo wash, north of Delamar Lake, and playa soils within Delamar Lake are not suitable for roads because of high flooding or erosion potential and a severe rutting hazard. Ponding is frequent in playa soils, covering 2,394 ac (10 km^2), with a 50% chance of occurrence in any given year. The water erosion potential is low to moderate for most soils. The susceptibility to wind erosion is moderate, with as much as 86 tons (78 metric tons) of soil eroded by wind per acre (4,000 m^2) each year (NRCS 2010). Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

Only the playa soils within the proposed Delamar Valley SEZ are rated as hydric.[2] Flooding is rare for most soils at the site except for the Slaw silt loam, north of Delamar Lake, which covers about 2,706 ac (11 km^2) and has an occasional flood rating, with a 5 to 50% chance in any year. Soils of the Geer-Penoyer association and the Koyen gravelly sandy loam, covering 7,990 ac (32 km^2) in the north part of the site, are classified as prime farmland, if irrigated, depending of soil quality and erodibility (NRCS 2010).

11.2.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy facilities in varying degrees and are described in more detail for the four phases of development in Section 5.7 1.

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2 A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding (NRCS 2010).

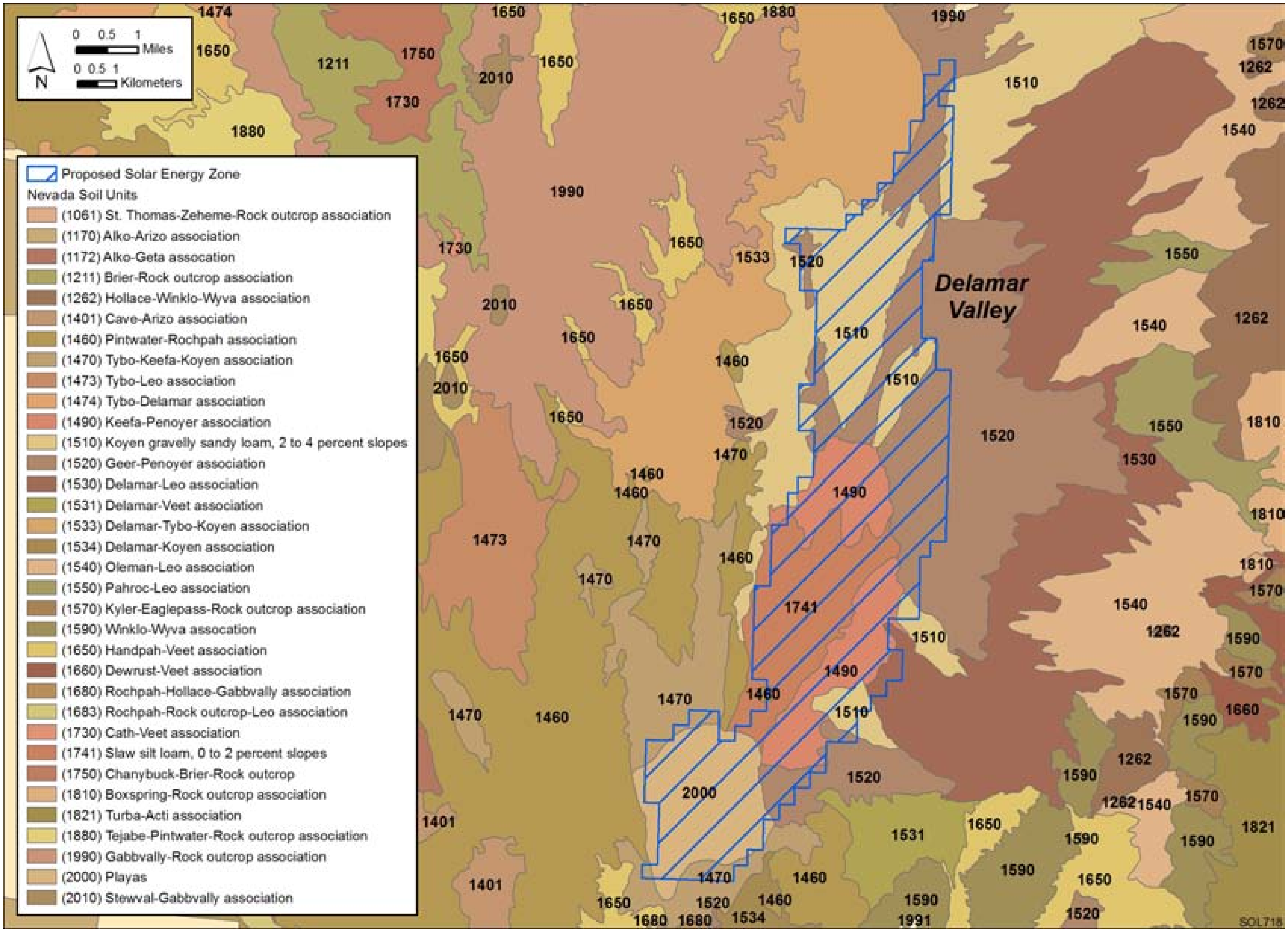

FIGURE 11.2.7.1-5 Soil Map for the Proposed Delamar Valley SEZ (NRCS 2008)

TABLE 11.2.7.1-1 Summary of Soil Map Units within the Proposed Delamar Valley SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
1520	Geer-Penoyer association	Moderate	Moderate (WEG 3)[d]	Consists of about 65% Geer fine sandy loam and 30% Penoyers silt loam. Level to nearly level soils on alluvial fan skirts and alluvial flats. Parent material is alluvium from welded tuff and limestone with a minor component of volcanic ash. Very deep and well drained, with moderate surface runoff potential and moderate permeability. Available water capacity is high. Severe rutting hazard. Used mainly for livestock grazing and cultivated crops (alfalfa, small grains, potatoes, and sugar beets). Prime farmland[e] if irrigated and reclaimed of excess salts and sodium.	4,314 (26)
1510	Koyen gravelly sandy loam (2 to 4% slopes)	Low	Moderate (WEG 4)	Nearly level soils on alluvial fan skirts. Parent material is alluvium from volcanic rock. Very deep and well drained, with moderate surface runoff potential and moderately rapid permeability. Available water capacity is low. Moderate rutting hazard. Used mainly for wildlife grazing and wildlife habitat. Prime farmland if irrigated (depending on climate and erodibility).	3,676 (22)
1490	Keefa-Penoyer association	Low	Moderate (WEG 3)	Consists of 70% Keefa sandy loam and 15% Penoyer silt loam. Level to nearly level soils on alluvial fan skirts. Parent material consists of alluvium from mixed sources. Very deep and well drained, with moderate surface runoff potential and moderate permeability. Available water capacity is low to high. Moderate rutting hazard. Used mainly for livestock grazing.	2,866 (17)
1741	Slaw silt loam (0 to 2% slopes)	High	Moderate (WEG 4)	Level to nearly level soils on alluvial flats and lacustrine deposits. Parent material consists of alluvium from mixed sources. Very deep and well drained, with high surface runoff potential (slow infiltration rate) and slow permeability. Available water capacity is high. Severe rutting hazard. Used mainly for livestock grazing, wildlife habitat, and limited irrigated cropland.	2,706 (16)

TABLE 11.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
2000	Playas	Moderate	Moderate (WEG 5)	Level soils formed on playas. Parent material consists of alluvium derived from mixed sources, including limestone and dolomite. Deep and somewhat poorly drained, with moderate surface runoff potential and slow permeability. Moderately to strongly saline. Available water capacity is very low. Severe rutting hazard.	2,394 (14)
1470	Tybo-Keefa-Koyen association	Low	Moderate (WEG 4)	Consists of 30% Tybo gravelly fine sandy loam, 30% Keefa gravelly very fine sandy loam, and 25% Koyen gravelly fine sandy loam. Level to nearly level soils on inset fans, sand sheets, and dunes. Parent material consists of alluvium from mixed sources, including volcanic rock. Deep (Tybo soils shallow to duripan) and well drained, with low surface runoff potential (high infiltration rate) and moderately rapid permeability. Available water capacity is very low to low. Moderate rutting hazard. Used mainly as livestock grazing and wildlife habitat.	334 (2)
1530	Delamar-Leo association	Low	Moderate (WEG 4)	Consists of 60% Delamar gravelly sandy loam and 30% Leo gravelly sandy loam. Nearly level soils on inset fans and alluvial fan remnants. Parent material consists of alluvium from mixed sources. Very deep (Delamar soils moderately deep to an indurated duripan) and well to excessively drained, with moderate surface runoff potential and moderately slow to rapid permeability. Available water capacity is low. Moderate rutting hazard. Used mainly for livestock grazing, wildlife habitat, and irrigated cropland (alfalfa and small grains).	155 (<1)

TABLE 11.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
1533	Delamar-Tybo-Koyen association	Moderate	Moderate (WEG 3)	Consists of 45% Delamar sandy loam, 25% Tybo gravelly fine sandy loam, and 15% Koyen gravelly sandy loam. Nearly level soils on inset fans and fan remnants. Parent material consists of alluvium from mixed sources, including volcanic rocks. Deep (Delamar soils moderately deep to an indurated duripan) and well drained, with moderate surface runoff potential and rapid to very rapid permeability. Available water capacity is very low to low. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat.	97 (<1)

[a] Water erosion potential rates based on soil erosion factor K, which indicates the susceptibility of soil to sheet and rill erosion by water. Values range from 0.02 to 0.69 and are provided in parentheses under the general rating; a higher value indicates a higher susceptibility to erosion. Estimates based on the percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8 low (see footnote d for further explanation).

[c] To convert from acres to km^2, multiply by 0.004047.

[d] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEGs 3 and 4, 86 tons (78 metric tons) per acre (4,000 m^2) per year; and WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year.

[e] Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses.

Source: NRCS (2010).

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility since some components would involve greater disturbance and would take place over a longer timeframe.

Delamar Lake may not be a suitable location for construction, because lakebed sediments are often saturated with shallow groundwater and likely collapsible. The lake sits within the lowest elevation area of Delamar Valley and serves as a sump for drainage in the valley.

11.2.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Delamar Valley SEZ. Implementing the programmatic design features described under both Soils and Air Quality in Appendix A, Section A.2.2., as required under BLM's Solar Energy Program, would reduce the potential for soil impacts during all project phases.

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11.2.8 Minerals (Fluids, Solids, and Geothermal Resources)

11.2.8.1 Affected Environment

There were no locatable mining claims within the proposed Delamar Valley SEZ as of July 13, 2010 (BLM and USFS 2010a), and the public land within the SEZ was closed to locatable mineral entry in June 2009, pending the outcome of this solar energy PEIS. There are no active oil and gas leases in the area, but all but a small portion of the area has been leased in the past (BLM and USFS 2010b). The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals, and for disposal of salable minerals. There is no active geothermal leasing or development in or near the SEZ, although a portion of the southwestern corner of the SEZ was previously leased (BLM and USFS 2010b).

11.2.8.2 Impacts

If the area were identified as a solar energy zone, it would continue to be closed to all incompatible forms of mineral development. For the purpose of this analysis, it was assumed that future development of oil and gas resources would continue to be possible, since such development could occur with directional drilling from outside the SEZ. Since the SEZ does not contain existing mining claims, it was also assumed that there would be no future loss of locatable mineral production. The production of common minerals, such as sand and gravel and mineral materials used for road construction or other purposes, might take place in areas not directly developed for solar energy production.

The SEZ has had no history of development of geothermal resources. For that reason, it is not anticipated that solar development would adversely affect the development of geothermal resources.

11.2.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features have been identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for mineral resources.

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11.2.9 Water Resources

11.2.9.1 Affected Environment

The proposed Delamar Valley SEZ is located within the Central Nevada Desert Basins subunit of the Great Basin hydrologic region (USGS 2010a) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). Delamar Valley is a narrow valley oriented north to south between the Delamar Mountains to the east and the South Pahroc Range to the west (Figure 11.2.9.1-1) with an average relief of 18 ft/mi (3.4 m/km) (Eakin 1963). The proposed Delamar Valley SEZ has surface elevations ranging between 4,530 and 4,760 ft (1,380 and 1,450 m); elevations in the surrounding mountains reach higher than 6,500 ft (1981 m). The climate in this region of Nevada is characterized as having low humidity and precipitation, with mild winters and hot summers (Planert and Williams 1995; WRCC 2010a). The average annual precipitation is 6.9 in. (17.5 cm), and the average annual snowfall is 2.7 in. (6.9 cm) in the adjacent Pahranagat Valley near the town of Hiko (WRCC 2010b). Precipitation and snowfall amounts are greater at higher elevations; the average annual precipitation ranges from 13.5 to 15.7 in. (34 to 40 cm) and snowfalls from 34.7 to 61.6 in. (88 to 156 cm) (WRCC 2010c,d). Pan evaporation rates are estimated to be 80 in./yr (203 cm/yr) (Cowherd et al. 1988; WRCC 2010e). Reference crop evapotranspiration has been estimated at 59 in./yr (150 cm/yr) in nearby Caliente (Huntington and Allen 2010).

11.2.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

There are no perennial surface water features in the proposed Delamar Valley SEZ. Delamar Lake is a dry lake that covers 2,600 acres (10.5 km^2) in the southern portion of the proposed SEZ. Two intermittent streams that originate out of the Delamar Mountains flow through the proposed SEZ. Both of these intermittent streams, Jumbo Wash and an unnamed wash, flow west out of the mountains and then turn southward towards Delamar Lake (Figure 11.2.9.1-1). Several ephemeral washes are located in the northern and central portions of the proposed SEZ that are oriented from north to south flowing towards Delamar Lake.

Several ephemeral washes that flow out of the surrounding mountains end prior to reaching the proposed SEZ (not labeled in Figure 11.2.9.1-1 but can be seen as drainage patterns on aerial photo). The most significant of these come out of the Delamar Mountains and include Monkey Wrench Wash, Helene Wash, Delamar Wash, Cedar Wash, and Big Lime Wash (listed by location from north to south); they are all north of Jumbo Wash. A shallow drainage divide separates the Delamar Valley and Dry Lake Valley just to the north. In Dry Lake Valley, peak discharges in the Dry Lake Valley Tributary coming out of the Delamar Mountains are as high as 150 ft^3/s (4.2 m^3/s) (USGS 2010b; gauge 10245270).

The White River system (also referred to as Pahranagat Creek in the Pahranagat Valley) follows the axis of the adjacent Pahranagat Valley, approximately 9 mi (14 km) west and south of Delamar Valley (Figure 11.2.9.1-1). The river bed is typically dry, but Upper Pahranagat Lake

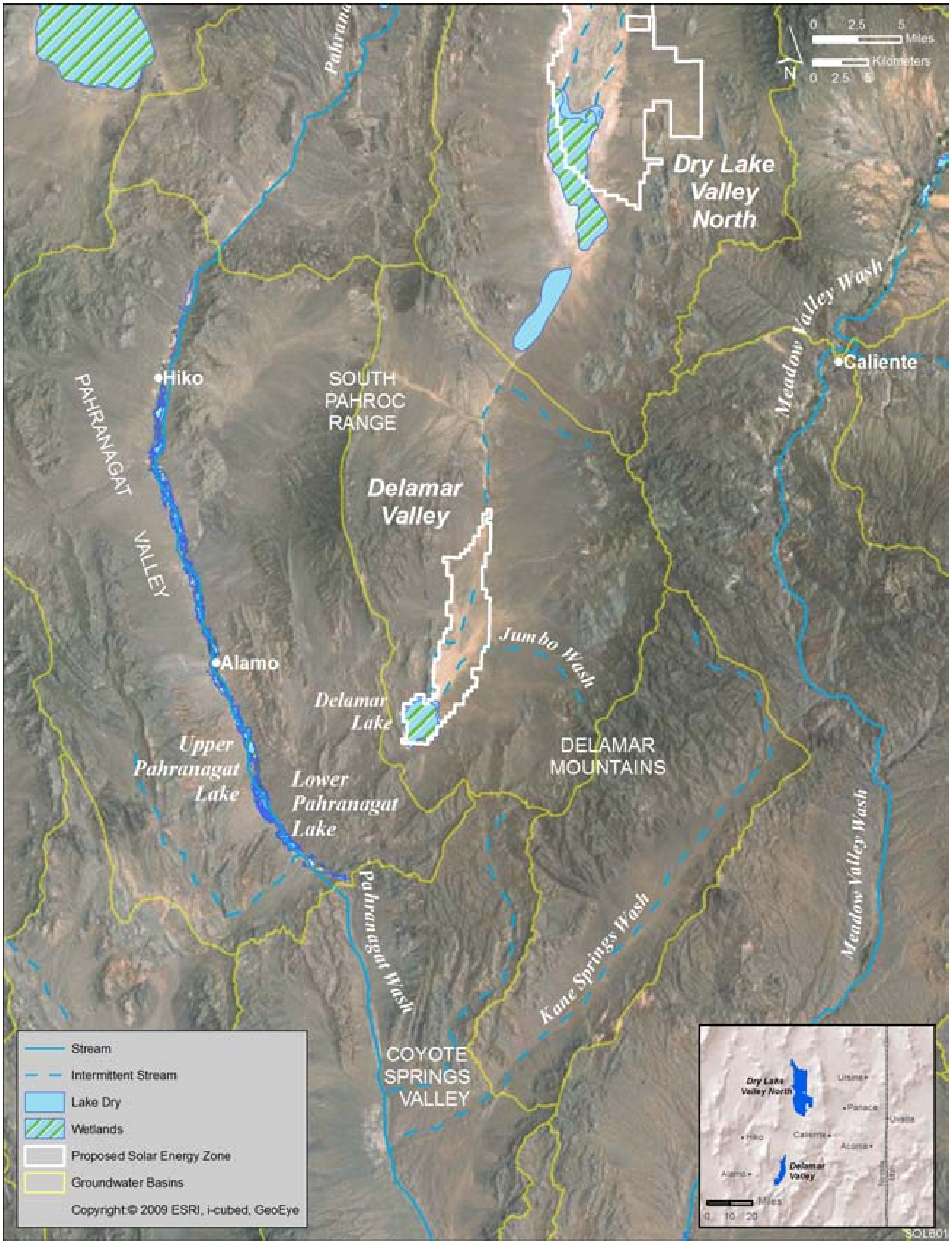

FIGURE 11.2.9.1-1 Surface Water Features near the Proposed Delamar Valley SEZ

contains water fed by thermal springs, which gets released to the Lower Pahranagat Lake and riparian areas downstream to maintain conditions in the Pahranagat National Wildlife Refuge (USFWS 2010d).

Delamar Lake is classified as a lacustrine wetland with an unconsolidated shore substrate, and the riparian regions of the White River system, Upper Pahranagat Lake, and Lower Pahranagat Lake contain a mixture of riverine, palustrine, and lacustrine wetlands according to the National Wetlands Inventory (USFWS 2009a). The hydrologic conditions of the marshes and wetlands in the Pahranagat National Wildlife Refuge are controlled to encourage habitat conditions, as well as to promote plant decomposition and plant growth at certain times (USFWS 2010b). Further information on wetlands in the region of the proposed Delamar Valley SEZ is presented in Section 11.2.10.1.

Flood hazards have not been identified (Zone D) for the region surrounding the proposed Delamar Valley SEZ (FEMA 2009). Intermittent flooding may occur, with temporary ponding and erosion along the ephemeral washes, from the hills on the sides of the basin and within the Delamar Lake region.

11.2.9.1.2 Groundwater

The proposed Delamar Valley SEZ is located within the Delamar Valley groundwater basin, which covers an area of 245,120 acres (992 km^2) (NDWR 2010a). The Delamar Valley groundwater basin is hydraulically connected to the Dry Lake Valley groundwater basin to the north (see Section 11.4.9.1.2) separated by a shallow surface divide. Groundwater in the Delamar Valley is contained in Quaternary and Tertiary age basin-fill deposits, Tertiary age volcanic rocks, and Paleozoic carbonate-rock aquifers (Burbey 1997). The basin fill deposits consist of interbedded sand, gravel, and clay with a thickness ranging from 1,000 to 4,000 ft (305 to 1,219 m) (Burbey 1997; SNWA and BLM 2008). The volcanic rock aquifer is up to 6,000 ft (1,829 m) in thickness (Burbey 1997), and the basin fill and volcanic rock aquifers together average a thickness of 9,800 ft (2,987 m) (Mankinen et al. 2008). The carbonate-rock aquifer can be as much as 10,000 ft (3,048 m) below the surface, except in the southwestern portion of Delamar Valley, where it is located at shallower depths (Burbey 1997).

The carbonate-rock aquifer beneath Delamar Valley and Dry Lake Valley basins is a part of the White River Groundwater Flow System, a regional-scale carbonate-rock aquifer that flows generally toward the south and terminates at Muddy River Springs and the Virgin River (Eakin 1966). The White River Groundwater Flow System is a part of a large carbonate-rock province that occurs within approximately one-third of Nevada, a large portion of Utah, and parts of Arizona and California (Harrill and Prudic 1998). Connectivity of the carbonate rocks that underlay Dry Lake Valley to the White River Groundwater Flow System is not well understood, and has yet to be studied in detail in this area (Harrill and Prudic 1998; NDWR 2008).

The water balance on groundwater in the Delamar Valley consists of precipitation recharge, subsurface inflow, and subsurface outflow processes. Evapotranspiration of groundwater is negligible given the considerable depth to groundwater in the Delamar Valley

(NDWR 2008). Groundwater recharge from precipitation occurs within the valley and via runoff from higher elevations in the surrounding mountains. Estimates of groundwater recharge vary depending upon the methodology used and range from 1,000 ac-ft/yr (1.2 million m^3/yr) (Eakin 1963, 1966) to between 6,400 and 7,760 ac-ft/yr (7.9 million and 9.6 million m^3/yr) (Flint et al. 2004; NDWR 2008). Subsurface inflow from the Dry Lake Valley groundwater basin ranges from 5,000 to 7,000 ac-ft/yr (6.2 million to 8.6 million m^3/yr), and subsurface discharge to Pahranagat Valley and Coyote Springs Valley from 6,000 to 9,500 ac-ft/yr (7.4 million to 11.7 million m^3/yr) (Burbey 1997).

Several springs are located at higher elevations in the Delamar Mountains according to USGS topographic maps. Only one spring is considered to have a significant water source, Grassy Spring, in the northeastern portion of Delamar Valley and at an elevation of 5,783 ft (1,760 m), which has a discharge ranging from 1.6 to 16.0 ac-ft/yr (1,970 to 19,700 m^3/yr) (SNWA and BLM 2008). However, the springs in this region are predominantly recharged by local runoff in the mountains and disconnected from the main groundwater aquifers in Delamar Valley (NDWR 2008).

In the Delamar Valley, groundwater enters from the Dry Lake Valley to the north and along the basin margins, where infiltration occurs along mountain front areas. The general groundwater flow direction is from north to south. Groundwater surface elevations range from 3,840 ft (1,170 m) near the center of the valley to 4,530 ft (1,381 m) at the base of the Delamar Mountains (USGS 2010b; wells 372639114520901 and 33192311451330, respectively). The depth to groundwater is typically on the order of 900 ft (274 m) below the ground surface, and a substantial portion of the groundwater flow is in the basin fill and volcanic rock aquifers (Burbey 1997). Delamar Valley is at higher elevations than Pahranagat Valley and Coyote Springs Valley located to the west and south, and the relative amount of groundwater discharge to these receiving basins is not fully realized (NDWR 2008). However, it is likely that the groundwater in the basin fill and volcanic rock aquifers of Delamar Valley discharges to the carbonate-rock aquifers of the Pahranagat Valley and Coyote Springs Valley basins that are a part of the White River Groundwater Flow System, given that the basin fill deposits are not as thick in these receiving basins (Burbey 1997).

The chemical quality of water in the Delamar Valley basin is varied, as indicated by groundwater sampling conducted by the SNWA. This effort indicated that some groundwater samples exceeded primary drinking water MCL standards for arsenic and fluoride, as well as secondary MCL standards for aluminum and iron. TDS concentrations ranged between 210 and 481 mg/L (SNWA and BLM 2008).

11.2.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million m^3/yr), and livestock and mining water uses on the order of 230 ac-ft/yr (280,000 m^3/yr) and

450 ac-ft/yr (560,000 m^3/yr), respectively (Kenny et al. 2009). However, within Delamar Valley there has been very little groundwater development, with less than 100 ac-ft/yr (123,000 m^3/yr) withdrawn for stock ponds (Eakin 1963).

All waters in Nevada are the property of the public in the state of Nevada and subject to the laws described in Nevada Revised Statutes, Chapters 532 through 538 (available at http://leg.state.nv.us/nrs). The NDWR, led by the Office of the State Engineer, is the agency responsible for managing both surface water and groundwater resources, and this responsibility includes overseeing water right applications, appropriations, and interbasin transfers (NDWR 2010b). The two principal ideas behind water rights in Nevada are the prior appropriations doctrine and the concept of beneficial use. A water right establishes an appropriation amount and date such that more senior water rights have priority over newer water rights. Additionally, water rights are treated as both real and personal property, such that water rights can be transferred without affecting the land ownership (NDWR 2010b). Water rights applications (new or transfer of existing) are approved if the water is available to be appropriated, if existing water rights will not be affected, and if the proposed use is not deemed to be harmful to the public interest. If these conditions are satisfied according to the Office of the State Engineer, a proof of beneficial use of the approved water must be provided within a certain time period, and following that a certificate of appropriation is issued (BLM 2001).

Delamar Valley is not a designated groundwater basin; thus, there are no specified beneficial uses set by the NDWR (NDWR 1974). The NDWR estimates the perennial yield for each groundwater basin as the amount of water that can be economically withdrawn for an indefinite period without depleting the source (NDWR 1999). The perennial yield of the Delamar Valley groundwater basin is set at 2,550 ac-ft/yr (3.1 million m^3/yr), representing one-half of the natural recharge estimate used by the Office of the State Engineer in Ruling 5875 (NDWR 2008). Of the available 2,550 ac-ft/yr (3.1 million m^3/yr) in water rights, 7 ac-ft/yr (8,600 m^3/yr) is allocated for stock water and 2,493 ac-ft/yr (3.1 million m^3/yr) for municipal use (NDWR 2010a). The municipal water right allocation was granted to the SNWA by the Office of the State Engineer through Ruling 5875, with the remaining 50 ac-ft/yr (61,700 m^3/yr) of unallocated water rights in Delamar Valley being set aside for future water development (NDWR 2008). The SNWA is developing a project that would convey water to Las Vegas with a small portion of this water set for use in Lincoln County (SNWA 2008). However, in October 2009, the Seventh Judicial District Court of Nevada (Lincoln County) ordered the NDWR Ruling 5875 be remanded, and in November 2009, the SNWA filed an appeal to the Nevada Supreme Court to fight this decision (BLM 2010b). In June 2010, the Nevada Supreme Court issued a ruling related to SNWA water rights applications in Dry Lake Valley; the NDWR has been ordered to reconsider the SNWA water rights applications and reopen the protest period related to the applications (*Great Basin Water Network v. State Engineer* 2010).

11.2.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, as well as off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water-wetland-groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by the excessive withdrawal from aquifers).

11.2.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy development and are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. Land disturbance activities should be avoided to the extent possible within the two intermittent streams, Jumbo Wash and unnamed wash, in the proposed Delamar Valley SEZ. Additionally, minimizing landscape alterations to the many ephemeral washes and Delamar Lake would reduce impacts associated with erosion, sedimentation, and habitat disturbances within the washes, as well as the clogging of groundwater recharge at Delamar Lake.

11.2.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Delamar Valley SEZ include the following:

- On the basis of a total area of 16,552 acres (67 km2), it is assumed that two solar projects would be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;

- The maximum land disturbance for an individual solar facility during the peak construction year is 3,000 acres (12 km2);

- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, result in the potential to disturb up to 36% of the SEZ total area during the peak construction year; and

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry cooling (see Section 5.9.2.1).

Site Characterization

During site characterization, water would be used mainly for the workforce potable water supply and fugitive dust control. Impacts on water resources during this phase of development are expected to be negligible, because activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Because there are no significant surface water bodies on the proposed Delamar Valley SEZ, the water requirements for construction activities could be met either by trucking water to the sites or by using on-site groundwater resources. The variable quality of groundwater in the Delamar Valley basin could potentially be an issue for the potable water supply. Elevated concentrations of arsenic and fluoride have been reported in the basin that exceed drinking water standards. If the groundwater supply used for a project does not meet drinking water standards, then treatment or off-site sources would need to be considered.

Water requirements for dust suppression and potable water supply during construction are shown in Table 11.2.9.2-1 and could be as high as 2,814 ac-ft (3.5 million m^3). The assumptions underlying these estimates for each solar energy technology are described in Appendix M. Groundwater wells would have to yield an estimated 1,220 to 1,740 gpm (4,620 to 6,590 L/min) to meet the estimated construction water requirements. These groundwater withdrawal rates are similar in magnitude to those of large municipal and irrigation production wells (Harter 2003), so multiple wells may be needed in order to obtain the water requirements. The total water requirements during the peak construction year are similar to quantities used on small to medium-size farms in Nevada (USDA 2009c). The availability of groundwater and the potential impacts of groundwater withdrawal would need to be assessed during the site characterization phase. In addition, up to 148 ac-ft (182,600 m^3) of sanitary wastewater would need to be treated either on-site or sent to an off-site facility.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 11.2.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, hybrid, wet). Further refinements to water requirements for cooling would result from the percentage of time that the

TABLE 11.2.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Delamar Valley SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	1,816	2,724	2,724	2,724
Potable supply for workforce (ac-ft)	148	90	37	19
Total water use requirements (ac-ft)	1,964	2,814	2,761	2,743
Wastewater generated				
Sanitary wastewater (ac-ft)	148	90	37	19

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Appendix M.

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 80 in./yr (203 cm/yr) (Cowherd et al. 1988; WRCC 2010e).

[c] To convert ac-ft to m^3, multiply by 1,234.

option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 11.2.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 74 to 1,324 ac-ft/yr (91,300 to 1.6 million m^3/yr) and the workforce potable water supply from 2 to 37 ac-ft/yr (2,500 to 45,600 m^3/yr). The maximum total water usage during normal operation at full build-out capacity would be greatest for technologies using the wet-cooling option and is estimated to be as high as 39,762 ac-ft/yr (49.0 million m^3/yr). Water usage for dry-cooling systems would be as high as 4,009 ac-ft/yr (4.9 million m^3/yr), approximately a factor of 10 times less than that for the wet-cooling option. Non-cooled technologies require substantially less water at full build-out capacity: 752 ac-ft/yr (927,600 m^3/yr) for dish engine and 76 ac-ft/yr (93,700 million m^3/yr) for PV systems (Table 11.2.9.2-2). Operations would produce up to 37 ac-ft/yr (45,600 m^3/yr) of sanitary wastewater. In addition, for wet-cooled technologies, 418 to 752 ac-ft/yr (515,600 to 927,600 m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed Delamar Valley SEZ. The NDWR has set the perennial yield of the Delamar Valley groundwater basin at 2,550 ac-ft/yr (3.1 million m^3/yr), which is only 6% to 35% of the water needed for technologies using wet-cooling. The water requirement estimates for technologies using dry-cooling are on the order of the perennial yield of the basin depending upon operation

TABLE 11.2.9.2-2 Estimated Water Requirements during Operations at the Proposed Delamar Valley SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	2,648	1,471	1,471	1,471
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	1,324	736	736	74
Potable supply for workforce (ac-ft/yr)	37	16	16	2
Dry cooling (ac-ft/yr)[e]	530–2,648	294–1,471	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	11,917–38,401	6,621–21,334	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	752	76
Dry-cooled technologies (ac-ft/yr)	1,891–4,009	1,046–2,223	NA	NA
Wet-cooled technologies (ac-ft/yr)	13,278–39,762	7,373–22,086	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	752	418	NA	NA
Sanitary wastewater (ac-ft/yr)	37	16	16	2

a Land area for parabolic trough was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

b Water needs are linearly related to power. Water usage for any other size project can be estimated by using the multipliers provided in Table M.9-2 (Appendix M).

c Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

d To convert ac-ft to m^3, multiply by 1,234.

e Dry-cooling value assumes 0.2 to 1.0 ac-ft/yr/MW and wet-cooling value assumes 4.5 to 14.5 ac-ft/yr/MW (range in these values represents 30 and 60% operating times) (DOE 2009).

f NA = not applicable.

g Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

conditions. Obtaining water rights within the Delamar Valley groundwater basin is potentially limited by the municipal water rights of the SNWA totaling 2,493 ac-ft/yr (3.1 million m^3/yr), which are currently under review by the Office of the State Engineer (see Section 11.2.9.1.3). Under current conditions of available water rights in the Delamar Valley, only 50 ac-ft/yr (61,700 m^3/yr) is unallocated, which is on the order of water requirements needed for PV systems. Given the available water resources within the Delamar Valley basin, PV systems would be the preferred technology for the full build-out scenario. Solar development projects using dry-cooling and dish engine technologies would likely have to negotiate water rights with the SNWA and the NDWR. Technologies using wet cooling are unfeasible for the proposed Delamar Valley SEZ, because their water use requirements are well above the available groundwater in the basin.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its preconstruction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and might also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because quantities of water needed during the decommissioning/reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

11.2.9.2.3 Off-Site Impacts: Roads and Transmission Lines

The proposed Delamar Valley SEZ is located approximately 8 mi (13 km) east of U.S. 93, and an existing 69-kV transmission line runs through the proposed SEZ, as described in Section 11.2.1.2. Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. Water needed for road modification and transmission line construction activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. As a result, water use impacts would be negligible. Impacts on surface water and groundwater quality resulting from spills would be minimized by implementing the mitigation measures described in Section 5.9.3 (e.g., cleaning up spills as soon as they occur). Ground-disturbing activities that have the potential to increase sediment and dissolved solid loads in downstream waters would be conducted following the mitigation measures outlined in Section 5.9.3 to minimize impacts associated with alterations to natural drainage pathways and hydrologic processes.

11.2.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources from solar energy development at the proposed Delamar Valley SEZ are associated with land disturbance effects on the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation, as well as alter groundwater recharge and discharge processes. Two intermittent streams, several ephemeral washes, and a dry lake are located within the proposed SEZ. Alterations to the natural drainage patterns of these surface features should be avoided to the extent possible in order to minimize erosion and sedimentation impacts, as well as the disruption of wildlife habitat and clogging of groundwater recharge areas.

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater in the Delamar Valley is a part of White River Groundwater Flow System, which is a regional-scale system of carbonate-rock aquifers. Subsurface inflow from Dry Lake Valley to the north moves southward through Delamar Valley, primarily in the basin-fill aquifer, and discharges to Pahranagat Valley and Coyote Springs Valley. Delamar Valley and

Dry Lake Valley are at higher elevations than the receiving Pahranagat Valley and Coyote Springs Valley that have thin basin-fill deposits, so it is likely that subsurface discharge from Delamar Valley contributes to the carbonate-rock aquifers of the White River Groundwater Flow System. Excessive groundwater withdrawals at the proposed Delamar Valley SEZ could disrupt this groundwater flow pattern and adversely affect the White River Groundwater Flow System, as well as the springs and wetlands within the Pahranagat National Wildlife Refuge that support critical wildlife habitat.

Groundwater is the primary water resource available to solar energy facilities in the proposed Delamar Valley SEZ. The perennial yield of the Delamar Valley basin is set at 2,550 ac-ft/yr (3.1 million m^3/yr), and currently only 50 ac-ft/yr (61,700 m^3/yr) is unallocated. Wet-cooling technologies would not be feasible in Delamar Valley, because their water use requirements far exceed available groundwater resources in the basin. Dry-cooled parabolic trough facilities would have to modify operations and employ water conservation measures in order to reduce needed water quantities to that of the perennial yield of the basin. Additionally, dry-cooling and dish engine technologies would have to negotiate with the SNWA and the NDWR to obtain water rights to meet project demands. PV systems are the preferred technology for the full build-out scenario, because their water use requirements are of similar magnitude to the unallocated water rights within the Delamar Valley groundwater basin.

11.2.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require the programmatic design features presented in Appendix A, Section A.2.2, to be implemented, thus mitigating some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and on conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Design features specific to the proposed Delamar Valley SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures;

- Land disturbance activities should avoid impacts to the extent possible in the vicinity of the intermittent streams, ephemeral washes, and the dry lake present on the site;

- Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters;

- Groundwater rights must be obtained from the NDWR (dry-cooling and dish engine technologies may have to negotiate with the SNWA for water rights);

- Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection (NDEP 2010);

- Groundwater monitoring and production wells should be constructed in accordance with state standards (NDWR 2006); and

- Water for potable uses would have to meet or be treated to meet water quality standards according to Nevada Administrative Code (445A.453-445A.455).

11.2.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Delamar Valley SEZ. The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 60-ft (18-m) wide portion of an assumed access road corridor. No new transmission projects are expected to be needed to serve development on the SEZ because of the proximity of existing infrastructure (refer to Section 11.2.1.2 for development assumptions). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed access road corridor, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but did not include ground-disturbing activities because these would not take place outside of the SEZ. The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

11.2.10.1 Affected Environment

The proposed Delamar Valley SEZ is located within the Tonopah Basin Level IV ecoregion, which primarily supports sparse shadscale (*Atriplex confertifolia*) communities on broad valleys, hills, bajadas, and alluvial fans (Bryce et al. 2003). Additional commonly occurring shrubs include bud sagebrush (*Picrothamnus desertorum*), spiny hopsage (*Grayia spinosa*), seepweed (*Suaeda* sp.), fourwing saltbush (*Atriplex canescens*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedra nevadensis*), littleleaf horsebrush (*Tetradymia glabrata*), Douglas rabbitbrush (*Chrysothamnus viscidiflorus*), and winterfat (*Krascheninnikovia lanata*), which, along with shadscale, often codominate in highly diverse mosaics. Warm season grasses, such as Indian rice grass (*Achnatherum hymenoides*) and galleta grass (*Pleuraphis jamesii*), occur in the understory. Stands of inland saltgrass (*Distichlis spicata*) and alkali sacaton (*Sporobolus airoides*) also occur. Warm desert species, such as blackbrush (*Coleogyne ramosissima*), Joshua tree (*Yucca brevifolia*), banana yucca (*Yucca baccata*), and cholla (*Cylindropuntia* sp.), are found in this ecoregion. Black greasewood (*Sarcobatus vermiculatus*) occurs in saline bottoms. Springs and sporadic precipitation in foothills provide surface water sources. Annual precipitation in the vicinity of the SEZ is very low, averaging 6.2 in. (15.7 cm) at the Pahranagat NWR (see Section 11.2.13).

The Tonopah Basin lies within the Central Basin and Range Level III ecoregion, described in Appendix I, and is part of the Great Basin desertscrub biome; however, the

Delamar Valley SEZ is located in a transition zone between the Great Basin and Mojave Deserts, with Mojave desertscrub communities and endemic species in the SEZ and adjacent areas.

The area surrounding the SEZ is a mosaic of five Level IV ecoregions: (1) the Tonopah Basin; (2) the Tonopah Sagebrush Foothills ecoregion, which supports black sagebrush (*Artemisia nova*) and Mojave species such as blackbrush, Joshua tree, and cholla on rocky substrates; (3) Tonopah Uplands, which includes woodlands, such as pinyon (*Pinus monophylla*)-juniper (*Juniperus osteosperma*), and shrublands on hills and mountains; (4) the Woodland and Shrub Covered Low Mountains to the east, which includes open groves of juniper and pinyon with mountain brush communities at higher elevations; and (5) the Arid Footslopes ecoregion to the southeast, part of the Mojave Basin and Range, which supports a sparse mixture of Mojave desert species, such as creosotebush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), cacti, and *Yucca* species, including Joshua tree, on alluvial fans, basalt flows, hills, and low mountains, and blackbrush at higher elevations.

Land cover types described and mapped under the SWReGAP (USGS 2005a) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Delamar Valley SEZ are shown in Figure 11.2.10.1-1. Table 11.2.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the proposed Delamar Valley SEZ are classified primarily as Inter-Mountain Basins Mixed Salt Desert Scrub. Additional cover types within the SEZ are given in Table 11.2.10.1-1. The southern portion of the SEZ includes a large playa, bordered by a salt scrub community of fourwing saltbush (*Atriplex canescens*) and shadscale (*Atriplex confertifolia*). Dominant species in the low scrub communities observed in other portions of the SEZ in August 2009 included winterfat (*Krascheninnikovia lanata*), shadscale, buckwheat (*Eriogonum* sp.), halogeton (*Halogeton glomeratus*), broom snakeweed (*Gutierrezia sarothrae*), tumbleweed (*Sisymbrium loeselii*), and rabbitbrush (*Chrysothamnus* sp.). The northern portion of the SEZ supports a Joshua tree (*Yucca brevifolia*) forest community with ephedra (*Ephedra* sp.), spiny hopsage (*Grayia spinosa*), rabbitbrush, Cholla (*Cylindropuntia* sp.), and Indian rice grass (*Achnatherum hymenoides*). Because of its location in a narrow transition zone between the Great Basin and Mojave Deserts, the plant assemblage of the SEZ is not likely found anywhere else. Sensitive habitats on the SEZ include desert dry washes, playas, wetlands, and Joshua tree communities. The area has had a long history of livestock grazing, and the plant communities present within the SEZ have likely been affected by grazing.

The area of indirect effects, including the area surrounding the SEZ within 5 mi (8 km), includes 22 cover types, which are listed in Table 11.2.10.1-1. The predominant cover types are Inter-Mountain Basins Semi-Desert Shrub Steppe, Mojave Mid-Elevation Mixed Desert Scrub, Inter-Mountain Basins Big Sagebrush Shrubland, and Inter-Mountain Basins Mixed Salt Desert Scrub.

One wetland mapped by the NWI is located within the southern portion of the SEZ (USFWS 2009a) (Figure 11.2.10.1-2). This large sparsely vegetated lacustrine wetland, Delamar Lake, is mapped primarily as Inter-Mountain Basins Playa, with small areas of Inter-Mountain

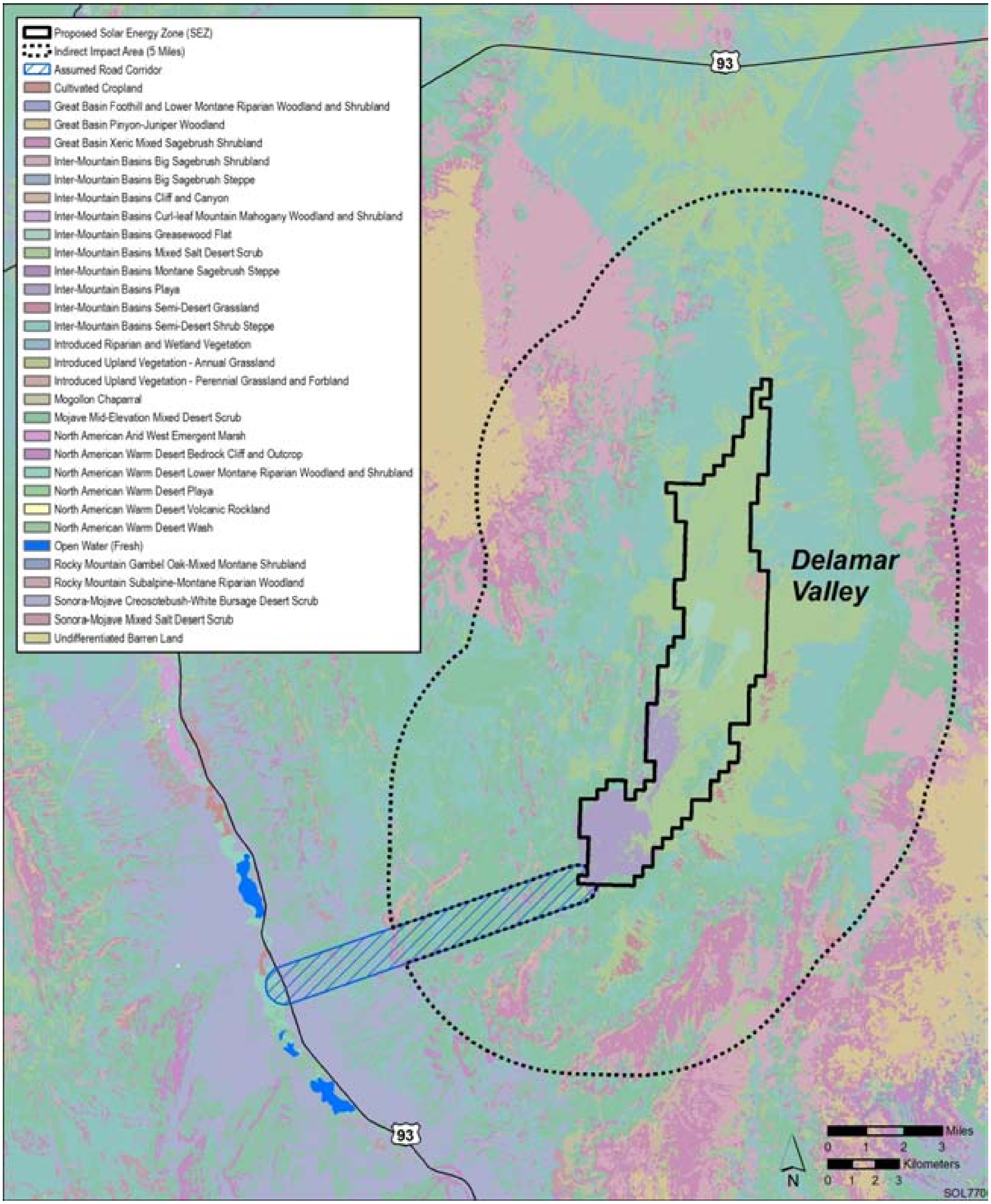

FIGURE 11.2.10.1-1 Land Cover Types within the Proposed Delamar Valley SEZ (Source: USGS 2004)

TABLE 11.2.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Delamar Valley SEZ and Potential Impacts

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Mixed Salt Desert Scrub: Generally consists of open shrublands that include at least one species of *Atriplex*, along with other shrubs. Perennial grasses dominate a sparse to moderately dense herbaceous layer.	10,269 acres[g] (2.6%, 2.7%)	2 acres (<0.1%)	21,848 acres (5.6%)	Moderate
Inter-Mountain Basins Playa: Playa habitats are intermittently flooded and generally barren or sparsely vegetated. Depressions may contain small patches of grass, and sparse shrubs may occur around playa margins.	3,088 acres (18.3%, 18.5%)	1 acre (<0.1%)	526 acres (3.1%)	Large
Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	1,072 acres (0.2%, 0.3%)	13 acres (<0.1%)	46,797 acres (10.1%)	Small
Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs, and grasses and may include *Yucca* spp.	977 acres (0.1%, 0.1%)	31 acres (<0.1%)	40,770 acres (4.3%)	Small
Inter-Mountain Basins Greasewood Flat: Dominated or codominated by greasewood (*Sarcobatus vermiculatus*) and generally occurring in areas with saline soils, a shallow water table, and intermittent flooding, although remaining dry for most growing seasons. This community type generally occurs near drainages or around playas. These areas may include, or may be codominated by, other shrubs and may include a graminoid herbaceous layer.	964 acres (5.5%, 7.0%)	<1 acres (<0.1%)	163 acres (0.9%)	Moderate

TABLE 11.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Introduced Upland Vegetation – Perennial Grassland and Forbland: Dominated by non-native perennial grass and forb species.	171 acres (5.3%, 6.2%)	0 acres	375 acres (11.7%)	Moderate
Inter-Mountain Basins Semi-Desert Grassland: Consists of perennial bunchgrasses as dominants or codominants. Scattered shrubs or dwarf shrubs may also be present.	10 acres (0.1%, 0.2%)	0 acres	885 acres (12.4%)	Small
North American Arid West Emergent Marsh: Occurs in natural depressions, such as ponds, or bordering lakes, or slow-moving streams or rivers. Alkalinity is highly variable. The plant community is characterized by herbaceous emergent, submergent, and floating leaved species.	1 acre (<0.1%, 0.3%)	0 acres	1 acre (<0.1%)	Small
Sonora–Mojave Creosotebush–White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran Deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	0 acres	12 acres (<0.1%)	3,540 acres (0.4%)	Small
North American Warm Desert Lower Montane Riparian Woodland and Shrubland: Occurs along perennial and seasonally intermittent streams in mountain canyons and valleys. Consists of a mix of woodlands and shrublands.	0 acres	1 acre (<0.1%)	125 acres (2.0%)	Small

TABLE 11.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Great Basin Xeric Mixed Sagebrush Shrubland: Generally occurs on level plains, slopes, and ridges. The dominant shrub species are black sagebrush (*Artemisia nova*) or, at higher elevations, little sagebrush (*Artemisia arbuscula*), and codominants may be Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) or yellow rabbitbrush (*Chrysothamnus viscidiflorus*). Other shrub species, as well as sparse perennial bunchgrasses, may also be present.	0 acres	1 acre (<0.1%)	12,382 acres (2.8%)	Small
North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, and unstable scree and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	0 acres	1 acre (<0.1%)	160 acres (0.1%)	Small
Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	0 acres	1 acre (<0.1%)	23,226 acres 3.8 %)	Small
Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even codominant. Grasses occur at varying densities.	0 acres	1 acre (<0.1%)	193 acres (1.2%)	Small

TABLE 11.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Cliff and Canyon: Includes barren and sparsely vegetated (generally <10% plant cover) steep cliff faces, narrow canyons, small rock outcrops, and scree and talus slopes. Composed of widely scattered coniferous trees and a variety of shrubs.	0 acres	<1 acre (<0.1%)	1,546 acres (6.7%)	Small
North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	0 acres	<1 acre (<0.1%)	27 acres (0.2%)	Small
Introduced Riparian and Wetland Vegetation: Dominated by non-native riparian and wetland plant species.	0 acres	<1 acre (<0.1%)	5 acres (0.3%)	Small
Great Basin Pinyon-Juniper Woodland: Occurs on low-elevation slopes and ridges. Singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), or both are the dominant species, generally associating with curl-leaf mountain mahogany (*Cercocarpus ledifolius*). Understory species include shrubs and grasses.	0 acres	0 acres	2,920 acres (0.4%)	Small
Introduced Upland Vegetation – Annual Grassland: Dominated by non-native annual grass species.	0 acres	0 acres	408 acres (15.3%)	Small

TABLE 11.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Montane Sagebrush Steppe: Occurs on flats, ridges, level ridgetops, and mountain slopes. Mountain big sagebrush (*Artemisia tridentata vaseyana*) and related taxa such as big sagebrush (*Artemisia tridentata spiciformis*) are typically the dominant species. Perennial herbaceous species, especially grasses, are usually abundant, although shrublands are also present.	0 acres	0 acres	16 acres (0.1%)	Small
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland: Composed of a mosaic of multiple tree-dominated communities with diverse shrubs. Sedges, rushes, perennial grasses; mesic forbs are the dominant herbaceous species. Disturbed areas often include non-native grasses.	0 acres	0 acres	6 acres (<0.1%)	Small
Undifferentiated Barren Land: Includes a variety of barren areas, generally with less than 15% cover of vegetation.	0 acres	0 acres	2 acres (1.6%)	Small

[a] Land cover descriptions are from USGS (2005a). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from USGS (2004).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region.

[d] For access road development, direct effects were estimated within an 8-mi (13-km) long, 60-ft (18-m) wide road ROW from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of the cover type within the 1-mi (1.6-km) wide road corridor. Impacts are for the area of the cover type within the assumed ROW, and the percentage that area represents of all occurrences of that cover type within the SEZ region.

Footnotes continued on next page.

TABLE 11.2.10.1-1 (Cont.)

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[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed access road corridor, where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project facilities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the indirect effects area and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[f] Overall impact magnitude categories were based on professional judgment and were (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; and (3) *large*: >10% of a cover type would be lost.

[g] To convert acres to km^2, multiply by 0.004047.

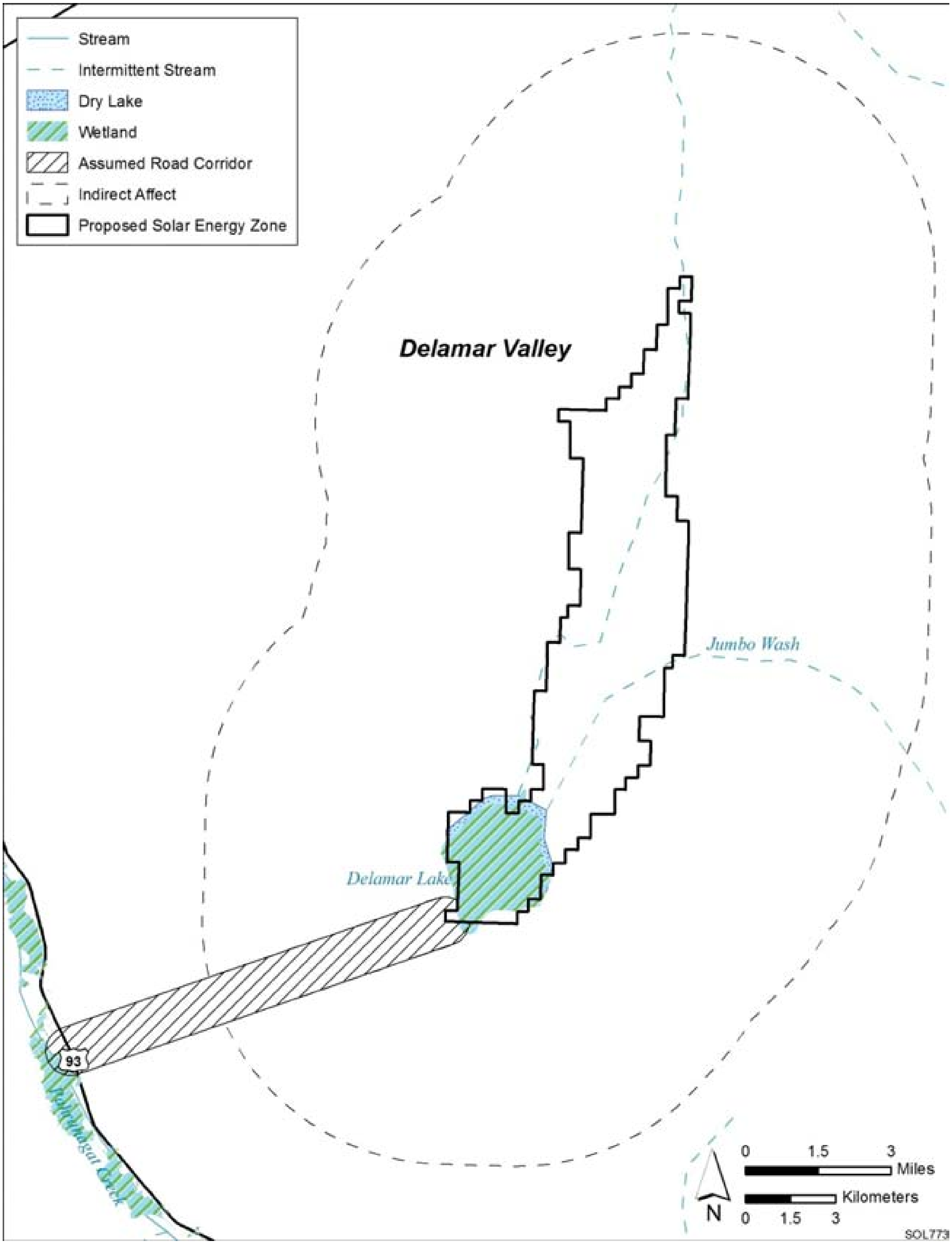

FIGURE 11.2.10.1-2 Wetlands within the Proposed Delamar Valley SEZ (Source USFWS 2009a)

Basins Mixed Salt Desert Scrub. Approximately 2,364 acres (9.6 km^2) of this 2,648.8-acre (10.7-km^2) wetland is located within the SEZ. The remaining portion is located entirely within the indirect effects area. Smaller playa areas not mapped by the NWI occur north of Delamar Lake. A 1-acre (0.004-km^2) area mapped as Northern American Arid West Emergent Marsh is located within the SEZ, south of Delamar Lake playa. Numerous dry washes occur within the SEZ, generally flowing to the south and terminating in the large playa. These washes typically do not support wetland or riparian habitats. Jumbo Wash is an intermittent stream and, along with an unnamed intermittent stream, is a major surface drainage on the SEZ. The dry washes and playas typically contain water for short periods during or following precipitation events. Springs occur in the vicinity of the SEZ, but are disconnected from the main groundwater flow system (see Section 11.2.9).

Approximately 133 acres (0.5 km^2) of wetlands, including a large wetland complex and several smaller wetlands, occurs along and near Pahranagat Creek, a riverine wetland, within the southwestern end of the assumed access road corridor. A portion of these wetlands is supported by springs and is part of the Pahranagat NWR. These wetlands are predominantly palustrine wetlands with emergent plant communities, ranging from temporarily flooded to saturated, seasonally flooded, and semipermanently flooded. Small areas of permanently flooded palustrine wetlands with sparse plant communities and saturated and seasonally flooded palustrine forested wetlands also occur. All except 2.4 acres (0.01 km^2) of wetland occur to the west of U.S. 93. The wetlands are mapped as North American Warm Desert Lower Montane Riparian Woodland and Shrubland, North American Warm Desert Wash, Introduced Riparian and Wetland Vegetation, Sonora-Mojave Creosotebush-White Bursage Desert Scrub, and small areas of Mojave Mid-Elevation Mixed Desert Scrub. An additional 29.3 acres (0.1 km^2) of wetland within the corridor occurs adjacent to the SEZ and is associated with Delamar Lake.

The State of Nevada maintains an official list of weed species designated as noxious species. Table 11.2.10.1-2 provides a summary of the noxious weed species regulated in Nevada that are known to occur in Lincoln County (USDA 2010; Creech et al. 2010), which includes the proposed Delamar Valley SEZ. Sahara mustard is known to occur in the southern portion of the SEZ. Halogeton and tumbleweed, invasive species not regulated by Nevada, were observed on the SEZ in August 2009.

The Nevada Department of Agriculture classifies noxious weeds into one of three categories (NDA 2010):

- "Category A: Weeds not found or limited in distribution throughout the state; actively excluded from the state and actively eradicated wherever found; actively eradicated from nursery stock dealer premises; control required by the state in all infestations."

- "Category B: Weeds established in scattered populations in some counties of the state; actively excluded where possible, actively eradicated from nursery stock dealer premises; control required by the state in areas where populations are not well established or previously unknown to occur."

TABLE 11.2.10.1-2 Designated Noxious Weeds of Nevada Occurring in Lincoln County

Common Name	Scientific Name	Category
Black henbane[a]	*Hyoscyamus niger*	A
Dalmatian toadflax[a,b]	*Linaria dalmatica*	A
Diffuse knapweed[a]	*Centaurea diffusa*	B
Hoary cress[b]	*Cardaria draba*	C
Johnsongrass[a]	*Sorghum halepense*	C
Mayweed chamomile[b]	*Anthemis cotula*	A
Malta star thistle[a]	*Centaurea melitensis*	A
Puncture vine[b]	*Tribulus terrestris*	C
Sahara/African mustard[a]	*Brassica tournefortii*	B
Saltcedar[b]	*Tamarix* spp.	C
Spotted knapweed[a,b]	*Centaurea maculosa*	A
Water hemlock[a]	*Cicuta maculata*	C

[a] Creech et al. (2010).

[b] USDA (2010).

- "Category C: Weeds currently established and generally widespread in many counties of the state; actively eradicated from nursery stock dealer premises; abatement at the discretion of the state quarantine officer."

11.2.10.2 Impacts

The construction of solar energy facilities within the proposed Delamar Valley SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (13,242 acres [53.6 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (caused, for example, by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation within the SEZ are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and from any additional mitigation applied. Section 11.2.10.2.3, below, identifies design features of particular relevance to the proposed Delamar Valley SEZ.

11.2.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if they affected a relatively small proportion (<1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); moderate impacts (>1 but <10%) could affect an intermediate proportion of cover type; and large impacts could affect greater than 10% of a cover type.

Solar facility construction and operation in the proposed Delamar Valley SEZ would primarily affect communities of the Inter-Mountain Basins Mixed Salt Desert Scrub cover type. Additional cover types that would be affected within the SEZ include Inter-Mountain Basins Playa, Inter-Mountain Basins Semi-Desert Shrub Steppe, Mojave Mid-Elevation Mixed Desert Scrub, Inter-Mountain Basins Greasewood Flat, Introduced Upland Vegetation – Perennial Grassland and Forbland, Inter-Mountain Basins Semi-Desert Grassland, and North American Arid West Emergent Marsh. Additional cover types that would be affected only by the assumed access road include Sonora–Mojave Creosotebush–White Bursage Desert Scrub, North American Warm Desert Lower Montane Riparian Woodland and Shrubland, Great Basin Xeric Mixed Sagebrush Shrubland, North American Warm Desert Bedrock Cliff and Outcrop, Inter-Mountain Basins Big Sagebrush Shrubland, Sonora-Mojave Mixed Salt Desert Scrub, Inter-Mountain Basins Cliff and Canyon, North American Warm Desert Wash, and Introduced Riparian and Wetland Vegetation. The Introduced Upland Vegetation – Perennial Grassland and Forbland and Introduced Riparian and Wetland Vegetation cover types would likely have relatively minor populations of native species. Table 11.2.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed Delamar Valley SEZ. Most of these cover types are relatively common in the SEZ region; however, several cover types are relatively uncommon, representing 1% or less of the land area within the SEZ region: Inter-Mountain Basins Cliff and Canyon (0.5%), Inter-Mountain Basins Playa (0.3%), Inter-Mountain Basins Greasewood Flat (0.3%), North American Warm Desert Wash (0.3%), Inter-Mountain Basins Semi-Desert Grassland (0.1%), North American Arid West Emergent Marsh (0.08%), Introduced Upland Vegetation –Perennial Grassland and Forbland (0.06%), and Introduced Riparian and Wetland Vegetation (0.03%). Desert dry washes, playas, wetlands, and Joshua tree communities are sensitive habitats on the SEZ.

The construction, operation, and decommissioning of solar projects within the proposed Delamar Valley SEZ would result in large impacts on the Inter-Mountain Basins Playa cover type. Solar project development within the SEZ would result in moderate impacts on Inter-Mountain Basins Mixed Salt Desert Scrub, Inter-Mountain Basins Greasewood Flat, and Introduced Upland Vegetation – Perennial Grassland and Forbland cover types, and small impacts on all other cover types within the affected area.

Solar project development within the northern portion of the SEZ could result in direct and indirect impacts on the Joshua tree forest community that occurs within the Inter-Mountain Basins Mixed Salt Desert Scrub and Inter-Mountain Basins Semi-Desert Shrub Steppe cover types. Joshua tree communities within the assumed access road corridor could also be directly and indirectly affected.

Because of the arid conditions, reestablishment of shrub, shrub steppe, or grassland communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. It is unlikely that winterfat communities on the SEZ would be effectively restored. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region. Damage to these crusts, by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect effects area identified in Table 11.2.10.1-1.

Communities associated with Delamar Lake and other playa habitats, Jumbo Wash and the unnamed intermittent stream, greasewood flats communities, riparian habitats, marsh, or other intermittently flooded areas within or downgradient from solar projects or access road could be affected by ground-disturbing activities. Site-clearing and -grading could disrupt surface water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter playa, riparian, marsh, or greasewood flats plant communities, including occurrences outside the SEZ, and affect community function. Increases in surface runoff from a solar energy project site or access road could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect dry wash habitats within the SEZ or access road footprint. Alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation.

Potential impacts on wetlands as a result of solar energy facility development are described in Section 5.6.1. Approximately 2,364 acres (9.6 km^2) of wetland habitat has been identified within the SEZ, associated with the Delamar Lake playa, and could be affected by project development. In addition, a 1-acre (0.004-km^2) area mapped as North American Arid West Emergent Marsh could be affected in the southern portion of the SEZ. Direct impacts on the wetland would occur if fill material were placed within the playa or marsh for solar facility construction. Indirect impacts, as described above, could occur with project construction near or upgradient from Delamar Lake.

The construction of access roads within the assumed road corridor could potentially result in direct impacts on wetlands that may occur in or near the roadway if fill material were placed within wetland areas or could result in indirect impacts. Approximately 162 acres (0.7 km^2) of wetland habitat within the assumed access road corridor could be affected by construction. Grading could result in direct impacts on the wetlands within the access road corridor. Approximately 132.8 acres (0.5 km^2) occurs near the western end of the corridor, near U.S. 93, with the remaining wetland area associated with Delamar Lake. However, all except 2.4 acres (0.01 km^2) of wetland near U.S. 93 occurs to the west of the highway and would be unlikely to be directly affected. Grading near wetlands in or near the corridor could disrupt surface water or groundwater flow characteristics, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter wetland plant communities and wetland function. Increases in surface runoff from an access road could also affect wetland hydrologic characteristics. The introduction of contaminants into wetlands in or near the corridor could result from spills of fuels or other materials. Soil disturbance could result in sedimentation in wetland areas, which could degrade or eliminate wetland plant communities. Sedimentation effects or hydrologic changes could extend to wetlands outside of the corridor.

The use of groundwater within the proposed Delamar Valley SEZ for technologies with high water requirements, such as wet-cooling systems, could disrupt the groundwater flow pattern and adversely affect the springs and wetlands within the Pahranagat NWR, southwest of the SEZ (see Section 11.2.9). Subsequent reductions in groundwater discharges at the springs could result in degradation of these habitats. The potential for impacts on springs would need to be evaluated through project-specific hydrological studies.

11.2.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

Executive Order (E.O.) 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential effects of noxious weeds and invasive plant species that could result from solar energy facilities are described in Section 5.10.1. Noxious weeds and invasive species could inadvertently be brought to a project site by equipment previously used in infested areas, or they may be present on or near a project site. Despite required programmatic design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Delamar Valley SEZ, and increase the probability that weeds could be transported into areas that were previously relatively weed-free. This could result in reduced restoration success and possible widespread habitat degradation.

Invasive species, including halogeton and tumbleweed, occur on the SEZ. Additional species designated as noxious weeds in Nevada, and known to occur in Lincoln County, are given in Table 11.2.10.1-2. Approximately 171 acres (0.7 km^2) of Introduced Upland Vegetation – Perennial Grassland and Forbland occurs within the SEZ and 375 acres (1.5 km^2) in the indirect effects area; <1 acre (0.004 km^2) of Introduced Riparian and Wetland Vegetation occurs in the assumed access road corridor and 5 acres (0.02 km^2) in the indirect effects area;

approximately 171 acres (0.7 km^2) of Introduced Upland Vegetation – Annual Grassland occurs within the indirect effects area. Disturbance associated with solar project development may promote the establishment and spread of invasive species associated with these cover types. Past or present land uses, such as grazing or OHV activity, may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Disturbance associated with existing roads and transmission lines within the SEZ area of potential impacts also likely contributes to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

11.2.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to the programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While specific practices are best established when project details are being considered, some SEZ-specific design features can be identified at this time, as follows:

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as halogeton or tumbleweed. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- Dry washes, Delamar Lake playa, and the nearby marsh should be avoided to the extent practicable, and any impacts minimized and mitigated. Appropriate engineering controls should be used to minimize impacts on wetlands within the assumed access road corridor, as well as dry washes, Delamar Lake and other playas, and riparian, marsh, and greasewood flat habitats within the SEZ and corridor, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition. All wetland, dry wash, and riparian habitats within the assumed access road corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetlands, playas, dry washes, and riparian areas to reduce the potential for impacts. Appropriate buffers and engineering controls would be determined through agency consultation.

- Joshua tree communities are protected by the State of Nevada and should be avoided in the northern areas of the SEZ and along the assumed access road corridor. Any Joshua trees in areas of direct impacts should be salvaged.

- Cactus species, including cholla, or ocotillo should be avoided. Any cacti that cannot be avoided should be salvaged.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on springs and wetlands in the vicinity of the SEZ, at Pahranagat NWR. Potential impacts on springs should be determined through hydrological studies.

If these SEZ-specific design features are implemented in addition to other programmatic design features, it is anticipated that a high potential for impacts from invasive species and impacts on Joshua tree communities, dry washes, playas, springs, riparian habitats, greasewood flats, and wetlands would be reduced to a minimal potential for impacts.

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11.2.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Delamar Valley SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 60-ft (18-m) wide portion of an assumed 8-mi (13-km) long access road corridor. The maximum developed area within the SEZ would be 13,242 acres (53.6 km^2).

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within a 1.0-mi (1.6-km) access road corridor where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills in the SEZ or road construction area). Potentially suitable habitat within the SEZ greater than the maximum of 13,242 acres (53.6 km^2) of direct effects was also included as part of the area of indirect effects. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. The area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. These areas of direct and indirect effects are defined and the impact assessment approach is described in Appendix M.

The primary land cover habitat type within the affected area is Inter-Mountain Basins Mixed Salt Desert Scrub (see Section 11.2.10). Temporary aquatic habitats that occur in the SEZ and the area of indirect effects include Delamar Lake (a dry lake), Jumbo Wash, and an unnamed dry wash (see Figure 11.2.9.1-1).

11.2.11.1 Amphibians and Reptiles

11.2.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Delamar Valley SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from the NNHP (NDCNR 2002) and range maps and habitat information available from the SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Based on species distributions within the area of the SEZ and habitat preferences of the amphibian species, the Great Basin spadefoot (*Spea intermontana*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). They would most likely occur in the portions of the SEZ that overlap the dry lake and wash habitats.

More than 25 reptile species occur within the area that encompasses the proposed Delamar Valley SEZ (USGS 2007; Stebbins 2003). The desert tortoise (*Gopherus agassizii*) is a federal and state-listed threatened species and is discussed in Section 11.2.12. Lizard species expected to occur within the SEZ include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), side-blotched lizard (*Uta stansburiana*), western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*). Snake species expected to occur within the SEZ are the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and nightsnake (*Hypsiglena torquata*). The sidewinder (*Crotalus cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 11.2.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Delamar Valley SEZ. Special status amphibian and reptile species are addressed in Section 11.2.12.

11.2.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.2.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed Delamar Valley SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area as presented in Section 11.2.11.1.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 11.2.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on amphibians and reptiles summarized in Table 11.2.11.1-1, direct impacts on representative amphibian and

TABLE 11.2.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Delamar Valley SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Amphibians					
Great Basin spadefoot (*Spea intermontana*)	Sagebrush flats, semidesert shrublands, pinyon-juniper woodlands, and spruce-fir forests. Breeds in temporary and permanent waters including rain pools, pools in intermittent streams, and flooded areas along streams. About 2,199,200 acres[h] of potentially suitable habitat occurs within the SEZ region.	10,269 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	60,070 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	3.5 acres of potentially suitable habitat lost (<0.0002% of available potentially suitable habitat) and 306.5 acres in area of indirect effects	Small overall impact. Avoid Delamar Lake and wash habitats.
Red-spotted toad (*Bufo punctatus*)	Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos, desert streams and oases, open grassland, scrubland oaks, and dry woodlands. About 3,069,900 acres of potentially suitable habitat occurs within the SEZ region.	11,427 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	66,999 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 3,941 acres in area of indirect effects	Small overall impact. Avoid Delamar Lake and wash habitats.
Lizards					
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. About 4,068,300 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	147,352 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,534 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

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TABLE 11.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Lizards (Cont.)					
Great Basin collared lizard (*Crotaphytus bicinctores*)	Usually inhabits alluvia, lava flows, mountain slopes, canyons, buttes, rock outcrops, washes, and rocky plains. Limiting factors are the presence of large boulders and open/sparse vegetation. About 3,410,000 acres of potentially suitable habitat occurs in the SEZ region.	12,318 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	121,938 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 5,327 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 3,390,900 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	97,859 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,102 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Side-blotched lizard (*Uta stansburiana*)	Low to moderate elevations in washes, arroyos, boulder-strewn ravines, rocky cliff bases, and flat shrubby areas in canyon bottoms. Often along sandy washes. Usually in areas with a lot of bare ground. About 2,714,400 acres of potentially suitable habitat occurs within the SEZ region.	987 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) during construction and operations	45,951 acres of potentially suitable habitat (1.7% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 3,598 acres in area of indirect effects	Small overall impact. Avoid wash habitats.

TABLE 11.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Western fence lizard (*Sceloporus occidentalis*)	Disturbed areas, roadsides, gravel beds, rock quarries, lava flows, outcrops, talus slopes, shrublands, riparian areas, and coniferous woodlands. About 3,975,900 acres of potentially suitable habitat occurs within the SEZ region.	11,341 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	110,016 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	32 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,749 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Western whiptail (*Cnemidophorus tigris*)	Arid and semiarid habitats with sparse plant cover. About 3,997,400 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	124,221 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,285 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Zebra-tailed lizard (*Callisaurus draconoides*)	Open, warm-desert habitats, especially dry washes and canyons with fine gravel and sand. About 2,820,300 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	74,686 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,075 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes					
Coachwhip (*Masticophis flagellum*)	Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 3,320,000 acres of potentially suitable habitat occurs within the SEZ region.	2,046 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	89,206 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,430 acres in area of indirect effects	Small overall impact.
Glossy snake (*Arizona elegans*)	Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 2,041,300 acres of potentially suitable habitat occurs within the SEZ region.	4,170 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	72,721 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	26 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,298 acres in area of indirect effects	Small overall impact.
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 3,938,700 acres of potentially suitable habitat occurs in the SEZ region.	4,075 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	80,418 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,179 acres in area of indirect effects	Small overall impact.

TABLE 11.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Snakes (Cont.)					
Groundsnake (*Sonora semiannulata*)	Arid and semiarid regions with rocky to sandy soils. River bottoms, desert flats, sand hummocks, and rocky hillsides. About 4,077,100 acres of potentially suitable habitat occurs in the SEZ region.	2,059 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	125,481 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	59 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,166 acres in area of indirect effects	Small overall impact.
Nightsnake (*Hypsiglena torquata*)	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, it seeks refuge underground, in crevices, or under rocks. About 2,733,300 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	76,936 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,484 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Sidewinder (*Crotalus cerastes*)	Windblown sand habitats near rodent burrows. Most common in areas of sand hummocks topped with creosote, mesquite, or other desert plants. About 1,825,400 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,561 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 3,874 acres in area of indirect effects	Small overall impact.

a Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

Footnotes continued on next page.

TABLE 11.2.11.1-1 (Cont.)

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 13,242 acres of direct effects within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 13,242 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] For access road development, direct effects were estimated within an 8-mi (13-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

[i] To convert ft to m, multiply by 0.3048.

Sources: CDFG (2008); NatureServe (201); NDCNR (2002); USGS (2004, 2005a, 2007).

reptile species would be small, ranging from 0.05% for the side-blotched lizard to 0.5% for the nightsnake (Table 11.2.11.1-1). Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 3.6% of available habitat for the desert horned lizard, Great Basin collared lizard, and glossy snake). Indirect impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.2.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., washes and playas). Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features are best established when project details are being considered, one design feature can be identified at this time:

- Delamar Lake, Jumbo Wash, and the unnamed wash should be avoided.

If this SEZ-specific design feature is implemented in addition to the programmatic design features, impacts on amphibian and reptile species could be reduced. However, as potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.2.11.2 Birds

11.2.11.2.1 Affected Environment

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Delamar Valley SEZ. The list of bird species potentially present in the SEZ area was determined from the NNHP (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Eight bird species that could occur on or in the affected area of the SEZ are considered focal species in the *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), and verdin (*Auriparus flaviceps*). Habitats for most of these species are described in Table 11.2.11.2-1. Due to its special species status, the burrowing owl is discussed in Section 11.2.12.

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state solar study area. However, within the proposed Delamar Valley SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Playa and wash habitats within the SEZ may attract shorebird species, but the perennial streams within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) is the shorebird species most likely to occur within the SEZ.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state solar energy study area. Species expected to occur within the proposed Delamar Valley SEZ include the ash-throated flycatcher, Bewick's wren (*Thryomanes bewickii*), black-throated sparrow, cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's

TABLE 11.2.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Delamar Valley SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Shorebirds					
Killdeer (*Charadrius vociferus*)	Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 51,700 acres[h] of potentially suitable habitat occurs within the SEZ region.	3,089 acres of potentially suitable habitat lost (6.0% of available potentially suitable habitat) during construction and operations	457 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	1 acre of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 71 acres in area of indirect effects	Moderate overall impact. Avoid Delamar Lake and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Neotropical Migrants					
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats, including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 4,306,500 acres of potentially suitable habitat occurs within the SEZ region.	12,210 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	100,946 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	49 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,254 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Bewick's wren (*Thryomanes bewickii*)	Generally associated with dense, brushy habitats. It is a permanent resident of lowland deserts and pinyon-juniper forests of southern Utah. Breeding occurs in brushy areas of open woodlands and other open habitats. It is a cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 3,511,800 acres of potentially suitable habitat occurs within the SEZ region.	5,124 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	88,783 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	31 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,657 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert-scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 2,655,300 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) during construction and operations	43,481 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	43 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 3,750 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. About 1,211,300 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	38,118 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	34 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 2,964 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 3,491,800 acres of potentially suitable habitat occurs within the SEZ region.	11,233 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	63,000 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	17 acres of potentially suitable habitat lost (0.0005% of available potentially suitable habitat) and 1,475 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or man-made structures. Forages in sparse, open terrain. About 4,836,400 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	150,024 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,400 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 1,966,700 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,709 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 3,947 acres in area of indirect effects	Small overall impact. Avoid wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Fairly common in all desert habitats. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,449,200 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	102,364 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	49 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,250 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 3,932,400 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	148,184 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,304 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in Mojave and Colorado Deserts. Variety of habitats, including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 3,254,800 acres of potentially suitable habitat occurs within the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	66,841 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,134 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 2,223,200 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	62,263 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 3,922 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water, including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 3,646,400 acres of potentially suitable habitat occurs within the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	97,940 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,208 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 4,837,500 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	149,068 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,432 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Northern mockingbird (*Mimus polyglottos*)	Parkland, cultivated lands, second-growth habitats, desert scrub, and riparian areas at low elevations. Forages on ground in short, grassy to nearly barren substrates. About 4,983,600 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	152,695 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,577 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Rock wren (*Salpinctes obsoletus*)	Arid and semiarid habitats. Breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices and the nest entrance is paved with small rocks and stones. About 4,856,900 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	152,547 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,531 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Sage sparrow (*Amphispiza belli*)	Prefers shrubland, grassland, and desert habitats. The nest, constructed of twigs and grasses, is located either low in a shrub or on the ground. About 3,005,900 acres of potentially suitable habitat occurs within the SEZ region.	12,315 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	108,451 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	18 acres of potentially suitable habitat lost (0.0006% of available potentially suitable habitat) and 1,525 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 3,205,400 acres of potentially suitable habitat occurs within the SEZ region.	1,941 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	77,919 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,079 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Scott's oriole (*Icterus parisorum*)	Desert-facing slopes of mountains or semiarid plains between mountain ranges. Nests in trees or yuccas. About 1,811,900 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,957 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	31 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 2,734 acres in area of indirect effects	Small overall impact. Avoid Mojave mid-elevation mixed desert scrub habitat. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Verdin (*Auriparus flaviceps*)	Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 1,842,300 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,561 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.0002% of available potentially suitable habitat) and 3,901 acres in area of indirect effects	Small overall impact. Avoid Mojave mid-elevation mixed desert scrub habitat. Also avoid Delamar Lake and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Western kingbird (*Tyrannus verticalis*)	Occurs in a variety of habitats, including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. It migrates to Central America or the southeastern United States for the winter. About 3,946,100 acres of potentially suitable habitat occurs within the SEZ region.	12,318 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	144,904 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,353 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Birds of Prey					
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 4,844,100 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	149,149 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	63 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,479 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Birds of Prey (Cont.)					
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,994,200 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	149,149 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	63 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,506 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Great horned owl (*Bubo virginianus*)	Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 5,026,500 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	153,651 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,582 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Long-eared owl (*Asio otus*)	Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush-bursage flats, desert scrub, grasslands, and agricultural fields). About 4,634,000 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	147,410 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,317 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 2,581,100 acres of potentially suitable habitat occurs in the SEZ region.	12,328 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	131,116 acres of potentially suitable habitat (5.1% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 4,150 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 3,237,800 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	66,922 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,192 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Upland Game Birds					
Chukar (*Alectoris chukar*)	Steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds found within 0.25 mi (0.4 km) of water during the brooding period. About 4,781,900 acres of potentially suitable habitat occurs in the SEZ region.	12,328 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	147,761 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,356 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 3,819,600 acres of potentially suitable habitat occurs within the SEZ region.	3,023 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	124,461 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,365 acres in area of indirect effects	Small overall impact. Avoid Delamar Lake and wash habitats.
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,415,200 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	139,241 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,352 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Upland Game Birds (Cont.)					
White-winged dove (*Zenaida asiatica*)	Nests in low to medium height trees with dense foliage and fairly open ground cover. Feeds on wild seeds, grains, and fruit. About 1,959,800 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,709 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	44 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 3,827 acres in area of indirect effects	Small overall impact. Avoid Mojave mid-elevation mixed desert scrub habitat.
Wild turkey (*Meleagris gallopavo*)	Lowland riparian forests, foothill shrubs, pinyon-juniper woodlands, foothill riparian forests, and agricultural areas. About 2,497,200 acres of potentially suitable habitat occurs within the SEZ region.	4,170 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	86,902 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	18 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 1,556 acres in area of indirect effects	Small overall impact.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 13,242 acres of direct effects within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 13,242 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

Footnotes continued on next page.

TABLE 11.2.11.2-1 (Cont.)

[e] For access road development, direct effects were estimated within an 8-mi (13-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

hummingbird, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker, Le Conte's thrasher, lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), northern mockingbird (*Mimus polyglottos*), rock wren (*Salpinctes obsoletus*), sage sparrow (*Amphispiza belli*), Say's phoebe (*Sayornis saya*), Scott's oriole (*Icterus parisorum*), verdin, and western kingbird (*Tyrannus verticalis*) (USGS 2007).

Birds of Prey

Section 4.10.2.2.4 provided an overview of the birds of prey (raptors, owls, and vultures) within the six-state solar study area. Raptor species that could occur within the proposed Delamar Valley SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*) (USGS 2007). Several other special status birds of prey are discussed in Section 11.2.12. These include the ferruginous hawk (*Buteo regalis*), northern goshawk (*Accipiter gentilis*), prairie falcon (*Falco mexicanus*), and burrowing owl.

Upland Game Birds

Section 4.10.2.2.5 provided an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed Delamar Valley SEZ include the chukar (*Alectoris chukar*), Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), white-winged dove (*Zenaida asiatica*), and wild turkey (*Meleagris gallopavo*) (USGS 2007).

Table 11.2.11.2-1 provides habitat information for representative bird species that could occur within the proposed Delamar Valley SEZ. Special status bird species are discussed in Section 11.2.12.

11.2.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2 and through the application of any additional mitigation measures. Section 11.2.11.2.3, below, identifies design features of particular relevance to the proposed Delamar Valley SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 11.2.11.2.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 11.2.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), and from disturbance, injury, or mortality to individual birds. Table 11.2.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed Delamar Valley SEZ. On the basis of the impacts on birds summarized in Table 11.2.11.2-1, direct impacts on representative bird species would be moderate for the killdeer (loss of 6.0% of potentially suitable habitat) and small for all other bird species (ranging from 0.04% for the black-throated sparrow to 0.5% for Le Conte's thrasher (Table 11.2.11.2-1). Larger areas of potentially suitable habitats for the bird species occur within the area of potential indirect effects (e.g., up to 5.1% of available habitat for the red-tailed hawk). Indirect impacts on birds could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.2.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds, especially for those species that depend on habitat types that can be avoided (e.g., wash and playa habitats). Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important for reducing impacts on birds are best established when considering specific project details, some design features can be identified at this time:

- For solar energy facilities within the SEZ, the requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed.

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act.

- Delamar Lake, Jumbo Wash, and the unnamed wash should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on bird species could be reduced. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.2.11.3 Mammals

11.2.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Delamar Valley SEZ. The list of mammal species potentially present in the SEZ area was determined from the NNHP (NDCNR 2002) and range maps and habitat information available from the SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Over 55 species of mammals have ranges that encompass the area of the proposed Delamar Valley SEZ (NDCNR 2002; USGS 2007); however, suitable habitats for a number of these species are limited or nonexistent within the SEZ (USGS 2007). Similar to the overview of mammals provided for the six-state solar energy study area (Section 4.10.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share important habitats.

Big Game

The big game species that could occur within the vicinity of the proposed Delamar Valley SEZ include cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), Nelson's bighorn sheep (*Ovis canadensis nelsoni*), and pronghorn (*Antilocapra americana*) (USGS 2007). Due to its special species status, the Nelson's bighorn sheep is addressed in Section 11.2.12. Among the other big game species, potentially suitable habitats for the cougar, mule deer, and pronghorn occur within the SEZ. No potentially suitable habitat for elk occurs within the SEZ, while only limited potentially suitable habitat for this species occurs within the area of indirect effects. Figure 11.2.11.3-1 shows the location of the SEZ relative to mapped elk habitat; Figure 11.2.11.3-2 shows the location of the SEZ relative to the mapped range of mule deer habitat; and Figure 11.2.11.3-3 shows the location of the SEZ relative to mapped pronghorn habitat.

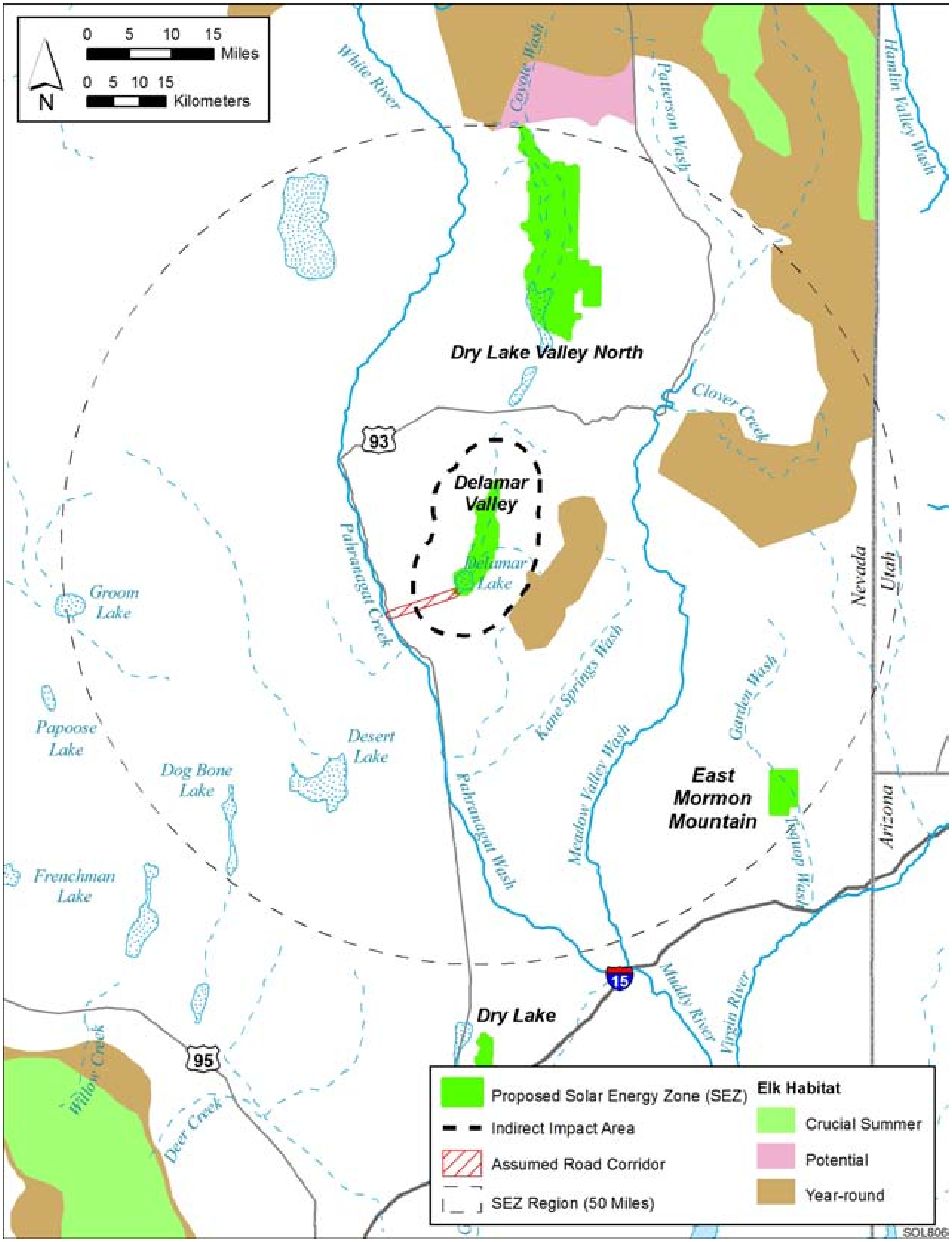

FIGURE 11.2.11.3-1 Location of the Proposed Delamar Valley SEZ Relative to the Mapped Range of Elk (Source: NDOW 2010)

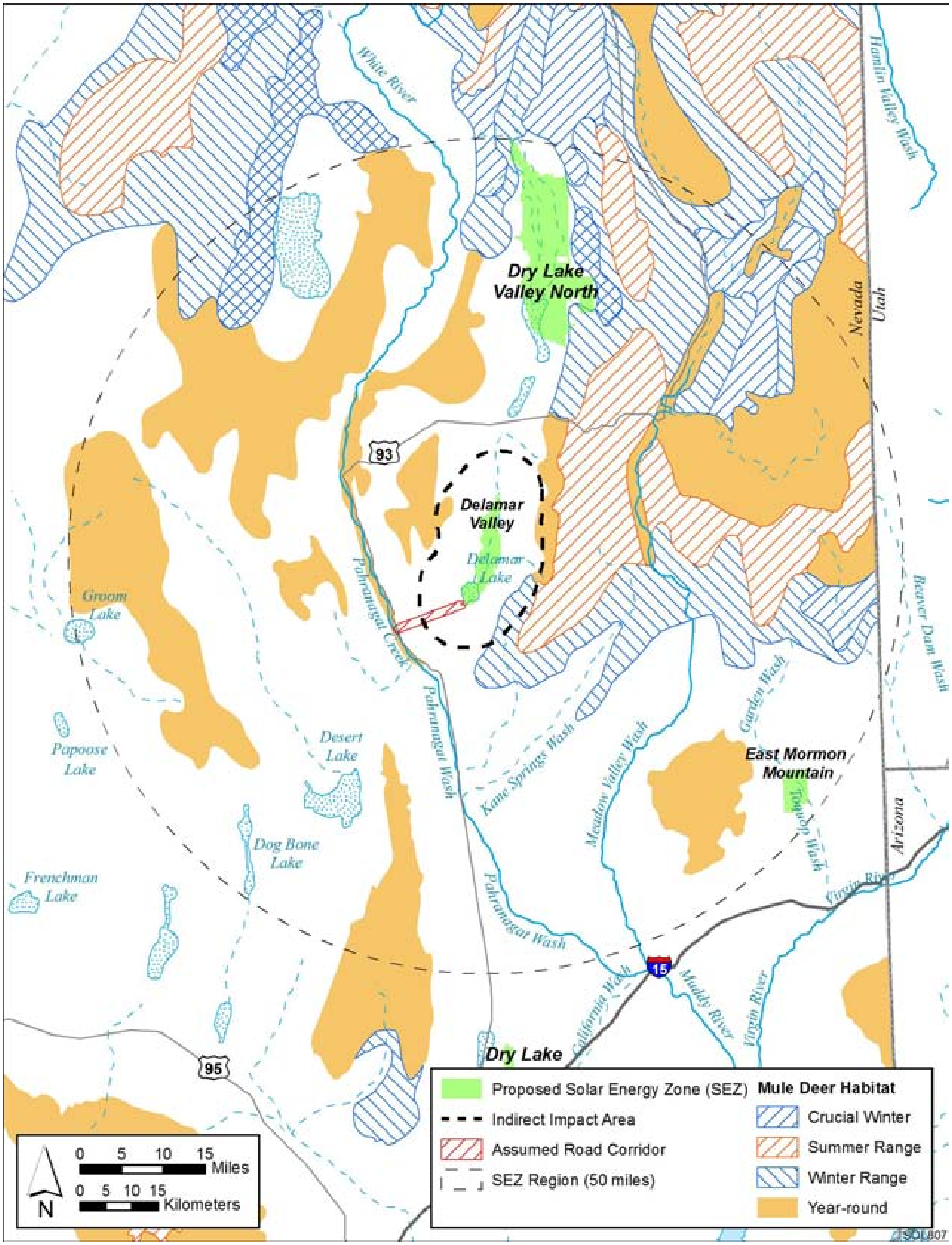

FIGURE 11.2.11.3-2 Location of the Proposed Delamar Valley SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)

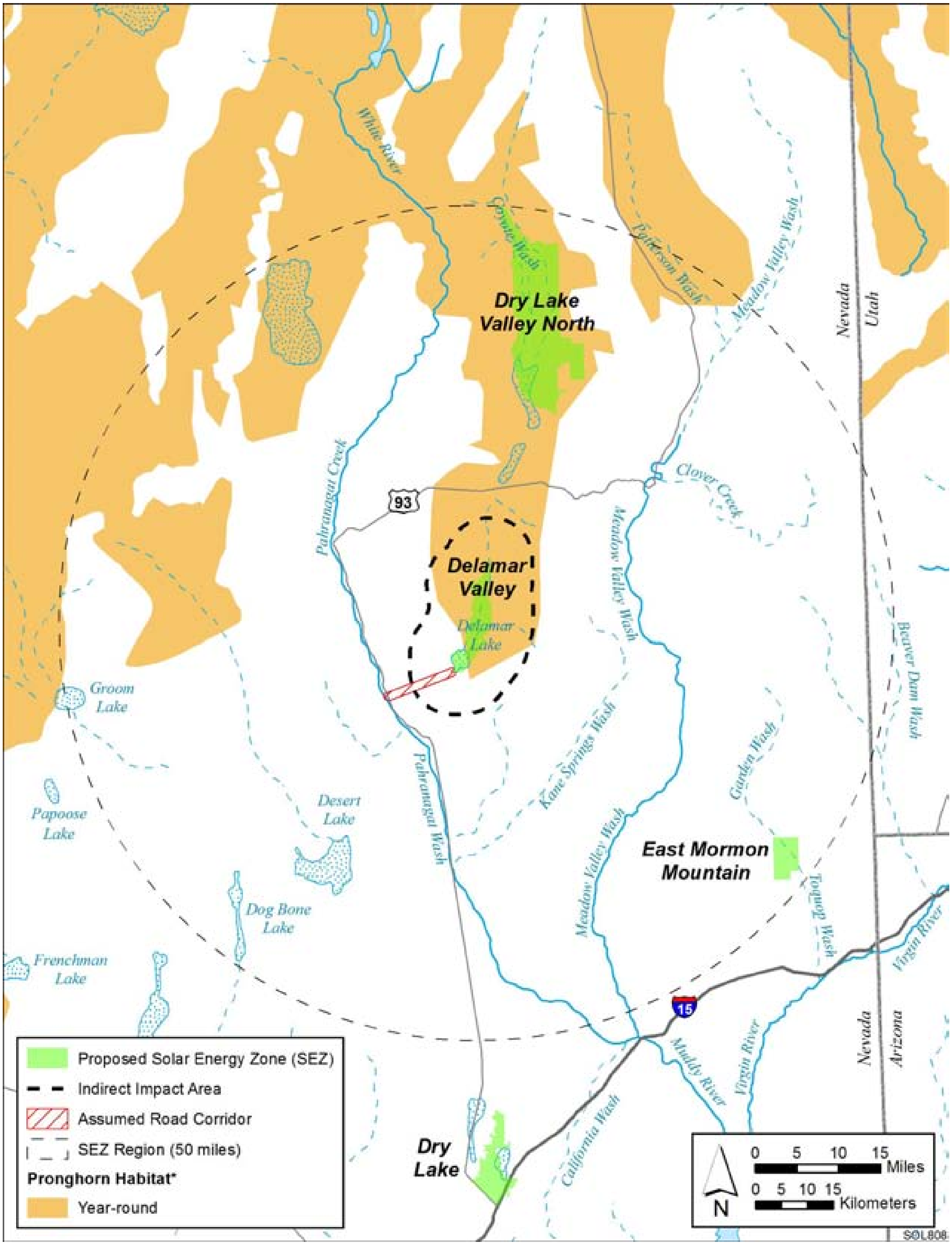

FIGURE 11.2.11.3-3 Location of the Proposed Delamar Valley SEZ Relative to the Mapped Range of Pronghorn (Source: NDOW 2010)

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Delamar Valley SEZ. Species that could occur within the area of the SEZ would include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*, common), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and red fox (*Vulpes vulpes*) (USGS 2007).

The nongame (small) mammals include rodents, bats, and shrews. Representative species for which potentially suitable habitat occurs within the proposed Delamar Valley SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), canyon mouse (*P. crinitis*), deer mouse (*P. maniculatus*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's pocket mouse (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), southern grasshopper mouse (*O. torridus*), western harvest mouse (*Reithrodontomys megalotis*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), little brown myotis (*M. lucifugus*), long-legged myotis (*M. volans*), silver-haired bat (*Lasionycteris noctivagans*), and western pipistrelle (*Parastrellus hesperus*) (USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ. Several other special status bat species that could occur within the SEZ area are addressed in Section 11.2.12.

Table 11.2.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Delamar Valley SEZ. Special status mammal species are discussed in Section 11.2.12.

11.2.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.2.11.3.3, below, identifies design features of particular relevance to mammals for the proposed Delamar Valley SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 11.2.11.3.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 11.2.11.3.3).

Table 11.2.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed Delamar Valley SEZ.

Cougar

Up to 12,391 acres (50.1 km^2) of potentially suitable cougar habitat could be lost through solar energy and access road development within the proposed Delamar Valley SEZ. This represents about 0.2% of potentially suitable cougar habitat within the SEZ region. About 154,416 acres (624.9 km^2) of potentially suitable cougar habitat occurs within the area of indirect effects for the SEZ and access road. This is about 3.1% of potentially suitable cougar habitat within the SEZ region. Overall, impacts on cougar from solar energy development in the SEZ would be small.

Elk

Based on land cover analyses, potentially suitable elk habitat does not occur within the proposed Delamar Valley SEZ. Slightly more than 160 acres (0.6 km^2) of potentially suitable habitat occurs within the proposed access road corridor and could directly affect about 2 acres (0.008 km^2) of habitat. Thus, solar energy development in the SEZ would have little direct impact on elk habitat. About 35,470 acres (143.5 km^2) of potentially suitable elk habitat occurs within the area of indirect effects, or more than 2.8% of potentially suitable elk habitat within the SEZ region. Based on mapped ranges, the closest year-round elk habitat is about 4.4 mi (7.1 km) from the SEZ, while the closest crucial summer habitat is about 19 mi (31 km) from the SEZ (Figure 11.2.11.3-1). About 530 acres (2.1 km^2) of mapped year-round elk habitat occurs within the area of indirect effects. Overall, impacts on elk from solar energy development in the SEZ would be small to none.

Mule Deer

Based on land cover analyses, up to 13,303 acres (53.9 km^2) of potentially suitable mule deer habitat could be lost through solar energy and access road development within the proposed Delamar Valley SEZ. This represents about 0.3% of potentially suitable mule deer habitat within the SEZ region. About 149,047 acres (603.2 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effects for the SEZ and access road. This is about 3.7% of potentially suitable mule deer habitat within the SEZ region. Based on mapped range, the closest year-round mule deer habitat is about 3 mi (5 km) from the SEZ (Figure 11.2.11.3-2). About 6,465 acres (26.2 km^2) of year-round mule deer habitat occurs within the area of indirect effects, or about 0.6% of the year-round mule deer habitat within the SEZ region. The closest winter mule deer habitat occurs 2.5 mi (4.0 km) from the SEZ; while the closest summer range is 4.9 mi (7.9 km) from the SEZ (Figure 11.2.11.3-2). About 9,740 acres (39.4 km^2) of winter range and 31 acres (0.1 km2) of summer range occur within the area of indirect effects. Overall, impacts on mule deer from solar energy development in the SEZ would be small.

TABLE 11.2.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Delamar Valley SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Big Game					
Cougar (*Puma concolor*)	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,934,200 acres[h] of potentially suitable habitat occurs in the SEZ region.	12,328 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	148,938 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	63 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,478 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Mule deer (*Odocoileus hemionus*)	Most habitats, including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provides abundant browse and cover. About 3,999,800 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	144,498 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,549 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Pronghorn (*Antilocapra americana*)	Grasslands and semidesert shrublands on rolling topography that affords good visibility. Most abundant in shortgrass or midgrass prairies and least common in xeric habitats. About 1,691,100 acres of potentially suitable habitat occurs in the SEZ region.	2,046 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	82,177 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	15 acres of potentially suitable habitat lost (<0.0001% of available potentially suitable habitat) and 1,292 acres in area of indirect effects	Small overall impact.

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TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers					
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 4,605,600 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	152,466 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,426 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,851,700 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	152,547 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,407 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Bobcat (*Lynx rufus*)	Most habitats except subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 4,288,600 acres of potentially suitable habitat occurs in the SEZ region.	6,112 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	126,105 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	60 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,265 acres in area of indirect effects	Small overall impact.

TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Small Game and Furbearers (Cont.)					
Coyote (*Canis latrans*)	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 5,025,783 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	153,651 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,582 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 3,730,100 acres of potentially suitable habitat occurs in the SEZ region.	12,315 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	109,331 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,480 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Gray fox (*Urocyon cinereoargenteus*)	Deserts, open forests, and brush. Prefers wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 2,836,200 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	78,063 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,637 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Kit fox (*Vulpes macrotis*)	Desert and semidesert areas with relatively open vegetative cover and soft soils. Seeks shelter in underground burrows. About 4,055,200 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	146,162 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,330 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Red fox (*Vulpes vulpes*)	Most common in open woodlands, pasturelands, riparian areas, and agricultural lands. About 3,250,200 acres of potentially suitable habitat occurs in the SEZ region.	4,171 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	89,427 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,546 acres in area of indirect effects	Small overall impact.
Nongame (small) Mammals					
Big brown bat (*Eptesicus fuscus*)	Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 2,785,100 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	78,061 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,485 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Botta's pocket gopher (*Thomomys bottae*)	Variety of habitats, including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 2,533,400 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	96,745 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,444 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 3,425,900 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	99,748 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,648 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Cactus mouse (*Peromyscus eremicus*)	Variety of areas, including desert scrub, semidesert chaparral, desert wash, semidesert grassland, and cliff and canyon habitats. About 3,205,500 acres of potentially suitable habitat occurs in the SEZ region.	3,024 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	91,847 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	59 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,089 acres in area of indirect effects	Small overall impact. Avoid wash habitats.

TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Nongame (small) Mammals (Cont.)					
California myotis (*Myotis californicus*)	Desertscrub, semidesert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 2,717,300 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	96,834 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,648 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Canyon mouse (*Peromyscus crinitus*)	Associated with rocky substrates in a variety of habitats, including desert scrub, sagebrush shrublands, woodlands, cliffs and canyons, and volcanic rock and cinder lands. Source of free water not required. About 3,119,700 acres of potentially suitable habitat occurs in the SEZ region.	977 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	76,157 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,081 acres in area of indirect effects	Small overall impact. Avoid Mojave mid-elevation mixed desert scrub habitat.
Deer mouse (*Peromyscus maniculatus*)	Tundra; alpine and subalpine grasslands; plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran desert scrub habitats. About 4,801,800 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	148,987 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,434 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Desert shrew (*Notiosorex crawfordi*)	Usually in arid areas with adequate cover such as semiarid grasslands, shortgrass plains, desert scrub, chaparral slopes, shortgrass plains, oak savannas and woodlands, and alluvial fans. About 3,059,300 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	112,817 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 5,378 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,936,500 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	149,149 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	63 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,506 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Hoary bat (*Lasiurus cinereus*)	Chaparral, shortgrass plains, scrub-grassland, desertscrub, forests and woodlands. Usually roosts in trees, also in caves, rock crevices, and houses. About 2,398,100 acres of potentially suitable habitat occurs in the SEZ region.	5,134 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	54,198 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,470 acres in area of indirect effects	Small overall impact.

TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Little brown myotis (*Myotis lucifugus*)	Various habitats, including pinyon-juniper woodlands, montane shrublands, and riparian woodlands. It uses man-made structures for summer roosting, although caves and hollow trees are also utilized. Winter hibernation often occurs in caves or mines. Most foraging activity occurs in woodlands over or near water. About 3,360,100 acres of potentially suitable habitat occurs within the SEZ region.	12,329 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	133,976 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	50 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,308 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Little pocket mouse (*Perognathus longimembris*)	Mostly sandy and gravelly soils, but also stony soils and rarely rocky sites. About 3,871,400 acres of potentially suitable habitat occurs in the SEZ region.	12,318 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	143,526 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	60 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,259 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Long-legged myotis (*Myotis volans*)	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees are used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 2,822,000 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	78,079 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,610 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b] Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b] Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Long-tailed pocket mouse (*Chaetodipus formosus*)	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 4,022,700 acres of potentially suitable habitat occurs within the SEZ region.	12,318 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	145,111 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,380 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Merriam's kangaroo rat (*Dipodomys merriami*)	Plains grasslands, scrub-grasslands, desertscrub, shortgrass plains, oak and juniper savannahs, mesquite dunes, and creosote flats. About 4,023,100 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	148,166 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,331 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Northern grasshopper mouse (*Onychomys leucogaster*)	Occurs in grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 4,262,300 acres of potentially suitable habitat occurs within the SEZ region.	2,059 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	125,503 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	59 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,166 acres in area of indirect effects	Small overall impact.

TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Silver-haired bat (*Lasionycteris noctivagans*)	Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savannah, and desertscrub habitats. Roosts under bark, and in hollow trees, caves and mines. Forages over clearings and open water. About 3,409,300 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	99,232 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	31 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,662 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Southern grasshopper mouse (*Onychomys torridus*)	Low, arid, shrub and semiscrub vegetation of deserts. About 2,828,700 acres of potentially suitable habitat occurs within the SEZ region.	12,328 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	108,963 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	60 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 5,227 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects
Western harvest mouse (*Reithrodontomys megalotis*)	Various habitats, including scrub-grasslands, temperate swamps and riparian forests, salt marshes, shortgrass plains, oak savannah, dry fields, agricultural areas, deserts, and desertscrub. Grasses are the preferred cover. About 2,525,700 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	76,480 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	27 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,364 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 2,649,400 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	96,828 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,496 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends its nights and other periods of inactivity in underground burrows. About 3,414,400 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	124,926 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,311 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Yuma myotis (*Myotis yumanensis*)	Riparian areas, grasslands, semidesert shrubland, mountain brush, woodlands, and deserts. It occurs where there is open water, regardless of the habitat. Roosts in caves, mines, cliffs, crevices, buildings, and swallow nests. About 2,715,000 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	95,709 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,625 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

Footnotes on next page.

TABLE 11.2.11.3-1 (Cont.)

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[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 13,242 acres of direct effects within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 13,242 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] For access road development, direct effects were estimated within an 8-mi (13-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

Pronghorn

Based on land cover analyses, up to 2,061 acres (8.3 km^2) of potentially suitable pronghorn habitat could be lost through solar energy and access road development within the proposed Delamar Valley SEZ. This represents about 0.1% of potentially suitable pronghorn habitat within the SEZ region. About 83,469 acres (337.8 km^2) of potentially suitable pronghorn habitat occurs within the area of indirect effects for the SEZ and access road. This is about 4.9% of potentially suitable pronghorn habitat within the SEZ region. Based on mapped range, 14,035 acres (56.8 km^2) of year-round pronghorn habitat would be directly affected by solar energy development within the SEZ (Figure 11.2.11.3-3), or about 1.5% of the year-round habitat mapped within the SEZ region. About 93,360 (378 km^2) of habitat occurs within the area of indirect effects (Figure 11.2.11.3-3). Overall, impacts on pronghorn from solar energy development in the SEZ would be small (based on land cover) to moderate (based on mapped range).

Other Mammals

Direct impacts on all other representative mammal species would be small (Table 11.2.11.3-1). Direct impacts (percent loss of potentially available habitat) for these species would range from 0.03% for the canyon mouse to 0.5% for the gray fox, big brown bat, Botta's pocket gopher, California myotis, long-legged myotis, western harvest mouse, western pipistrelle, and Yuma myotis (Table 11.2.11.3-1). Larger areas of potentially suitable habitats for these mammal species occur within the area of potential indirect effects (e.g., up to 5.9% of available habitat for the western pipistrelle).

Summary

Overall, impacts on mammal species, based on land cover analyses, would be small (Table 11.2.11.3-1). Based on mapped ranges for big game, a moderate impact could occur to pronghorn. In addition to habitat loss, other direct impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences). Indirect impacts on mammals could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. Indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.2.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important for reducing impacts on mammals are best established when considering specific project details, design features that can be identified at this time are:

- The fencing around the solar energy development should not block the free movement of mammals, particularly big game species.

- Delamar Lake and the unnamed wash should be avoided.

If these SEZ-specific design features are implemented in addition to other programmatic design features, impacts on mammals could be reduced. Any residual impacts are anticipated to be small given the relative abundance of potentially suitable habitats in the SEZ region. However, potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ; therefore, species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.2.11.4 Aquatic Biota

11.2.11.4.1 Affected Environment

This section addresses aquatic habitats and biota known to occur in the proposed Delamar Valley SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. There are no surface water bodies or perennial streams within the proposed Delamar Valley SEZ or within the area of direct effects associated with the assumed new road corridor (Figure 11.2.1.1-1). As described in Section 11.2.9.1.1, 4 mi (6 km) of the intermittent Jumbo Wash and 8 mi (13 km) of an unnamed wash cross through the SEZ. These washes are typically dry and flow only after precipitation, at which time they carry water to Delamar Lake, a dry lake, 2,465 acres (10 km^2) of which are also located within the SEZ. Other ephemeral washes may also cross the SEZ, but they typically do not support wetland or riparian habitats. As described in Section 11.2.9.1.1, Delamar Lake is classified as a lacustrine wetland by the NWI. However, in the desert southwest, wetlands near dry lakes rarely have water (USFS 1998). Consequently, aquatic habitat and communities are not likely to be present in the proposed Delamar Valley SEZ, although opportunistic crustaceans and aquatic insect larvae adapted to desert conditions may be present even under dry conditions.

There are no permanent surface water bodies or perennial streams located within the area of indirect effects associated with the proposed Delamar Valley SEZ. However, the boundary of the area of indirect effects associated with the presumed new road corridor does extend to the spring-fed perennial Pahranagat Creek, which flows into Pahranagat National Wildlife Refuge.

Pahranagat NWR contains stream and wetland habitat critical for aquatic biota, including several protected endemic fish species, such as the White River springfish (*Crenichthys baileyi baileyi*) and the Pahranagat roundtail chub (*Gila robusta jordani*). There are no intermittent surface water features in the area of indirect effects associated with the presumed road corridors, but there are several within the area of indirect effects associated with the SEZ, including 141 acres (0.6 km^2) of Delamar Lake, 6 mi (7 km) of Jumbo Wash, and 9 mi (14 km) of an unnamed intermittent stream. The intermittent/ephemeral nature of these features suggests aquatic habitat and biota are unlikely. However, more detailed site survey data would be needed to characterize the aquatic biota, if present.

Outside of the potential indirect effects area, but within 50 mi (80 km) of the SEZ, there are several dry lakes, the area of which totals approximately 152,193 acres (616 km^2). There are 319 mi (513 km) of intermittent stream and 223 mi (359 km) of perennial stream located within 50 mi (80 km) of the SEZ. Ash Spring and the Pahranagat NWR are also located within 50 mi (80 km) of the SEZ. Within the SEZ and the area of potential indirect effects, intermittent streams and dry lakes are the only surface-water features present, representing approximately 7% of the amount of intermittent stream and 2% of dry lake available within the overall analysis area.

11.2.11.4.2 Impacts

Section 5.10.3 discusses in detail the types of impacts that could occur to aquatic habitats and biota due to the development of utility-scale solar energy facilities. Effects that are particularly relevant to aquatic habitats and communities include water withdrawal and changes in water, sediment, and contaminant inputs associated with runoff.

No permanent water bodies or streams are present within the area of direct or indirect effects associated with the proposed Delamar Valley SEZ. The nearest perennial surface waters are located more than 8 mi (13 km) from the SEZ and the intermittent streams in the SEZ do not drain into any permanent surface waters. Therefore, no direct impacts on perennial aquatic habitat are expected to result from solar development activities within the SEZ. Ground disturbance related to the presumed new access road terminates at U.S. 93, less than 1 mi (2 km) from Pahranagat Creek. Therefore, indirect impacts on the creek may result from the deposition of fugitive dust following ground disturbance. Intermittent surface water features are present within the area of direct and indirect effects associated with the SEZ, and ground disturbance could result in airborne and waterborne sediment deposition into these habitats. However, intermittent streams and water bodies within the SEZ are typically dry and no aquatic habitat or communities are expected to exist. Consequently, impacts on aquatic biota are expected to be minimal, although more detailed site surveys for biota in ephemeral and intermittent surface waters would be necessary to determine whether solar energy development activities would result in direct or indirect impacts to aquatic biota, if present. The implementation of commonly used engineering practices to control water runoff and sediment deposition into Pahranagat Creek, intermittent washes, and Delamar Lake would further minimize the potential for impacts on aquatic habitat.

As identified in Section 5.10.3, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning for a solar energy facility. Within the SEZ, there is the potential for contaminants to enter washes and Delamar Lake, especially if heavy machinery is used in or near the channel. The potential for introducing contaminants into permanent surface waters would be small, given the relatively large distance from any features to solar development activities (minimum of approximately 8 mi [13 km]).

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats, including surface water features outside of the SEZ and area of indirect effects, could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. Of the technologies available, a PV system is the most practical given the amount of groundwater present and the existing water allotments (Section 11.2.9.2). The associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

11.2.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for effects on aquatic biota and aquatic habitats from development and operation of solar energy facilities. While some SEZ-specific design features are best established when specific project details are being considered, a design feature that can be identified at this time includes the following:

- Appropriate engineering controls should be implemented to minimize the amount of contaminants and sediment entering washes and Delamar Lake and Pahranagat Creek.

If this SEZ-specific design feature is implemented in addition to programmatic design features and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the Delamar Valley SEZ would be negligible.

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11.2.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Delamar Valley SEZ. Special status species include the following types of species[3]:

- Species listed as threatened or endangered under the ESA;
- Species that are proposed for listing, under review, or are candidates for listing under the ESA;
- Species that are listed by the BLM as sensitive;
- Species that are listed by the state of Nevada[4]; and
- Species that have been ranked as S1 or S2 by the state of Nevada, or as species of concern by the state of Nevada or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the Delamar Valley SEZ (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the NNHP (NDCNR 2004, 2005, 2009a,b; Miskow 2009), SWReGAP (USGS 2004, 2005, 2007), and ECOS (USFWS 2010c). Information reviewed consisted of county-level occurrences as determined from NatureServe and the NNHP, element occurrences provided by the NNHP, and modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from SWReGAP. The 50-mi (80-km) SEZ region intersects Clark, Lincoln, and Nye Counties, Nevada, as well as Washington County, Utah. However, the affected area around the SEZ occurs entirely within Lincoln County, Nevada. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

11.2.12.1 Affected Environment

The affected area considered in our assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the proposed Delamar Valley SEZ, the area of direct effects included the SEZ and the portions of the road corridor where ground-disturbing activities are assumed to occur. Due to the proximity of

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[3] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[4] State-listed species for the state of Nevada are those protected under NRS 501.110 (animals) or NRS 527 (plants).

existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades (see Section 11.2.1.2 for development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and portions of the access road corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ and road construction area, but do not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary land cover habitat type within the affected area is inter-mountain basin semidesert shrubland (Section 11.2.10). Potentially unique habitats in the affected area in which special status species may reside include rocky cliffs and outcrops, riparian woodlands, desert washes, and playa habitats. Aquatic habitats that occur in the affected area include Jumbo Wash and other small ephemeral streams that drain into Delamar Lake (approximately 2,500 acres [10 km^2] in size), which exists in the southern portion of the SEZ. Although the assumed access road corridor for the SEZ does not cross any surface water features, approximately 0.5 mi (0.8 km) of Pahranagat Creek intersects the area of potential indirect effects for the access road corridor (Figure 11.2.12.1-1).

In scoping comments regarding the proposed Delamar Valley SEZ (Stout 2009), the USFWS expressed concern that groundwater withdrawals associated with solar energy development on the SEZ may reduce the White River Valley regional groundwater supply that supports spring-fed aquatic habitats in the SEZ region, including habitats in the White River, Pahranagat, and Moapa Valleys. The spatial extent of this groundwater system extends from Ely in central Nevada to the Moapa Valley in southern Nevada. However, as discussed in Section 11.2.9.2, groundwater in the Delamar Valley is not a major contributor to the far northern or far southern extents of the White River Valley regional groundwater system. Instead, groundwater interaction from the Delamar Valley with the White River Regional groundwater system is highly localized, occurring primarily within the Pahranagat Valley. For these reasons, the analysis in this section does not consider impacts on some of the species mentioned in the USFWS scoping letter. Instead, only those species dependent on groundwater-supported habitats within the Pahranagat Valley are included in our assessment here. This includes species that occur in aquatic and riparian habitat associated with the following springs: Ash Springs, Crystal Spring, and Hiko Spring (Figure 11.2.12.1-1). Although these areas are outside of the affected area as defined above, they are included in our evaluation because of the possible effect of groundwater withdrawals.

All special status species that are known to occur within the Delamar Valley SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats in Appendix J. Of these species, there are 49 that could be affected by

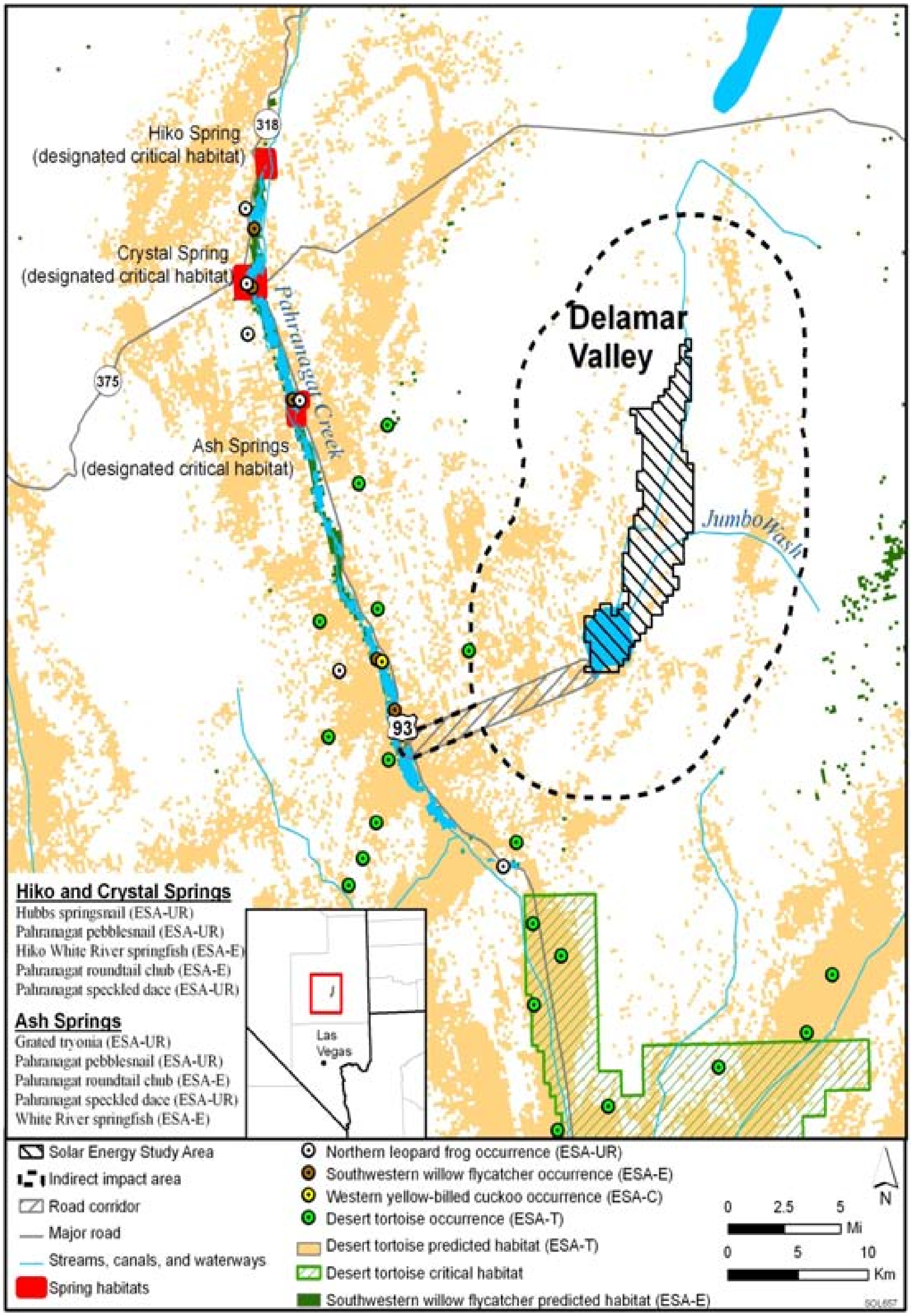

FIGURE 11.2.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA, Candidates for ESA Listing, or under Review for Listing in the Affected Area of the Proposed Delamar Valley SEZ (Sources: Miskow 2009; USFWS 2010c; USGS 2007).

solar energy development on the SEZ (including those dependent on groundwater discharge in the region), on the basis of recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 11.2.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped SWReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 m) away from the SEZ.

Based on NNHP records and information provided by the USFWS, only the desert tortoise is known to occur within the affected area of the Delamar Valley SEZ. In addition to this species, there are 16 groundwater-dependent species or species with habitats that may be affected by groundwater discharge in the White River Valley regional groundwater system from withdrawals in the Delamar Valley. These species include the Ash Springs riffle beetle, grated tryonia, Hubbs springsnail, nearctic riffle beetle, Pahranagat naucorid, Pahranagat pebblesnail, Hiko White River springfish, Pahranagat roundtail chub, Pahranagat speckled dace, White River desert sucker, White River springfish, northern leopard frog, southwestern toad, phainopepla, southwestern willow flycatcher, and western yellow-billed cuckoo. Ten additional groundwater-dependent species were identified in the FWS scoping letter (Stout 2009): Moapa pebblesnail, Moapa Valley springsnail, Moapa Warm Spring riffle beetle, Big Spring spinedace, Moapa dace, Moapa speckled dace, Moapa White River springfish, Pahrump poolfish, Railroad Valley springfish, and White River spinedace. However, these species occur outside the Pahranagat Valley, and, as discussed above, are considered to be unaffected by groundwater withdrawals on the Delamar Valley SEZ.

11.2.12.1.1 Species Listed under the ESA That Could Occur in the Affected Area

In scoping comments regarding the proposed Delamar Valley SEZ, the USFWS expressed concern for impacts of project development within the SEZ on the Mojave population of the desert tortoise—a species listed as threatened under the ESA in the SEZ region (Stout 2009). The USFWS also expressed concern that groundwater withdrawals to serve development on the SEZ from the White River Valley regional groundwater system may also reduce the groundwater supply that supports aquatic and riparian habitats for various ESA-listed species in the SEZ region. The following ESA-listed species that may occur outside the area of indirect effects but that could be impacted from groundwater withdrawals within the SEZ are considered: Hiko White River springfish (endangered), Pahranagat roundtail chub (endangered), White River springfish (endangered), and southwestern willow flycatcher (endangered). These species are discussed below and information on their habitats is presented in Table 11.2.12.1-1; additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

TABLE 11.2.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could be Affected by Solar Energy Development on the Proposed Delamar Valley SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c] Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants							
Ackerman milkvetch	*Astragalus ackermanii*	NV-S2	Endemic to the Sheep and Pintwater ranges of southern Nevada in crevices and ledges of carbonate cliffs in the mixed shrub, sagebrush, and juniper woodland habitat communities at elevations between 4,000 and 6,200 ft.[i] Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 21 mi[j] southwest of the SEZ. About 2,689,000 acres[k] of potentially suitable habitat occurs within the SEZ region.	976 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	78 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	48,900 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance or minimization of disturbance to occupied habitats in the areas of direct effects; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.
Antelope Canyon goldenbush	*Ericameria cervina*	NV-S1	Rock crevices and talus in shadscale and Douglas-fir-bristlecone pine communities often on calcareous substrates; less commonly on ash flow tuff. Elevation ranges between 3,100 and 8,800 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 33 mi southeast of the SEZ. About 850,600 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	3,000 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Charleston ground-daisy	*Townsendia jonesii* var. *tumulosa*	BLM-S; FWS-SC	Endemic to Nevada, where the species is known from 27 occurrences encompassing an area of less than 10 acres. Occurs in open, sparsely vegetated calcareous areas, on shallow gravelly carbonate soils of slopes and exposed knolls in forest clearings. Most commonly in montane conifer habitat, but also in pinyon-juniper, and lower subalpine conifer communities. Elevation ranges between 5,200 and 11,000 ft. Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 40 mi southwest of the SEZ. About 1,950,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	45,500 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on rocky cliffs and outcrops would reduce impacts. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Eastwood milkweed	*Asclepias eastwoodiana*	BLM-S; FWS-SC; NV-S2	Endemic to Nevada from public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, or shale outcrops, generally barren and lacking competition. Small washes or other moisture-accumulating microsites at elevations between 4,700 and 7,100 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 31 mi north of the SEZ. About 663,500 acres of potentially suitable habitat occurs within the SEZ region.	2,000 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	25 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	48,000 acres of potentially suitable habitat (7.2% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.
Jaeger beardtongue	*Penstemon thompsoniae* ssp. *jaegeri*	NV-S2	Endemic to southern Nevada, where it is known from 24 occurrences on limestone soils of knolls and slopes, drainages, and under conifers within pinyon-juniper through the subalpine conifer zones. Elevation ranges between 5,600 and 11,000 ft. Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 41 mi southwest of the SEZ. About 724,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	2,900 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Long-calyx milkvetch	*Astragalus oophorus* var. *lonchocalyx*	BLM-S; FWS-SC; NV-S2	Regionally endemic to the Great Basin in western Utah and eastern Nevada in pinyon-juniper woodlands, sagebrush, and mixed shrub communities at elevations between 5,800 and 7,500 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 11 mi east of the SEZ. About 3,145,000 acres of potentially suitable habitat occurs within the SEZ region.	11,200 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	101,000 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.
Meadow Valley sandwort	*Eremogone stenomeres*	NV-S2	Endemic to Nevada, where it is restricted to Clark and Lincoln Counties on limestone cliffs at elevations between 2,950 and 3,950 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 31 mi south of the SEZ. About 129,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	161 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Needle Mountains milkvetch	*Astragalus eurylobus*	BLM-S; FWS-SC; NV-S2	Gravel washes, playa margins, and arid grasslands on sandy soils at elevations between 4,250 and 6,250 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 26 mi northeast of the SEZ. About 68,000 acres of potentially suitable habitat occurs within the SEZ region.	3,100 acres of potentially suitable habitat lost (4.6% of available potentially suitable habitat)	2 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,800 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat could reduce impacts. See the Ackerman milkvetch for a list of other potential mitigations.
Nevada willowherb	*Epilobium nevadense*	BLM-S; FWS-SC; NV-S2	Pinyon-juniper woodlands and oak/mountain mahogany communities, on talus slopes and rocky limestone outcrops. Elevation ranges between 5,000 and 8,800 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 20 mi east of the SEZ. About 879,500 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	3,000 acres of potentially suitable habitat (0.3% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Pioche blazingstar	*Mentzelia argillicola*	BLM-S; NV-S1	Endemic to Nevada on dry, soft, silty clay soils on knolls and slopes with sparse vegetation consisting mainly of sagebrush. Nearest recorded occurrence is from the Patterson Wash, approximately 40 mi northeast of the SEZ. About 1,980,500 acres of potentially suitable habitat occurs within the SEZ region.	12,000 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	105,000 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.
Rock phacelia	*Phacelia petrosa*	BLM-S; NV-S2	Dry limestone and volcanic talus slopes of foothills, washes, and gravelly canyon bottoms on substrates derived from calcarous material in mixed desert scrub, creosotebush, and blackbrush communities at elevations between 2,500 and 5,800 ft. Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 40 mi southwest of the SEZ. About 2,100,000 acres of potentially suitable habitat occurs within the SEZ region.	976 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	80 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	46,000 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Rock purpusia	*Ivesia arizonica* var. *saxosa*	BLM-S; NV-S1	Endemic to southern Nevada in crevices of cliffs and boulders on volcanic substrates in pinyon-juniper communities at elevations between 4,900 and 6,900 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 11 mi north of the SEZ. About 850,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	4,600 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on rocky cliffs and outcrops would reduce impacts. See Ackerman milkvetch for a list of other potential mitigations.
Sheep Mountain milkvetch	*Astragalus amphioxys* var. *musimonum*	BLM-S; FWS-SC; NV-S2	Restricted to the foothills of the Sheep Mountains in southern Nevada (historically occurred in Arizona) on carbonate alluvial gravels, particularly along drainages, roadsides, and in other microsites with enhanced runoff, at elevations between 4,400 and 6,000 ft. Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 40 mi southwest of the SEZ. About 1,977,000 acres of potentially suitable habitat occurs within the SEZ region.	976 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	78 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	46,000 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
St. George blue-eyed grass	*Sisyrinchium radicatum*	NV-S1	Primarily occurs in the Las Vegas–St. George region in moist, sometimes alkaline meadows, stream banks, and spring borders at elevations between 2,000 and 4,300 ft. Nearest recorded occurrence is along the Pahranagat Creek, approximately 15 mi west of the SEZ. About 24,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	138 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Tiehm blazingstar	*Mentzelia tiehmii*	BLM-S; NV-S1	Endemic to Nevada on hilltops of white soil, sparsely vegetated white calcareous knolls, and bluffs with scattered perennials. Nearest recorded occurrence is along the White River, approximately 38 mi north of the SEZ. About 1,520,000 acres of potentially suitable habitat occurs within the SEZ region.	12,000 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat)	27 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	92,700 acres of potentially suitable habitat (6.1% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Veyo milkvetch	*Astragalus ensiformis* var. *gracilior*	NV-S1	Restricted to Lincoln County, Nevada, and Washington County, Utah, on clay soil of open washes, valley floors, and hillsides under sagebrush within pinyon-juniper communities. Elevation ranges between 4,200 and 5,000 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 43 mi east of the SEZ. About 2,790,000 acres of potentially suitable habitat occurs within the SEZ region.	2,000 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	80 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	113,500 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.
White bearpoppy	*Arctomecon merriamii*	BLM-S	Endemic to the Death Valley region of California and Nevada in barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 17 mi south of the SEZ. About 152,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,700 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on rocky cliffs and outcrops would reduce impacts. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
White River cat's-eye	*Cryptantha welshii*	BLM-S; FWS-SC	Endemic to southern Nevada on dry, open, sparsely vegetated outcrops. Known to occur on carbonate substrates at elevations between 4,500 and 6,600 ft. Nearest recorded occurrence is along the Meadow Valley Wash, approximately 25 mi northeast of the SEZ. About 152,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,700 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on rocky cliffs and outcrops would reduce impacts. See Ackerman milkvetch for a list of other potential mitigations.
Invertebrates							
Ash Springs riffle beetle	*Stenelmis lariversi*	NV-S1	Endemic to Ash Springs in Lincoln County, Nevada approximately 15 mi west of the SEZ. About 198 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but approximately 198 acres of potentially suitable habitat in Ash Springs could be affected by groundwater withdrawals.	Small to large overall impact. The impact of water withdrawal on the White River Valley regional ground-water system that supports aquatic and mesic habitat in the SEZ region would depend on the volume of water withdrawn to support construction and operations. Limiting with-drawals from this regional ground-water system could

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Invertebrates (Cont.)							
Ash Springs riffle beetle *(Cont.)*							reduce impacts on this species to negligible levels. Note that these potential impact magnitudes and potential mitigation measures apply to all groundwater-dependent special status species that may occur in the SEZ region.
Grated tryonia	*Tryonia clathrata*	ESA-UR; BLM-S; NV-S2	Endemic to the Muddy River spring system in southeastern Nevada. Occurs in on or in algae and detritus substrates of slow-moving freshwater spring systems. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but approximately 198 acres of potentially suitable habitat in Ash Springs could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Invertebrates (Cont.)							
Hubbs springsnail	*Pyrgulopsis hubbsi*	ESA-UR; NV-S1	Endemic to Nevada, where it is restricted to Hiko and Crystal Spring. Nearest recorded occurrence is from Crystal Spring, approximately 18 mi west of the SEZ. About 361 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but approximately 361 acres of potentially suitable habitat in Hiko and Crystal Springs could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Mojave poppy bee	*Perdita meconis*	BLM-S; NV-S2	Known only from Clark County, Nevada, where the species is dependent on poppy plants (*Arctomecon* spp.) in roadsides, washes, and barren desert areas on gypsum soils. Nearest recorded occurrence is from BLM-administered lands, approximately 35 mi south of the SEZ. About 130,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	163 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Invertebrates (Cont.)							
Nearctic riffle beetle	*Stenelmis occidentalis*	NV-S1	High-gradient creeks as well as low-gradient medium rivers, springs, and brooks with woody debris, rocks, and exposed, submerged, or overhanging vegetation. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Pahranagat naucorid	*Pelocoris shoshone shoshone*	BLM-S; NV-S1	Known only to occur in the Muddy and White River Basins in southern Nevada. Inhabits quiet waters of warm, spring-fed habitats. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Invertebrates (Cont.)							
Pahranagat pebblesnail	*Pyrgulopsis merriami*	ESA-UR; NV-S1	Endemic to spring-fed systems in southern Nevada on rocks and emergent vegetation near the outflow of freshwater springs. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Red-tailed blazing star bee	*Megandrena mentzeliae*	NV-S2	Endemic to southern Nevada, where it is known only from Clark County and associated with the host plant *Mentzelia tricuspis* in open, dry, barren areas with gypsum to gravelly soils. Nearest recorded occurrence is from BLM-administered lands, approximately 34 mi south of the SEZ. About 1,910,000 acres of potentially suitable habitat occurs within the SEZ region.	11,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	104,000 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the area of direct effects could reduce impacts.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Fish							
Hiko White River springfish	*Crenichthys baileyi grandis*	ESA-E; NV-P; NV-S1	Endemic to Lincoln and Mineral Counties, Nevada, where it is restricted to the remaining waters of the White River and the stream and outflow habitats of Hiko and Crystal Springs. The species has also been introduced into Blue Link Spring. Nearest recorded occurrence is from Crystal Spring, approximately 18 mi west of the SEZ. About 361 acres of critical habitat associated with the Hiko and Crystal Springs occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Pahranagat roundtail chub	*Gila robusta jordani*	ESA-E; NV-P; NV-S1	Endemic to Nevada, where it is restricted to the White River system. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. About 37 mi of potentially suitable habitat in the Pahranagat Valley occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Fish (Cont.)							
Pahranagat speckled dace	*Rhinichthys osculus velifer*	ESA-UR; BLM-S; NV-P; NV-S1	Endemic to Nevada, where it is restricted to the White River Valley system. Inhabits rivers, streams, tributaries, springs, brooks, marshes, lakes, and reservoirs. Nearest recorded occurrence is from the Pahranagat Creek, approximately 15 mi west of the SEZ. About 37 mi of potentially suitable habitat in the Pahranagat Valley occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
White River desert sucker	*Catostomus clarkii intermedius*	BLM-S; NV-P; NV-S1	Endemic to Nevada, where it is restricted to remnant streams of the White River system, especially small to medium rivers. Nearest recorded occurrence is from the Pahranagat Creek, approximately 15 mi west of the SEZ. About 37 mi of potentially suitable habitat in the Pahranagat Valley occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Fish (Cont.)							
White River springfish	*Crenichthys baileyi baileyi*	ESA-E; NV-P; NV-S1	Restricted to the Ash Spring system approximately 15 mi west of the SEZ. About 198 acres of critical habitat in the White River system occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Amphibians							
Northern leopard frog	*Rana pipiens*	ESA-UR; BLM-S; NV-S2	Low-gradient creeks, moderate-gradient rivers, pools, springs, canals, flood plains, reservoirs, shallow lakes, and wet meadows, especially with rooted aquatic vegetation. Also found in fields. Nearest recorded occurrence is from riparian areas along the Pahranagat Creek, approximately 8 mi southwest of the SEZ. About 2,400 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Amphibians (Cont.)							
Southwestern toad	*Bufo microscaphus*	BLM-S; FWS-SC; NV-S2	Woodlands and low-elevation riparian habitats in association with permanent or semipermanent water bodies, also in and along streams, ditches, flooded fields, irrigated croplands, and permanent reservoirs. Nearest recorded occurrence is from riparian areas along the Meadow Valley Wash, approximately 15 mi east of the SEZ. About 22,600 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Reptiles							
Desert tortoise[l]	***Gopherus agassizii***	ESA-T; NV-P; NV-S2	Mojave and Sonoran Deserts in desert creosotebush communities on firm soils for digging burrows, and often along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Nearest recorded occurrence is 5 mi west of the SEZ. About 1,366,000 acres of potentially suitable habitat occurs within the SEZ region.	910 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	58 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	29,000 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ, translocation of individuals from areas of direct effects, or compensatory mitigation of direct effects on occupied habitats could

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Reptiles (Cont.)							
Desert tortoise ***(Cont.)***							reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and NDOW.
Birds							
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodlands. Usually nests in tall trees or on rock outcrops along cliff faces. Known to occur in Lincoln County, Nevada. About 1,277,000 acres of potentially suitable habitat occurs within the SEZ region. Although much of the habitat in the SEZ region is year-round foraging and nesting habitat, only winter foraging habitat occurs in the affected area.	910 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	7 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	37,000 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Phainopepla	*Phainopepla nitens*	BLM-S; NV-P; FWS-SC; NV-S2	Summer breeding resident in SEZ region in desert scrub, mesquite, and pinyon-juniper woodland communities, also desert riparian areas and orchards. Nests in trees or shrubs from 3 to 45 ft above the ground. Nearest recorded occurrence is from riparian areas along Pahranagat Creek, approximately 19 mi northwest of the SEZ. About 1,077,000 acres of potentially suitable foraging and nesting habitat occurs within the SEZ region.	0 acres	46 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	15,900 acres of potentially suitable habitat (1.5% of available potentially suitable habitat). Potentially suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Potentially suitable nesting habitat in riparian habitats in the White River and Pahranagat Valleys may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all species that may be affected by groundwater withdrawal. In addition, avoiding or minimizing disturbance of potentially suitable riparian habitat in the area of direct effects may reduce impacts.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Prairie falcon	*Falco mexicanus*	BLM-S	Year-round resident in the SEZ region, primarily in open habitats in mountainous areas, steppe, grasslands, or cultivated areas. Typically nests in well-sheltered ledges of rocky cliffs and outcrops. Known to occur in Lincoln County, Nevada. About 2,534,000 acres of potentially suitable foraging and nesting habitat occurs within the SEZ region.	11,300 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	52 acres of potentially suitable foraging and nesting habitat lost (<0.1% of available potentially suitable habitat)	87,700 acres of potentially suitable foraging and nesting habitat (3.5% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys, avoiding or minimizing disturbance of all occupied nesting habitat, or compensatory mitigation may reduce impacts.
Southwestern willow flycatcher	*Empidonax traillii extimus*	ESA-E; NV-P; NV-S1	Summer breeding resident in SEZ region in riparian shrublands and woodlands. Nests in thickets, scrubby and brushy areas, open second growth, swamps, and open woodlands. Nearest recorded occurrence is from riparian areas along Pahranagat Creek, approximately 8 mi west of the SEZ. About 40,000 acres of potentially suitable foraging and nesting habitat occurs within the SEZ region.	0 acres	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	200 acres of potentially suitable foraging and nesting habitat (0.5% of available potentially suitable habitat). Potentially suitable foraging and nesting habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Potentially suitable nesting habitat in riparian habitats in the White River and Pahranagat Valleys may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all species that may be affected by groundwater withdrawal. In addition, avoiding

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Southwestern willow flycatcher *(Cont.)*							or minimizing disturbance of potentially suitable riparian habitat in the area of direct effects may reduce impacts.
Swainson's hawk	*Buteo swainsoni*	BLM-S; NV-P; CA-S2; NV-S2	Summer breeding resident in SEZ region in savanna, open pine-oak woodlands, grasslands, and cultivated lands. Nests typically in solitary trees, bushes, or small groves. Known to occur in Lincoln County, Nevada. About 2,165,000 acres of potentially suitable foraging and nesting habitat occurs within the SEZ region.	1,950 acres of potentially suitable foraging habitat lost (0.1% of available potentially suitable habitat)	75 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	91,600 acres of potentially suitable foraging and nesting habitat (4.2% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; FWS-SC	Summer breeding resident in SEZ region in open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Known to occur in Lincoln County, Nevada. About 3,910,000 acres of potentially suitable habitat occurs within the SEZ region.	15,400 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	108 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	150,000 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied burrows in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	ESA-C; NV-P; NV-S1	Summer breeding resident in SEZ region. Riparian obligate, usually in large tracts of cottonwood/willow habitats with dense sub-canopies. Nearest recorded occurrence is from riparian areas along Pahranagat Creek, approximately 8 mi west of the SEZ. About 50 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable nesting habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Potentially suitable nesting habitat in riparian habitats in the White River and Pahranagat Valleys may be affected by groundwater with-drawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all species that may be affected by ground-water withdrawal.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals							
Desert Valley kangaroo mouse	*Microdipodops megacephalus albiventer*	BLM-S; NV-P; FWS-SC; NV-S2	Endemic to central Nevada in desert areas at playa margins and in dune habitats. Nearest recorded occurrence is 20 mi north of the SEZ. About 617,000 acres of potentially suitable habitat occurs within the SEZ region.	10,900 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	2 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	29,000 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Moderate overall impact. Avoidance of all playa habitats within the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Fringed myotis	*Myotis thysanodes*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in SEZ region in lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roosts in buildings and caves. Summer or year-round resident throughout the six-state solar energy region. Known to occur in Lincoln County, Nevada. About 4,534,000 acres of potentially suitable habitat occurs within the SEZ region.	13,200 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	106 acres of potentially suitable foraging or roosting habitat lost (<0.1% of available potentially suitable habitat)	142,000 acres of potentially suitable foraging and roosting habitat (3.1% of available potentially suitable habitat)	Moderate overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce impacts.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, except as corridors for travel between mountain ranges. Known to occur in Lincoln County, Nevada. About 1,400,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	18 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	32,600 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of habitats within the area of direct effects that serve as movement corridors could further reduce impacts.
Pahranagat Valley montane vole	*Microtus montanus fucosus*	BLM-S; NV-P; FWS-SC; NV-S2	Endemic to Lincoln County, Nevada, where it is restricted to spring-fed riparian habitats in the Pahranagat Valley. Within that area, isolated populations utilize mesic montane and desert riparian patches. Nearest recorded occurrence is from riparian areas along Pahranagat Creek, approximately 9 mi west of the SEZ. About 12,500 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	780 acres of potentially suitable habitat (6.3% of available potentially suitable habitat). Potentially suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Potentially suitable riparian habitats in the White River and Pahranagat Valleys may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all species that may be affected by groundwater withdrawal.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Silver-haired bat	*Lasionycteris noctivagans*	BLM-S; FWS-SC	Year-round resident in SEZ region in high-elevation (1,600 to 8,500 ft) forested areas comprised of aspen, cottonwood, white fir, pinyon-juniper, subalpine fir, willow, and spruce communities. Roosts in forests in tree foliage, cavities, or under loose bark. Nearest recorded occurrence is 42 mi south of the SEZ. About 3,400,000 acres of potentially suitable habitat occurs within the SEZ region.	14,500 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	52 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	101,000 acres of potentially suitable foraging and roosting habitat (3.0% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Spotted bat	*Euderma maculatum*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in the SEZ region forests and shrubland habitats. Uses caves and rock crevices for roosting and winter hibernation. Nearest recorded occurrence is from the vicinity of Panaca, Nevada, approximately 35 mi northeast of the SEZ. About 3,750,000 acres of potentially suitable habitat occurs within the SEZ region.	12,150 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	87 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	94,000 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce impacts.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; NV-P; NV-S2	Year-round resident in the SEZ region in forests and shrubland habitats below 9,000 ft elevation. Uses caves, mines, and buildings for day roosting and winter hibernation. Nearest recorded occurrence is 42 mi south of the SEZ. About 2,870,000 acres of potentially suitable habitat occurs within the SEZ region.	14,500 acres of potentially suitable foraging habitat lost (0.5% of available potentially suitable habitat)	48 acres of potentially suitable foraging or roosting habitat lost (<0.1% of available potentially suitable habitat)	77,500 acres of potentially suitable foraging and roosting habitat (2.7% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce impacts.
Western small-footed bat	*Myotis ciliolabrum*	BLM-S; FWS-SC	Year-round resident in a variety of woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Known to occur in Lincoln County, Nevada. About 4,977,000 acres of potentially suitable habitat occurs within the SEZ region.	16,300 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	112 acres of potentially suitable foraging or roosting habitat lost (<0.1% of available potentially suitable habitat)	155,000 acres of potentially suitable foraging and roosting habitat (3.1% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce impacts on roosting and habitat.

[a] BLM-S = listed as a sensitive species by the BLM; ESA-E = listed as endangered under the ESA; ESA-T = listed as threatened under the ESA; ESA-UR = under review for listing under the ESA; FWS-SC = USFWS species of concern; NV-P = protected in the state of Nevada under NRS 501.110 (animals) or NRS 527 (plants); NV-S1 = ranked as S1 in the state of Nevada; NV-S2 = ranked as S2 in the state of Nevada.

Footnotes continued on next page.

TABLE 11.2.12.1-1 (Cont.)

[b] For plant species, potentially suitable habitat was determined by using SWReGAP land cover types. For terrestrial vertebrate species, potentially suitable habitat was determined using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. No new transmission lines are assumed to be needed due to the proximity of transmission infrastructures to the SEZ.

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] For access road development, direct effects were estimated within an 8-mi (13-km) long, 60-ft (18-m) wide road corridor from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of potentially suitable habitat within the 1-mi (1.6-km) wide road corridor.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portions of the road and transmission corridors where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from project developments. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. Indirect effects on groundwater-dependent species were considered outside these defined areas.

[g] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[h] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[i] To convert ft to m, multiply by 0.3048.

[j] To convert mi to km, multiply by 1.609.

[k] To convert acres to km^2, multiply by 0.004047.

[l] Species in bold text have been recorded or have designated critical habitat within 5 mi (8 km) of the SEZ boundary.

Desert Tortoise

The Mojave population of the desert tortoise is listed as threatened under the ESA and is known to occur in the SEZ region in desert shrubland habitats. The nearest recorded occurrences of this species are 5 mi (8 km) west of the SEZ; designated critical habitat occurs outside the affected area approximately 9 mi (14 km) south of the SEZ (Figure 11.2.12.1-1).

In the scoping letter for the Delamar Valley SEZ (Stout 2009), the USFWS identified the potential for the desert tortoise to occur on the SEZ despite the lack of monitoring data in areas adjacent to the SEZ. According to the SWReGAP habitat suitability model, approximately 30,000 acres (121 km^2) of potentially suitable habitat for this species occurs in the affected area; 910 acres (3.7 km^2) occurs within the SEZ, 58 acres (0.2 km^2) occurs within the road corridor, and 29,000 acres (117 km^2) occurs in the area of indirect effects. The USGS desert tortoise model (Nussear et al. 2009) identifies the affected area as having overall low habitat suitability for desert tortoise (average suitability score: 0.1). According to the USGS model, the nearest high-quality habitat (greater than or equal to 0.8 out of 1.0) is along Pahranagat Creek, approximately 15 mi (24 km) west of the SEZ. According to the SWReGAP habitat suitability model, approximately 1,366,000 acres (5,500 km^2) of potentially suitable habitat for this species occurs in the SEZ region (Table 11.2.12.1-1).

Southwestern Willow Flycatcher

The southwestern willow flycatcher is a small neotropical migrant bird that inhabits riparian shrublands, woodlands, and thickets in the southwestern United States. The nearest recorded occurrence of this species is from riparian areas along Pahranagat Creek in the Desert National Wildlife Range, approximately 8 mi (13 km) west of the SEZ. Potentially suitable breeding and foraging habitats for this species within the Pahranagat Valley are dependent upon surface discharges from the White River Valley regional groundwater system. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, approximately 5 acres (<0.1 km^2) of potentially suitable habitat are expected to occur within the direct impact area of the access road corridor near Pahranagat Creek; approximately 200 acres (1 km^2) of potentially suitable habitat occurs in the area of indirect effects. Approximately 40,000 acres (162 km^2) of potentially suitable habitat occurs throughout the SEZ region (Figure 11.2.12.1-1).

Groundwater-Dependent Species

The USFWS (Stout 2009) identified the potential for impacts on nine ESA-listed species that could result from groundwater withdrawals that would serve solar energy development on the SEZ. As discussed previously, on the basis of the analysis presented in Section 11.2.9.2, five of these ESA-listed species are considered outside of the area that could be affected by groundwater withdrawals on the Delamar Valley SEZ. Only those species dependent on springs and spring-fed habitats within the Pahranagat Valley are considered here. The southwestern willow flycatcher, which could also be affected in the Pahranagat Valley by groundwater withdrawals on the SEZ, is discussed above.

Hiko White River Springfish. The Hiko White River springfish is a small fish that is listed as endangered under the ESA and is restricted to the remnant waters of the White River and outflow habitats of the Hiko and Crystal Springs in Lincoln County, Nevada. The nearest known occurrence of this species is from the Hiko Springs area, approximately 18 mi (29 km) west of the SEZ. Approximately 360 acres (1.5 km^2) of critical habitat has been designated at Hiko and Crystal Springs (Figure 11.2.12.1-1).

Pahranagat Roundtail Chub. The Pahranagat roundtail chub is a small fish that is listed as endangered under the ESA and is restricted to the remnant waters of the White River and Pahranagat Creek in Lincoln County, Nevada. The nearest known occurrence of this species is from the Ash Springs area, approximately 15 mi (24 km) west of the SEZ (Figure 11.2.12.1-1). Critical habitat has not been designated for this species.

White River Springfish. The White River springfish is a small fish that is listed as endangered under the ESA and is currently restricted to the Ash Springs system in southeastern Nevada. The nearest recorded occurrences and designated critical habitat are from the Ash Springs, approximately 15 mi (24 km) west of the SEZ (Figure 11.2.12.1-1).

11.2.12.1.2 Species That Are Candidates for Listing under the ESA

In scoping comments regarding the proposed Delamar Valley SEZ, the USFWS identified one ESA candidate species that may be directly or indirectly affected by solar energy development within the SEZ, the western yellow-billed cuckoo (Stout 2009). This species is a neotropical migrant bird that inhabits large riparian woodlands in the western United States. The nearest recorded occurrence of this species is from riparian areas along Pahranagat Creek in the Desert National Wildlife Range, approximately 8 mi (13 km) west of the SEZ (Figure 11.2.12.1-1; Table 11.2.12.1-1). Additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

In the scoping letter for the Delamar Valley SEZ (Stout 2009), the USFWS identified the potential for impacts on this species from groundwater withdrawals to serve solar energy development on the SEZ. Groundwater withdrawals from the White River Valley regional groundwater system could affect surface discharge from this system in portions of the SEZ region. Potentially suitable breeding and foraging habitats for this species within the Pahranagat Valley are dependent upon surface discharges from this groundwater system.

11.2.12.1.3 Species That Are under Review for Listing under the ESA

The USFWS (Stout 2009) identified three invertebrate species (mollusks) under review for ESA listing that may be directly or indirectly affected by solar energy development within the SEZ (Stout 2009). These species include the following: grated tryonia, Hubbs springsnail, and Pahranagat pebblesnail. These species do not occur within 5 mi (8 km) of the SEZ boundary, but they do occur in areas dependent on groundwater discharge in the Pahranagat Valley that could be affected by groundwater withdrawals in the Delamar Valley SEZ. In addition to the species identified by the USFWS, the northern leopard frog is another groundwater-dependent species under ESA review that may occur within the Pahranagat Valley (Table 11.2.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of these species. General information on each species is provided below.

Grated Tryonia

The grated tryonia is a freshwater mollusk known from the Muddy River system in southern Nevada. The nearest known occurrence of this species is from Ash Springs, approximately 15 mi (24 km) west of the SEZ (Figure 11.2.12.1-1).

Hubbs Springsnail

The Hubbs springsnail is a freshwater mollusk restricted to Hiko and Crystal Springs in southern Nevada. The nearest known occurrence of this species is from Crystal Spring, approximately 18 mi (29 km) west of the SEZ (Figure 11.2.12.1-1).

Pahranagat Pebblesnail

The Pahranagat pebblesnail is a freshwater mollusk restricted to spring-fed habitats in the White River system of southern Nevada. The nearest known occurrence of this species is from Ash Springs, approximately 15 mi (24 km) west of the SEZ (Figure 11.2.12.1-1).

Northern Leopard Frog

The northern leopard frog is an amphibian widely distributed throughout North America. The western distinct population segment (DPS) of the northern leopard frog, which includes populations in the state of Nevada, is currently under review for ESA listing. Within this DPS, populations are known to occur in various wetland communities, including creeks, rivers, pools, springs, canals, and flooded fields. The nearest known occurrence of this species is from the Pahranagat Creek, approximately 8 mi (13 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur within 5 mi (8 km) of the SEZ border or within the access road corridor. However, potentially suitable habitat is predicted to occur along Pahranagat Creek and other portions of the White River system (Figure 11.2.12.1-1).

11.2.12.1.4 BLM-Designated Sensitive Species

There are 34 BLM-designated sensitive species that may occur in the affected area of the Delamar Valley SEZ or that may be affected by solar energy development on the SEZ (Table 11.2.12.1-1). These BLM-designated sensitive species include the following (1) plants: Charleston ground-daisy, Eastwood milkweed, long-calyx milkvetch, Needle Mountains milkvetch, Nevada willowherb, Pioche blazingstar, rock phacelia, rock purpusia, Sheep Mountain milkvetch, Tiehm blazingstar, white bearpoppy, and White River cat's-eye; (2) invertebrates: Mojave poppy bee and Pahranagat naucorid; (3) fish: White River desert sucker; (4) amphibian: southwestern toad; (5) birds: ferruginous hawk, phainopepla, prairie falcon, Swainson's hawk, and western burrowing owl; and (6) mammals: Desert Valley kangaroo mouse, fringed myotis, Nelson's bighorn sheep, Pahranagat Valley montane vole, silver-haired bat, spotted bat, Townsend's big-eared bat, and western small-footed myotis. Several additional BLM-designated species that may occur in the affected area were discussed in Section 11.2.12.1.4 as species under review for ESA listing. These include the grated tryonia, Pahranagat speckled dace, and northern leopard frog. None of these BLM-designated sensitive species have been recorded within 5 mi (8 km) of the SEZ boundary. Habitats in which BLM-designated sensitive species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are presented in Table 11.2.12.1-1. These species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Charleston Ground-Daisy

The Charleston ground-daisy is a perennial forb that is endemic to Nevada, where it occurs on gravelly slopes and knolls in montane forested areas. The species is known to occur in the Desert National Wildlife Range, approximately 40 mi (64 km) southwest of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ. However, potentially suitable pinyon-juniper and rocky cliff habitat for this species may occur in the access road corridor and in portions of the area of indirect effects (Table 11.2.12.1-1).

Eastwood Milkweed

The Eastwood milkweed is a perennial forb that is endemic to Nevada from public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties. It occurs in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, washes, or shale outcrops at elevations between 4,700 and 7,100 ft (1,430 and 2,150 m). The species is known to occur about 31 mi (50 km) north of the SEZ. Although it is not known to occur in the affected area, potentially suitable shrubland and desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Long-Calyx Milkvetch

The long-calyx milkvetch is a perennial forb that is regionally endemic to the Great Basin in southwestern Utah and eastern Nevada. It occurs in pinyon-juniper woodlands, sagebrush, and mixed shrub communities at elevations between 5,800 and 7,500 ft (1,760 and 2,290 m). The species is known to occur about 11 mi (18 mi) east of the SEZ. Although it is not known to occur in the affected area, potentially suitable shrubland and desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Needle Mountains Milkvetch

The Needle Mountains milkvetch is a perennial forb that occurs on gravel washes and sandy soils in alkaline desert and arid grasslands at elevations between 4,250 and 6,250 ft (1,295 and 1,900 m). The species is known to occur about 26 mi (42 km) northeast of the SEZ. Although it is not known to occur in the affected area, potentially suitable grassland and desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Nevada Willowherb

The Nevada willowherb is a perennial forb endemic to eastern Nevada and western Utah. It occurs in pinyon-juniper woodlands and oak/mountain mahogany communities, on talus slopes and rocky limestone outcrops at elevations between 5,000 and 8,800 ft (1,525 and 2,680 m). The species is known to occur about 20 mi (32 km) east of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ or access road corridor. However, potentially suitable woodland and rocky cliff habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

Pioche Blazingstar

The Pioche blazingstar is a perennial forb endemic to Nevada. It occurs on dry, soft, silty clay soils on knolls and slopes with sparse vegetation consisting mainly of sagebrush. The nearest known occurrences are from Patterson Wash, approximately 40 mi (64 km) northeast of the SEZ. Although it is not known to occur in the affected area, potentially suitable shrubland and desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Rock Phacelia

The rock phacelia is an annual forb known only from Arizona, Nevada, and Utah. It occurs in limestone and volcanic talus slopes of foothills, washes, and gravelly canyon bottoms on substrates derived from calcarous material in mixed desert scrub, creosotebush, and blackbrush communities at elevations between 2,500 and 5,800 ft (750 and 1,750 m). The species is known to occur in the Desert National Wildlife Range, approximately 40 mi (64 km) southwest of the SEZ. The species is not known to occur in the affected area, but potentially suitable desert wash habitat may occur in the SEZ and potentially suitable desert wash habitat and rocky cliff and outcrop habitat may occur in the access road corridor (Table 11.2.12.1-1).

Rock Purpusia

The rock purpusia is a perennial forb endemic to southern Nevada. It occurs in crevices of cliffs and boulders on volcanic substrates in pinyon-juniper communities at elevations between 4,900 and 6,900 ft (1,490 and 2,100 m). The species is known to occur about 11 mi (18 km) north of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ. On the basis of an evaluation of SWReGAP land cover types, approximately 120 acres (0.5 km^2) of potentially suitable cliff and rock outcrop habitat occurs in the access road corridor, and approximately 4,600 ac (19 km^2) of potentially suitable woodland and rocky cliff habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

Sheep Mountain Milkvetch

The Sheep Mountains milkvetch is a perennial forb that is restricted to the foothills of the Sheep Mountains in southern Nevada. The species is known to occur in the Desert National Wildlife Range, approximately 40 mi (64 km) southwest of the SEZ. Although it is not known to occur in the affected area, potentially suitable desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Tiehm Blazingstar

The Tiehm blazingstar is a perennial forb endemic to Nevada. It occurs on hilltops, sparsely vegetated white calcareous knolls, and bluffs with other scattered perennial plant species. The nearest recorded occurrences are from the White River, approximately 38 mi (61 km) north of the SEZ. Although it is not known to occur in the affected area, potentially suitable shrubland habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

White Bearpoppy

The white bearpoppy is a perennial forb that is endemic to the desert regions of southeastern California and southern Nevada. It occurs in barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft (600 and 1,800 m). The nearest known occurrences are approximately 17 mi (27 km) south of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ. On the basis of an evaluation of SWReGAP land cover types, approximately 120 acres (0.5 km^2) of potentially suitable cliff and rock outcrop habitat occurs in the access road corridor, and approximately 1,700 ac (6.9 km^2) of potentially suitable cliff and rocky slope habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

White River Cat's-Eye

The White River cat's-eye is a perennial herb endemic to southern Nevada. It occurs on dry, open, sparsely vegetated outcrops on carbonate substrates at elevations between 4,500 and 6,600 ft (1,370 and 2,010 m). The nearest recorded occurrences are 25 mi (40 km) northeast of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ. On the basis of an evaluation of SWReGAP land cover types, approximately 120 acres (0.5 km^2) of potentially suitable cliff and rock outcrop habitat occurs in the access road corridor, and approximately 1,700 ac (6.9 km^2) of potentially suitable cliff and rocky slope habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

Mojave Poppy Bee

The Mojave poppy bee is an insect known only from Clark County, Nevada, where it is dependent on poppy plants (*Arctemocon* spp.). Such habitats include roadsides, washes, and barren desert areas. The nearest recorded occurrence is approximately 35 mi (56 km) south of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ or access road corridor. However, potentially suitable habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

Ferruginous Hawk

According to the SWReGAP habitat suitability model, only potentially suitable winter habitat for the ferruginous hawk is predicted to occur within the affected area of the Delamar Valley SEZ, although potentially suitable year-round habitat is expected to occur outside of the affected area within the SEZ region. The species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. This species is known to occur in Lincoln County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.2.12.1-1).

Phainopepla

The phainopepla occurs in the southwestern United States and Mexico, where it breeds in suitable habitats throughout much of the Delamar Valley SEZ region. The species occurs in desert scrub, mesquite, and pinyon-juniper woodland communities, as well as desert riparian areas and orchards. Nests are typically constructed in trees and shrubs from 3 to 45 ft (1 to 15 m) above the ground. This species is known to occur in Lincoln County, Nevada. According to SWReGAP, potentially suitable foraging or nesting habitat does not occur on the SEZ; however, potentially suitable foraging and nesting habitat may occur in the access road corridor and in other portions of the affected area (Table 11.2.12.1-1). Potentially suitable nesting habitat in riparian areas in the Pahranagat Valley (outside of the 5-mi [8-km] affected area surrounding the SEZ) could be affected by groundwater withdrawals from the White River Valley regional groundwater system to serve construction and operations of solar energy facilities on the Delamar Valley SEZ. The availability of suitable nesting habitat throughout the affected area has not been determined.

Prairie Falcon

The prairie falcon occurs throughout the western United States. According to the SWReGAP habitat suitability model for the prairie falcon, it is considered a year-round resident throughout the Delamar Valley SEZ region. The species occurs in open habitats in mountainous areas, sagebrush-steppe, grasslands, or cultivated areas. Nests are typically constructed in well-sheltered ledges of rocky cliffs and outcrops. This species occurs in Lincoln County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable nesting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable nesting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Swainson's Hawk

The Swainson's hawk occurs throughout the southwestern United States. According to the SWReGAP habitat suitability model for the Swainson's hawk, only summer breeding habitat occurs in the Delamar Valley SEZ region. This species inhabits desert, savanna, open pine-oak woodland, grassland, and cultivated habitats. Nests are typically constructed in solitary trees, bushes, or small groves. This species occurs in Lincoln County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat (solitary trees) within the area of direct effects, but approximately 2,900 acres (12 km^2) of pinyon-juniper woodland that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Western Burrowing Owl

According to the SWReGAP habitat suitability model for the western burrowing owl, the species is a summer (breeding) resident of open, dry grasslands and desert habitats in the Delamar Valley SEZ region. The species occurs locally in open areas with sparse vegetation, where it forages in grasslands, shrublands, and open disturbed areas, and nests in burrows typically constructed by mammals. The species occurs in Lincoln County, Nevada, and potentially suitable summer breeding habitat may occur in the SEZ, access road corridor, and in other portions of the affected area (Table 11.2.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Desert Valley Kangaroo Mouse

The Desert Valley kangaroo mouse is endemic to central Nevada, where it inhabits desert areas at playa margins and in dune habitats. This species is known to occur as near as the Dry Lake Valley, approximately 20 mi (32 km) north of the SEZ. According to the SWReGAP habitat suitability model for the kangaroo mouse, potentially suitable year-round habitat occurs within the SEZ, access road corridor, and throughout the affected area (Table 11.2.12.1-1).

Fringed Myotis

The fringed myotis is a year-round resident in the Delamar Valley SEZ region, where it occurs in a variety of habitats, including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. The species roosts in buildings and caves. It is known to occur in Lincoln County, Nevada, and the SWReGAP habitat suitability model for the species indicates that potentially suitable foraging habitat may occur on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable roosting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep (also called the desert bighorn sheep) is a subspecies of bighorn sheep that occurs in the Delamar Valley SEZ region. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats, and may utilize desert valleys as corridors for travel between portions of its range. It is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model for the species, suitable habitat does not occur on the SEZ; however, habitat that is potentially suitable as a migration corridor may occur in the affected area (Table 11.2.12.1-1).

Silver-Haired Bat

According to the SWReGAP habitat suitability model, the silver-haired bat is a year-round resident in the Delamar Valley SEZ region, where it occurs in montane forested habitats such as aspen, pinyon-juniper, and spruce communities. Foraging may occur in desert shrubland habitats. This species roosts in tree foliage or cavities, or under loose bark. The species is known to occur about 42 mi (67 km) south of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat (trees) within the area of direct effects, but approximately 2,900 acres (12 km^2) of pinyon-juniper woodland that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Spotted Bat

According to the SWReGAP habitat suitability model, the spotted bat is a year-round resident in the Delamar Valley SEZ region, where it occurs in a variety of forested and shrubland habitats. It roosts in caves and rock crevices. The species is known to occur in the vicinity of Panaca, Nevada, approximately 35 mi (56 km) northeast of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable roosting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Townsend’s Big-Eared Bat

The Townsend’s big-eared bat is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, the species forages year-round in a wide variety of desert and non-desert habitats in the Delamar Valley SEZ region. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. The nearest recorded occurrences are approximately 42 mi (67 km) south of the Delamar Valley SEZ. Potentially suitable foraging habitat may occur on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable roosting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Western Small-Footed Bat

The western small-footed bat is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, this species is a year-round resident in southern Nevada, where it occupies a wide variety of desert and non-desert habitats, including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, and tunnels, beneath boulders or loose bark, and in buildings, and other man-made structures. The species is known to occur in Lincoln County, Nevada, and potentially suitable foraging habitat may occur on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable roosting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Groundwater-Dependent Species

There are a number of species that do not occur within 5 mi (8 km) of the SEZ boundary or within the access road corridor but that do occur in areas dependent on groundwater discharge from the White River Valley regional groundwater system in habitats within the Pahranagat Valley that may interact with groundwater of the Delamar Valley. Groundwater from the Delamar Valley to serve solar energy development on the SEZ could affect aquatic and riparian habitats supported by groundwater discharge in the Pahranagat Valley. The phainopepla, which could also be affected in the Pahranagat Valley by groundwater withdrawals on the SEZ, is discussed above.

Pahranagat Naucorid. The Pahranagat naucorid is an aquatic insect known only to occur in the Muddy and White River Basins in southern Nevada. It inhabits warm, quiet waters of spring-fed systems. The nearest recorded occurrence is from Ash Springs, approximately 15 mi (24 km) west of the SEZ (Table 11.2.12.1-1).

White River Desert Sucker. The White River desert sucker is a small fish endemic to Nevada, where it is restricted to remnant streams of the White River system. The nearest recorded occurrence of this species is from the Pahranagat Creek, approximately 15 mi (24 km) west of the SEZ (Table 11.2.12.1-1).

Southwestern Toad. The southwestern toad is an amphibian that occupies scattered habitats in Arizona, Nevada, New Mexico, and Utah. It occurs in woodlands and low-elevation riparian habitats in association with permanent or semipermanent water bodies. The nearest recorded occurrence of this species is from riparian areas along the Meadow Valley Wash, approximately 15 mi (24 km) east of the SEZ (Table 11.2.12.1-1).

Pahranagat Valley Montane Vole. The Pahranagat Valley montane vole is endemic to Lincoln County, Nevada, where it is restricted to springs in the Pahranagat Valley. Within that area, isolated populations utilize mesic montane and desert riparian habitat. The species is known to occur near Pahranagat Creek, approximately 9 mi (14 km) west of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur in the SEZ or within the access road corridor; however, a potentially suitable habitat may occur in portions of the affected area. Potentially suitable riparian habitats for this species that occurs outside of the 5-mi (8-km) area surrounding the SEZ could be dependent on groundwater discharge from the White River Valley regional groundwater system.

11.2.12.1.5 State-Listed Species

There are 15 species listed by the State of Nevada that may occur in the Delamar Valley SEZ affected area or that may be affected by solar energy development on the SEZ (Table 11.2.12.1-1). These state-listed species include the following (1) fish: Hiko White River springfish, Pahranagat roundtail chub, Pahranagat speckled dace, White River desert sucker, and White River springfish; (2) reptile: desert tortoise; (3) birds: phainopepla, southwestern willow flycatcher, Swainson's hawk, and western yellow-billed cuckoo; and (4) mammals: Desert Valley kangaroo mouse, fringed myotis, Pahranagat Valley montane vole, spotted bat, and Townsend's big-eared bat. All of these species are protected in the state of Nevada under NRS 501.110. Each of these species has been previously discussed because of its known or review status under the ESA (Section 11.2.12.1.1 or 11.2.12.1.2) or the BLM (Section 11.2.12.1.3). Additional life history information for these species is provided in Appendix J.

11.2.12.1.6 Rare Species

There are 47 rare species (i.e., state rank of S1 or S2 in the state of Nevada or ranked as a species of concern by the State of Nevada or USFWS) that may be affected by solar energy development on the Delamar Valley SEZ (Table 11.2.12.1-1). Of these species, there are nine that have not been previously discussed because of their known or pending status under the ESA (Section 11.2.12.1.1 or 11.2.12.1.2) or the BLM (Section 11.2.12.1.3). These nine species include the following (1) plants: Ackerman milkvetch, Antelope Canyon goldenbush, Jaeger beardtongue, Meadow Valley sandwort, St. George blue-eyed grass, and Veyo milkvetch; and (2) invertebrates: Ash Springs riffle beetle, nearctic riffle beetle, and red-tailed blazing star bee. The habitats and known occurrences of these species relative to the SEZ are shown in Table 11.2.12.1-1. Additional life history information is provided in Appendix J.

11.2.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Delamar Valley SEZ is presented in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area, as presented in Section 11.2.12.1, following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 11.2.12.3).

Solar energy development within the Delamar Valley SEZ could affect a variety of habitats (see Sections 11.2.9 and 11.2.10). These impacts on habitats could in turn affect special status species that are dependent on those habitats. Based on NNHP records, the desert tortoise is the only special status species known to occur within 5 mi (8 km) of the Delamar Valley SEZ boundary. There are 15 species that occur more than 5 mi (8 km) from the SEZ boundary in habitats in the Pahranagat Valley that could be affected by groundwater withdrawals from the Delamar Valley SEZ. These species include the following (1) invertebrates: Hubbs springsnail, nearctic riffle beetle, Pahranagat naucorid, and Pahranagat pebblesnail; (2) fish: Hiko White River springfish, Pahranagat roundtail chub, Pahranagat speckled dace, White River desert sucker, and White River springfish; (3) amphibians: northern leopard frog and southwestern toad; (4) birds: phainopepla, southwestern willow flycatcher, and western yellow-billed cuckoo; and (5) mammals: Pahranagat Valley montane vole. Withdrawals from this regional groundwater system may be needed to support construction and operations of solar energy facilities on the Delmar Valley SEZ, which could in turn affect those special status species with habitats that are dependent on groundwater. Other special status species may occur on the SEZ or within the affected area, based on the presence of potentially suitable habitat. As discussed in Section 11.2.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effects outside the SEZ are presented in Table 11.2.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming programmatic design features are in place) is presented along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 11.2.1.2, a 9-mi (14-km) long access road corridor is assumed to be needed to serve solar facilities within this

SEZ. Impacts of transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ and the access road construction area where ground-disturbing activities are expected to occur. Indirect impacts could result from depletions of groundwater resources, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project facilities are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but over the long-term, conditions would improve especially if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., playas). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce groundwater consumption, runoff, sedimentation, spills, and fugitive dust.

11.2.12.2.1 Impacts on Species Listed under the ESA

Impacts on the five ESA-listed species that may occur in the Delamar Valley SEZ affected area, or that may be affected by solar energy development on the SEZ, are discussed below. These assessments are based on the best information available, but discussions of potential impacts and mitigation options should be held in consultation with the USFWS. Formal consultation with the USFWS under Section 7 of the ESA is required for any federal action that may adversely affect an ESA-listed species.

Desert Tortoise

The Mojave population of the desert tortoise is listed as threatened under the ESA and the species is known to occur about 5 mi (8 km) west of the SEZ (Figure 11.2.12.1-1). According to the USFWS (Stout 2009), desert tortoise populations have the potential to occur on the Delamar Valley SEZ and access road corridor despite the lack of monitoring effort in adjacent areas and the relatively low habitat suitability (as determined by the USGS habitat suitability model [Nussear et al. 2009]). According to the SWReGAP habitat suitability model, approximately 910 acres (4 km^2) of potentially suitable habitat on the SEZ and 58 acres (0.2 km^2) of potentially suitable habitat within the access road corridor could be directly affected by construction and operations of solar energy development on the SEZ (Table 11.2.12.1-1). This direct effects area represents about 0.1% of available suitable habitat of the desert tortoise in the region. About 29,000 acres (117 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 2.1% of the available suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to reduce these impacts to negligible levels. Avoidance of potentially suitable habitats for this species is not a feasible means of mitigating impacts because these habitats (desert scrub) are widespread throughout the area of direct effects. Pre-disturbance surveys to determine the abundance of desert tortoises on the SEZ to remove them from the affected area, and the implementation of a desert tortoise translocation plan and compensation plan could further reduce direct impacts.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions of incidental take statements) for the desert tortoise, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, translocation actions and compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. Consultation with the Nevada Department of Wildlife (NDOW) should also occur to determine any state mitigation requirements.

There are inherent dangers to tortoises associated with their capture, handling, and translocation from the SEZ. These actions, if done improperly, can result in injury or death. To minimize these risks, and as stated above, the desert tortoise translocation plan should be developed in consultation with the USFWS, and follow the *Guidelines for Handling Desert Tortoises During Construction Projects* (Desert Tortoise Council 1994) and other current translocation guidance provided by the USFWS. Consultation will identify potentially suitable recipient locations, density thresholds for tortoise populations in recipient locations, and procedures for pre-disturbance clearance surveys and tortoise handling, as well as disease testing and post-translocation monitoring and reporting requirements. Despite some risk of mortality or decreased fitness, translocation is widely accepted as a useful strategy for the conservation of the desert tortoise (Field et al. 2007).

To offset impacts of solar development on the SEZ, compensatory mitigation may be needed to balance the acreage of habitat lost with acquisition of lands that would be improved and protected for desert tortoise populations (USFWS 1994). Compensation can be accomplished by improving the carrying capacity for the desert tortoise on the acquired lands. Other mitigation actions may include funding for the habitat enhancement of the desert tortoise on existing federal lands. Consultation with the USFWS and NDOW would be necessary to determine the appropriate mitigation ratio to acquire, enhance, and preserve desert tortoise compensation lands.

Southwestern Willow Flycatcher

The southwestern willow flycatcher is listed as endangered under the ESA and is known to occur in the Pahranagat Valley, approximately 8 mi (13 km) west of the SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, approximately 5 acres (<0.1 km^2) of potentially suitable habitat within the access road corridor could be directly affected by construction and operations of solar energy development on the SEZ (Table 11.2.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat of the southwestern willow flycatcher in the region. About 200 acres (1 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 0.5% of the available suitable habitat in the region (Table 11.2.12.1-1).

Riparian habitats in the Pahranagat Valley that may provide suitable nesting and foraging habitat for the southwestern willow flycatcher may be affected by spring discharges associated with the White River Valley regional groundwater system from groundwater withdrawals from the Delamar Valley to serve development on the SEZ. Solar energy development on the SEZ may require water from the same regional groundwater system that supports the riparian habitats for this species in the Pahranagat Valley. As discussed below for other groundwater-dependent species, impacts on this species could range from small to large depending upon the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals (Table 11.2.12.1-1).

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system could reduce impacts on the southwestern willow flycatcher to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified. In addition, the avoidance of construction activities within riparian areas within the access road corridor would further reduce impacts.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions of incidental take statements) for the southwestern willow flycatcher, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. Consultation with the NDOW should also occur to determine any state mitigation requirements.

Groundwater-Dependent Species

There are three species listed as threatened or endangered under the ESA that do not occur within 5 mi (8 km) of the SEZ boundary or within the access road corridor but that do occur in areas dependent on groundwater discharge from the White River Valley regional groundwater system in the Pahranagat Valley. These species include the following fish: Hiko White River springfish, Pahranagat roundtail chub, and White River springfish. The southwestern willow flycatcher also could be affected by groundwater withdrawals. Groundwater withdrawn from the Delamar Valley to serve construction and operations of solar energy facilities on the SEZ could affect aquatic and riparian habitats within the Pahranagat Valley. These withdrawals could affect habitat for the ESA-listed species that are dependent on groundwater. Such impacts would result from the lowering of the water table and alteration of hydrologic processes.

Impacts of groundwater depletion from solar energy development in the Delamar Valley SEZ cannot be quantified without identification of the cumulative amount of groundwater withdrawals needed to support development on the SEZ. Consequently, the overall impact on these species could range from small to large, and would depend in part on the solar energy technology deployed, the scale of development within the SEZ, the type of cooling system used, and the degree of influence water withdrawals in the SEZ would have on drawdown and surface water discharges in habitats supporting these species (Table 11.2.12.1-1).

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system would reduce impacts on the groundwater-dependent species to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified and through application of a regional groundwater model.

11.2.12.2.2 Impacts on Species That Are Candidates for Listing under the ESA

According to the USFWS scoping letter (Stout 2009) and as verified by NNHP records, the western yellow-billed cuckoo is the only ESA candidate species that may be affected by solar energy development on the Delamar Valley SEZ. This species is known to occur in riparian areas along the Pahranagat Creek, approximately 8 mi (13 km) west of the SEZ (Figure 11.2.12.1-1). According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur anywhere within 5 mi (8 km) of the SEZ boundary or within the access road corridor. However, riparian habitats in the White River and Pahranagat Valleys may provide suitable nesting and foraging habitat for this species; these habitats may be affected by spring discharges associated with the White River Valley regional groundwater system. Solar energy development on the SEZ may require water from the same regional groundwater system that supports the riparian habitats for this species in the Pahranagat Valley. For this reason, and as discussed for the groundwater-dependent species above, impacts on the western yellow-billed cuckoo could range from small to large depending upon the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals (Table 11.2.12.1-1).

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system could reduce impacts on the western yellow-billed cuckoo. Impacts can be better quantified for specific projects once water needs are identified. Coordination with the USFWS and NDOW should be conducted to identify an appropriate survey protocol and mitigation requirements, which may include avoidance, minimization, or compensation.

11.2.12.2.3 Impacts on Species That Are under Review for Listing under the ESA

There are four species currently under review for ESA listing that may be affected by solar energy development on the Delamar Valley SEZ. These include the grated tryonia, Hubbs springsnail, Pahranagat pebblesnail, and northern leopard frog. These species do not occur within 5 mi (8 km) of the SEZ boundary, but they do occur in areas dependent on groundwater discharge within the Pahranagat Valley, which is hydrologically connected to groundwater in the Delamar Valley. Potential impacts on these species (which could range from small to large) and mitigations that could reduce those impacts would be similar to those described for groundwater-dependent ESA-listed species in Section 11.2.12.2.1. For all of these species, potential impacts and mitigation options should be discussed with the USFWS prior to project development.

11.2.12.2.4 Impacts on BLM-Designated Sensitive Species

BLM-designated sensitive species that may be affected by solar energy development on the Delamar Valley SEZ and are not previously discussed as ESA-listed (Section 11.2.12.2.1), candidates for ESA listing (Section 11.2.12.2.2), or under review for ESA listing (Section 11.2.12.2.3) are discussed below.

Charleston Ground-Daisy

The Charleston ground-daisy is not known to occur in the affected area of the Delamar Valley SEZ and potentially suitable habitat does not occur on the SEZ; however, approximately 5 acres (<0.1 km^2) of potentially suitable habitat within the access road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 45,500 acres (184 km^2) of potentially suitable habitat occur in the area of indirect effects; this area represents about 2.3% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Charleston ground-daisy from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing impacts on rocky cliffs and outcrops in the access road corridor may be sufficient to reduce impacts on the Charleston ground-daisy to small or negligible levels. For this species and other special status plants, impacts also could be reduced by conducting pre-disturbance surveys and avoiding or minimizing impacts of occupied habitats in the area of direct effects. If avoidance and minimization are not feasible options, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Eastwood Milkweed

The Eastwood milkweed is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 2,000 acres (8 km^2) of potentially suitable habitat on the SEZ and 25 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the SEZ region. About 48,000 acres (194 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 7.2% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Eastwood milkweed from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Eastwood milkweed is not feasible because potentially suitable sagebrush and mixed shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Long-Calyx Milkvetch

The long-calyx milkvetch is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 11,200 acres (45 km^2) of potentially suitable habitat on the SEZ and 61 acres (0.2 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.4% of potentially suitable habitat in the SEZ region. About 101,000 acres (409 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.2% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the long-calyx milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the long-calyx milkvetch is not feasible because potentially suitable sagebrush and mixed shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Needle Mountains Milkvetch

The Needle Mountains milkvetch is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 3,100 acres (13 km^2) of potentially suitable habitat on the SEZ and 2 acres (<1 km^2) of potentially suitable habitat within the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 4.6% of potentially suitable habitat in the SEZ region. About 1,800 acres (7 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.7% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Needle Mountains milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing impacts on all playa habitats on the SEZ may be sufficient to reduce impacts on the Needle Mountains milkvetch to small or negligible levels, but this would restrict development on a large portion of the SEZ. Impacts also could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Nevada Willowherb

The Nevada willowherb is not known to occur in the affected area of the Delamar Valley SEZ, and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 3,000 acres (12 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.3% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Nevada willowherb from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Pioche Blazingstar

The Pioche blazingstar is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 12,000 acres (49 km^2) of potentially suitable habitat on the SEZ and 29 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.6% of potentially suitable habitat in the SEZ region. About 105,000 acres (425 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5.3% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Pioche blazingstar from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Pioche blazingstar is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Rock Phacelia

The rock phacelia is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 976 acres (4 km^2) of potentially suitable habitat on the SEZ and 80 acres (0.3 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.1% of potentially suitable habitat in the SEZ region. About 46,000 acres (186 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.2% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the rock phacelia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the rock phacelia is not feasible because potentially suitable mixed desert scrub habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Rock Purpusia

The rock purpusia is not known to occur in the affected area of the Delamar Valley SEZ and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 3,000 acres (12 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.4% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the rock purpusia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing impacts on rocky cliffs and outcrops in the access road corridor may be sufficient to reduce impacts on the rock purpusia to small or negligible levels. Impacts also could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Sheep Mountain Milkvetch

The Sheep Mountain milkvetch is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 976 acres (4 km^2) of potentially suitable habitat on the SEZ and 78 acres (0.3 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.1% of potentially suitable habitat in the SEZ region. About 46,000 acres (186 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.3% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Sheep Mountain milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Sheep Mountain milkvetch is not feasible because potentially suitable mixed desert scrub habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Tiehm Blazingstar

The Tiehm blazingstar is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 12,000 acres (49 km^2) of potentially suitable habitat on the SEZ and 27 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.8% of potentially suitable habitat in the SEZ region. About 92,700 acres (375 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 6.1% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Tiehm blazingstar from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Tiehm blazingstar is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White Bearpoppy

The white bearpoppy is not known to occur in the affected area of the Delamar Valley SEZ, and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 161 acres (0.7 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.1% of the available potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the white bearpoppy from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing impacts on rocky cliffs and outcrops in the access road corridor may be sufficient to reduce impacts on the white bearpoppy to small or negligible levels. Impacts also could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White River Cat's-Eye

The White River cat's-eye is not known to occur in the affected area of the Delamar Valley SEZ and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 1,700 acres (7 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the White River cat's-eye from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing impacts on rocky cliffs and outcrops in the access road corridor may be sufficient to reduce impacts on the White River cat's-eye to small or negligible levels. Impacts also could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Poppy Bee

The Mojave poppy bee is not known to occur in the affected area of the Delamar Valley SEZ, and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 163 acres (0.7 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.1% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Mojave poppy bee from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Ferruginous Hawk

The ferruginous hawk occurs only as a winter resident in the vicinity of the Delamar Valley SEZ and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 910 acres (4 km^2) of potentially suitable foraging habitat on the SEZ and 7 acres (<0.1 km^2) within the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 0.1% of potentially suitable habitat in the SEZ region. About 37,000 acres (150 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 2.9% of the available suitable foraging habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels. Avoidance of all potentially suitable habitats to mitigate impacts on the ferruginous hawk is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effects.

Phainopepla

The phainopepla is not known to occur within 5 mi (8 km) of the Delamar Valley SEZ, and suitable habitat does not occur on the site. However, approximately 46 acres (0.2 km^2) of potentially suitable foraging or nesting habitat within the access road corridor could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 11.2.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat of the phainopepla in the region. About 15,900 acres (64 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 1.5% of the available suitable habitat in the region (Table 11.2.12.1-1).

Riparian habitats in the White River and Pahranagat Valleys that may provide suitable nesting and foraging habitat for the phainopepla may be affected by spring discharges associated with the White River Valley regional groundwater system. Solar energy development on the SEZ may require water from the same regional groundwater system that supports these riparian habitats. As discussed above for other groundwater-dependent species in Section 11.2.12.2.1, impacts on this species could range from small to large depending upon the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals (Table 11.2.12.1-1).

The implementation of programmatic design features and complete avoidance of or limitations on groundwater withdrawals from the regional groundwater system would reduce impacts on the phainopepla to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified. In addition, the complete avoidance of riparian areas in the access road corridor would further reduce impacts.

Prairie Falcon

The prairie falcon is a year-round resident in the Delamar Valley SEZ region, and potentially suitable foraging and nesting habitat may occur in the affected area. Approximately 11,300 acres (46 km^2) of potentially suitable foraging habitat on the SEZ and 52 acres (0.2 km^2) of potentially suitable foraging or nesting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 0.4% of potentially suitable habitat in the SEZ region. About 87,700 acres (355 km^2) of potentially suitable foraging and nesting habitat occurs in the area of indirect effects; this area represents about 3.5% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1). Most of this area could serve as foraging habitat (open shrublands). On the basis of SWReGAP land cover data, potentially suitable nesting habitat (cliffs and rock outcrops) does not occur on the SEZ. However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the prairie falcon from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging habitats to mitigate impacts on the prairie falcon is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effects. However, the complete avoidance of cliff and rock outcrop habitats within the access road corridor would reduce impacts on nesting habitats of this species to negligible levels. Impacts also could be reduced by conducting pre-disturbance surveys and avoiding or minimizing impacts of occupied habitats (especially nesting habitats) in the area of direct effects. If avoidance and minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat in the area of direct effects.

Swainson's Hawk

The Swainson's hawk is considered a summer breeding resident within the Delamar Valley SEZ region, and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 1,950 acres (8 km^2) of potentially suitable foraging habitat on the SEZ and 75 acres (0.3 km^2) of potentially suitable foraging habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 0.1% of potentially suitable habitat in the SEZ region. About 91,600 acres (371 km^2) of potentially suitable foraging and nesting habitat occurs in the area of indirect effects; this area represents about 4.2% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat (solitary trees) within the area of direct effects, but approximately 2,900 acres (12 km^2) of pinyon-juniper woodland that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the Swainson's hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging and nesting habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats to mitigate impacts on the prairie falcon is not feasible because potentially suitable foraging habitats are widespread throughout the area of direct effects and readily available in other portions of the affected area.

Western Burrowing Owl

The western burrowing owl is a summer breeding resident within the Delamar Valley SEZ region and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 15,400 acres (62 km^2) of potentially suitable habitat on the SEZ and 108 acres (0.4 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 0.4% of potentially suitable habitat in the SEZ region. About 150,000 acres (607 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.8% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging and nesting habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the western burrowing owl because potentially suitable shrubland habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. Impacts on the western burrowing owl could be reduced through the implementation of programmatic design features and by conducting pre-disturbance surveys and avoiding occupied burrows on the SEZ. If avoidance and minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Desert Valley Kangaroo Mouse

The Desert Valley kangaroo mouse is not known to occur in the affected area of the Delamar Valley SEZ. However, approximately 10,900 acres (44 km^2) of potentially suitable habitat on the SEZ and 2 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 1.8% of potentially suitable habitat in the SEZ region. About 29,000 acres (117 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 4.7% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Desert Valley kangaroo mouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered moderate because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoiding or minimizing impacts on all playa habitats in the SEZ could reduce impacts on this species, but this would restrict development on a large portion of the SEZ. Pre-disturbance surveys and avoidance of occupied habitats in the area of direct effects also could reduce impacts. If avoidance and minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Fringed Myotis

The fringed myotis is a year-round resident within the Delamar Valley SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ. However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. Approximately 13,200 acres (53 km^2) of potentially suitable foraging habitat on the SEZ and 106 acres (0.4 km^2) of potentially suitable foraging or roosting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the region. About 142,000 acres (575 km^2) of potentially suitable foraging and roosting habitat occurs in the area of indirect effects; this area represents about 3.1% of the available suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable foraging and roosting habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species.

Avoiding or minimizing direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects and readily available in other portions of the affected area. Impacts on the fringed myotis could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied roosts in the area of direct effects. If avoidance and minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre disturbance surveys for the species and its habitat in the area of direct effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is not known to occur in the affected area of the Delamar Valley SEZ, and suitable habitat is not expected to occur on the site. However, approximately 18 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the region. About 32,600 acres (132 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 2.3% of the available suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of the potentially suitable habitat in the region. The implementation of programmatic design features are expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Impacts on the Nelson's bighorn sheep could be reduced to small or negligible levels by conducting pre-disturbance surveys and avoiding or minimizing impacts on occupied habitats and important movement corridors within the area of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting surveys for the species and its habitat within the area of direct effects.

Silver-Haired Bat

The silver-haired bat is a year-round resident within the Delamar Valley SEZ region. On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat (trees) within the area of direct effects, but approximately 2,900 acres (12 km^2) of pinyon-juniper woodland that may be potentially suitable nesting habitat occurs in the area of indirect effects. Approximately 14,500 acres (59 km^2) of potentially suitable foraging habitat on the SEZ and 52 acres (0.2 km^2) of potentially suitable foraging habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.4% of potentially suitable habitat in the region. About 101,000 acres (409 km^2) of potentially suitable foraging and roosting habitat occurs in the area of indirect effects; this area represents about 3.0% of the potentially suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the silver-haired bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features are expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoiding or minimizing direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects and readily available in other portions of the affected area.

Spotted Bat

The spotted bat is a year-round resident within the Delamar Valley SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ.

However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. Approximately 12,150 acres (49 km^2) of potentially suitable foraging habitat on the SEZ and 87 acres (0.4 km^2) of potentially suitable foraging or roosting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the region. About 94,000 acres (380 km^2) of potentially suitable foraging and nesting habitat occurs in the area of indirect effects; this area represents about 2.5% of the potentially suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable foraging and roosting habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the spotted bat because potentially suitable habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the fringed myotis could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident within the Delamar Valley SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ. However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. Approximately 14,500 acres (59 km^2) of potentially suitable foraging habitat on the SEZ and 48 acres (0.2 km^2) of potentially suitable foraging or roosting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.5% of potentially suitable habitat in the region. About 77,500 acres (314 km^2) of potentially suitable foraging and roosting habitat occurs in the area of indirect effects; this area represents about 2.7% of the potentially suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable foraging and roosting habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the Townsend's big-eared bat because potentially suitable habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the fringed myotis could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Western Small-Footed Bat

The western small-footed bat is a year-round resident within the Delamar Valley SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ. However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. Approximately 16,300 acres (66 km^2) of potentially suitable foraging habitat on the SEZ and 112 acres (0.5 km^2) of potentially suitable foraging or roosting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the region. About 155,000 acres (627 km^2) of potentially suitable foraging and roosting habitat occurs in the area of indirect effects; this area represents about 3.1% of the potentially suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the western small-footed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable foraging and roosting habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the western small-footed bat because potentially suitable habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the fringed myotis could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Groundwater-Dependent Species

There are four BLM-designated sensitive species that may be affected by solar energy development in the Delamar Valley SEZ affected area, or that may be affected by solar energy development on the SEZ. These include the Pahranagat naucorid, White River desert sucker, southwestern toad, and Pahranagat Valley montane vole. These species do not occur within 5 mi (8 km) of the SEZ boundary, but they do occur in areas dependent on groundwater discharge within the Pahranagat Valley, which is hydrologically connected to groundwater in the Delamar Valley. Potential impacts on these species (which could range from small to large) and mitigations that could reduce those impacts would be similar to those described for groundwater-dependent ESA-listed species in Section 11.2.12.2.1. For all of these species, potential impacts and mitigation options should be discussed with the USFWS prior to project development.

11.2.12.2.5 Impacts on State-Listed Species

There are 15 species listed by the state of Nevada that may occur in the Delamar Valley SEZ affected area or that may be affected by solar energy development on the SEZ (Table 11.2.12.1-1). Impacts on each of these species have been previously discussed because of their known or pending status under the ESA (Section 11.2.12.2.1, 11.2.12.2.2, or 11.2.12.2.3) or their designation by the BLM as a sensitive species (Section 11.2.12.2.4).

11.2.12.2.6 Impacts on Rare Species

There are 47 rare species (state rank of S1 or S2 in Nevada or a species of concern by the state of Nevada or USFWS) that may be affected by solar energy development on the Delamar Valley SEZ. Impacts on 35 of these species have been previously discussed due to the species' known or pending status under the ESA (Section 11.2.12.2.1, 11.2.12.2.2, or 11.2.12.2.3) or designation under the BLM (Section 11.2.12.2.4). The remaining nine species that have not been previously discussed included the following (1) plants: Ackerman milkvetch, Antelope Canyon goldenbush, Jaeger beardtongue, Meadow Valley sandwort, St. George blue-eyed grass, and Veyo milkvetch; and (2) invertebrates: Ash Springs riffle beetle, nearctic riffle beetle, and red-tailed blazing star bee. Impacts and potentially applicable mitigation measures (if necessary) for each of these species are provided in Table 11.2.12.1-1. Additional life history information is provided in Appendix J.

11.2.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A**,** Section A.2.2, would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ and access road corridor (i.e., area of direct effects) to determine the presence and abundance of special status species, including those identified in Table 11.2.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible, translocation of individuals from areas of direct effects, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Avoiding or minimizing disturbance of wetland habitats within the area of direct effects, including riparian, desert wash, and playa habitats, could reduce or eliminate impacts on the Needle Mountains milkvetch, phainopepla, southwestern willow flycatcher, and Desert Valley kangaroo mouse.

- Avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce or eliminate impacts on the following nine special status species: Charleston ground-daisy, Rock purpusia, White bearpoppy, White River cat's-eye, prairie falcon, fringed myotis, spotted bat, Townsend's big-eared bat, and western small-footed bat.

- Avoidance or minimization of groundwater withdrawals from the Delamar Valley to serve solar energy development on the SEZ would reduce or prevent impacts on the following 15 groundwater-dependent species: Ash Springs riffle beetle, grated tryonia, Hubbs springsnail, nearctic riffle beetle, Pahranagat naucorid, Pahranagat pebblesnail, Hiko White River springfish, Pahranagat roundtail chub, Pahranagat speckled dace, White River desert sucker, White River springfish, northern leopard frog, southwestern toad, phainopepla, southwestern willow flycatcher, and western yellow-billed cuckoo. Potential impacts on these species, and mitigations, should be quantified through hydrologic modeling once water needs are identified for specific projects.

- Consultation with the USFWS and NDOW should be conducted to address the potential for impacts on the following five species listed as threatened or endangered under the ESA that may be affected by solar energy development on the SEZ: Hiko White River springfish, Pahranagat roundtail chub, White River springfish, desert tortoise, and southwestern willow flycatcher. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Coordination with the USFWS and NDOW should be conducted for the following four species under review for listing under the ESA that may be affected by solar energy development on the SEZ: grated tryonia, Hubbs springsnail, Pahranagat pebblesnail, and northern leopard frog. Coordination would identify an appropriate survey protocol, and mitigation requirements, which may include avoidance, minimization, translocation, or compensation.

- Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species could be reduced.

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11.2.13 Air Quality and Climate

11.2.13.1 Affected Environment

11.2.13.1.1 Climate

The proposed Delamar Valley SEZ is located in southeastern Nevada, in the south central portion of Lincoln County. Nevada lies on the eastern lee side of the Sierra Nevada Range, which markedly influences the climate of the state under the prevailing westerlies (NCDC 2010a). In addition, the mountains east and north of Nevada act as a barrier to the cold arctic air masses, and thus long periods of extremely cold weather are uncommon. The SEZ lies at an average elevation of about 4,600 ft (1,400 m) in the south central portion of the Great Basin Desert, which has a high desert climate marked by year-round pleasant weather (mild winters and warm summers), large daily temperature swings due to dry air, scant precipitation, low relative humidity, and abundant sunshine. Meteorological data collected at the Ely Yelland Field, about 124 mi (200 km) north of the Delamar Valley SEZ boundary, and Pahranagat NWR, about 9 mi (14 km) southwest, are summarized below.

A wind rose from the Ely Yelland Field, Nevada, for the 5-year period 2005 to 2009, taken at a level of 33 ft (10 m), is presented in Figure 11.2.13.1-1 (NCDC 2010b).[5] During this period, the annual average wind speed at the airport was about 9.2 mph (4.1 m/s), with a prevailing wind direction from the south (about 24.4% of the time) and secondarily from the south–southeast (about 16.0% of the time). The southerly wind component predominates, with about 52% of wind directions ranging from south–southeast clockwise to south–southwest. Winds blew predominantly from the south every month throughout the year. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 10% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were relatively uniform; they are the highest in spring at 9.7 mph (4.3 m/s), lower in summer and fall at 9.2 mph (4.1 m/s), and lowest in winter at 8.7 mph (3.9 m/s).

For the 1964 to 2009 period, the annual average temperature at Pahranagat NWR was 59.5°F (15.3°C) (WRCC 2010f).[6] December was the coldest month, with an average minimum temperature of 26.7°F (–2.9°C), and July was the warmest month, with an average maximum of 98.6°F (37.0°C). In summer, daytime maximum temperatures were frequently in the 90s, and

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5 Although the Ely Yelland Field is rather far away from the Delamar Valley SEZ, it was chosen to be representative of the SEZ, considering the similar north–south orientation of valley and mountain ranges.

6 Pahranagat NWR is located closer (about 9 mi [14 km]) to the Delamar Valley SEZ than Caliente (22 mi [35 km]) but is lower in elevation by about 1,200 ft (366 m) and 1,000 ft (305 m) than the SEZ and Caliente, respectively. Annual-average temperature at Pahranagat NWR is about 6.1°F (3.4°C) higher than that at Caliente, while precipitation and snowfall at Pahranagat NWR are about 71% and 13% of those at Caliente, respectively.

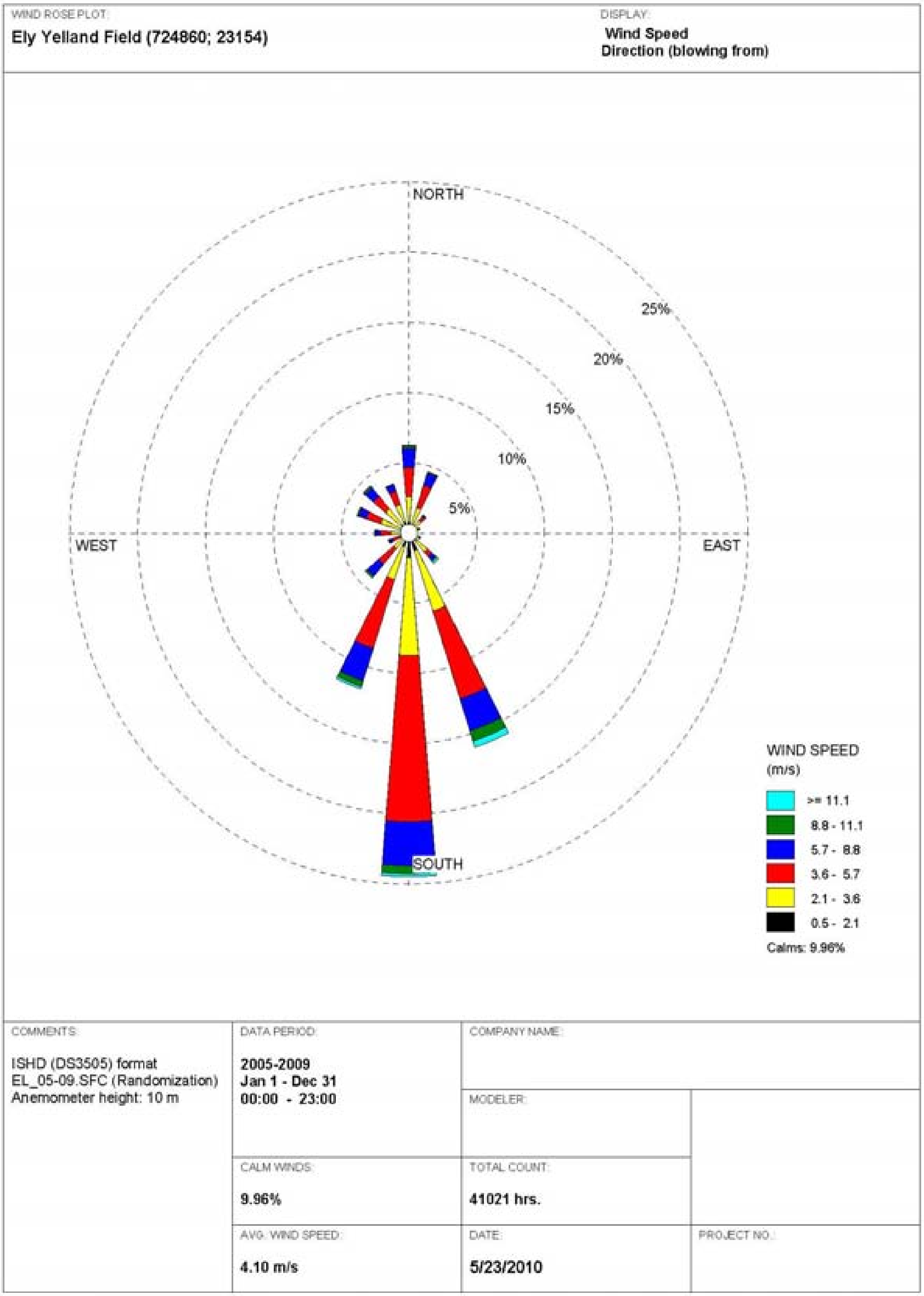

FIGURE 11.2.13.1-1 Wind Rose at 33 ft (10 m) at Ely Yelland Field, Nevada, 2005 to 2009 (Source: NCDC 2010b)

minimums were in the mid-50s or higher. The minimum temperatures recorded were below freezing (≤32°F [0°C]) during the colder months (most days in December and January). During the same period, the highest temperature, 113°F (45.0°C), was reached in July 2007, and the lowest, –1°F (–18.3°C), in December 1990. In a typical year, about 100 days had a maximum temperature of greater than or equal to 90°F (32.2°C), while about 95 days had minimum temperatures at or below freezing.

For the 1964 to 2009 period, annual precipitation at Pahranagat NWR averaged about 6.19 in. (15.7 cm) (WRCC 2010f). On average, there are 31 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). Precipitation is relatively evenly distributed by season, although recorded precipitation is slightly higher in winter and spring than in summer and fall. Snow falls as early as November and continues as late as April; most of the snow falls in December and January. The annual average snowfall at Pahranagat NWR is about 1.4 in. (3.6 cm); the highest monthly snowfall recorded was 9.0 in (22.9 cm) in December 1992.

Because the area surrounding the proposed Delamar Valley SEZ is far from major water bodies (more than 300 mi [483 km]) and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as thunderstorms and tornadoes, are rare.

In Nevada, flooding could occur from melting of heavy snowpack. On occasion, heavy summer thunderstorms also cause flooding of local streams, usually in sparsely populated mountainous areas, but they are seldom destructive (NCDC 2010a). Since 1996, 18 floods (17 flash floods and 1 flood) were reported in Lincoln County; most of these occurred in the nestled mountain communities and some caused property damage. In January 2005, heavy rain and rapid snow melt caused extensive flooding in southern Lincoln and northeast Clark Counties, bringing about significant property damage.

In Lincoln County, 7 hail storms have been reported since 1981, none of which caused property damage (NCDC 2010c). Hail measuring 1.5 in (3.8 cm) in diameter was reported in 1981. In Lincoln County, 22 high-wind events have been reported since 1995, which caused some property damage. Such events, with a maximum wind speed of 83 mph (37 m/s), have occurred any time of the year with a peak during spring months. In addition, four thunderstorm wind events have been reported since 1964. Thunderstorm winds, with a maximum wind speed of 69 mph (31 m/s). occurred mostly during summer months on occasion, one of which caused minor property damage.

TABLE 11.2.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Lincoln County, Nevada, Encompassing the Proposed Delamar Valley SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)
SO_2	230
NO_x	3,453
CO	47,458
VOCs	172,491
PM_{10}	2,586
$PM_{2.5}$	1,604

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

Source: WRAP (2009).

In Lincoln County, no dust storms have been reported (NCDC 2010c). However, about 85% of the SEZ is covered with fine sandy loams and silt loams, which have moderate dust storm potential. On occasion, high winds and dry soil conditions could result in blowing dust in Lincoln County. Dust storms can deteriorate air quality and visibility and have adverse effects on health.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes never hit Nevada. Historically, one tropical depression has passed within 100 mi (160 km) of the proposed Delamar Valley SEZ (CSC 2010). Tornadoes in Lincoln County, which encompasses the proposed Delamar Valley SEZ, occur infrequently. In the period 1950 to July 2010, a total of six tornadoes (0.1 per year) were reported in Lincoln County (NCDC 2010c). However, all tornadoes occurring in Lincoln County were relatively weak (i.e., one was uncategorized, four were F0, and one was F1 on the Fujita tornado scale). None of these tornadoes caused injuries or deaths, but one of them caused some property damage. All tornadoes in Lincoln County were reported far from the proposed Delamar Valley SEZ.

11.2.13.1.2 Existing Air Emissions

Lincoln County has several industrial emission sources scattered over the county, but their emissions are relatively small. No emission sources are located around the proposed Delamar Valley SEZ. Because of the sparse population, only a handful of major roads, such as U.S. 93 and State Routes 318, 319, and 375, exist in Lincoln County. Thus, onroad mobile source emissions are not substantial. Data on annual emissions of criteria pollutants and VOCs in Lincoln County are presented in Table 11.2.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total SO_2 and NO_x emissions (about 56% and 57%, respectively). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions contributed primarily to CO emissions (about 56%) and secondarily to NO_x emissions (about 22%), and accounted for most of VOC emissions (about 99%). Fire sources were primary contributors to PM_{10} and $PM_{2.5}$ emissions (about 60% and 83%, respectively) and secondary contributors to SO_2 and CO emissions (41% and 33%, respectively). Area sources accounted for about 37% of PM_{10} and 13% of $PM_{2.5}$. In Lincoln County, point sources were minor contributors to criteria pollutants and VOCs.

In 2005, Nevada produced about 56.3 MMt of *gross*[7] CO_2e[8] emissions, which is about 0.8% of the total U.S. GHG emissions in that year (NDEP 2008). Gross GHG emissions in

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7 Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

8 A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

Nevada increased by about 65% from 1990 to 2005 because of Nevada's rapid population growth, compared to 16.3% growth in U.S. GHG emissions during the same period. In 2005, electrical generation (48%) and transportation (30%) were the primary contributors to gross GHG emission sources in Nevada. Fuel use in the residential, commercial, and industrial sectors combined accounted for about 12% of total state emissions. Nevada's *net* emissions were about 51.3 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in Nevada. Its estimate of CO_2 emissions from fossil fuel combustion was 49.6 MMt, which was comparable to the state's estimate. Electric power generation and transportation accounted for about 52.7% and 33.6% of the CO_2 emissions total, respectively, while the residential, commercial, and industrial sectors accounted for the remainder (about 13.7%).

11.2.13.1.3 Air Quality

The EPA set NAAQS for six criteria pollutants (EPA 2010a): SO_2, NO_2, CO, O_3, PM (PM_{10} and $PM_{2.5}$), and Pb. Nevada has its own SAAQS, which are similar to the NAAQS but have some differences (NAC 445B.22097). In addition, Nevada has set standards for 1-hour H_2S emissions, which are not addressed by the NAAQS. The NAAQS and Nevada SAAQS for criteria pollutants are presented in Table 11.2.13.1-2.

Lincoln County is located administratively within the Nevada Intrastate AQCR, along with 10 other counties in Nevada. This excludes Las Vegas Intrastate AQCR, including Clark County only—which encompasses Las Vegas—and Northwest Nevada Intrastate AQCR, including five northwest counties—which encompasses Reno. Currently, the area surrounding the proposed SEZ is designated as being unclassifiable/attainment of NAAQS for all criteria pollutants (40 CFR 81.329).

Because of Lincoln County's low population density, it has no significant emission sources of its own and only minor mobile emissions along major highways. Accordingly, ambient air quality in Lincoln County is relatively good. There are no ambient air-monitoring stations in Lincoln County. To characterize ambient air quality around the SEZ, one monitoring station in Clark County was chosen: Apex in the northeast corner of North Las Vegas in Clark County, about 63 mi (101 km) to the south of the SEZ. The Apex station, which is located downwind of the Las Vegas area along with predominant southwesterly winds, but upwind of the SEZ, can be considered representative of the proposed SEZ. Ambient concentrations of NO_2, O_3, PM_{10}, and $PM_{2.5}$ are recorded at the Apex station. The East Sahara Avenue station, which is on the outskirts of Las Vegas, has only one SO_2 monitor in the area. CO concentrations at the East Tonopah Avenue station in Las Vegas, which is the farthest downwind of Las Vegas among CO monitoring stations, were presented. No Pb measurements have been made in the state of Nevada because of low Pb concentration levels after the phaseout of leaded gasoline. The background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 11.2.13.1-2 (EPA 2010b). Monitored concentration levels were lower than their respective standards (up to 65%), except O_3, which approaches the 1-hour NAAQS/SAAQS but exceeds the 8-hour NAAQS. However, ambient concentrations around the SEZ are anticipated to be

TABLE 11.2.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed Delamar Valley SEZ in Lincoln County, Nevada, 2004 to 2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	SAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	75 ppb[d]	–[e]	–	–
	3-hour	0.5 ppm	0.5 ppm	0.009 ppm (1.8%)	Las Vegas, Clark County, 2005
	24-hour	0.14 ppm	0.14 ppm	0.008 ppm (5.7%)	Las Vegas, Clark County, 2005
	Annual	0.030 ppm	0.030 ppm	0.006 ppm (20%)	Las Vegas, Clark County, 2005
NO_2	1-hour	100 ppb[f]	–	–	–
	Annual	0.053 ppm	0.053 ppm	0.006 ppm (11%)	North Las Vegas, Clark County, 2007
CO	1-hour	35 ppm	35 ppm	5.7 ppm (16%)	Las Vegas, Clark County, 2004
	8-hour	9 ppm	9 ppm[g]	3.9 ppm (43%)	Las Vegas, Clark County, 2005
O_3	1-hour	0.12 ppm[h]	0.12 ppm[i]	0.104 ppm (87%)	North Las Vegas, Clark County, 2005
	8-hour	0.075 ppm	–	0.081 ppm (108%)	North Las Vegas, Clark County, 2007
PM_{10}	24-hour	150 μg/m^3	150 μg/m^3	97 μg/m^3 (65%)	North Las Vegas, Clark County, 2006
	Annual	–	50 μg/m^3	22 μg/m^3 (44%)	North Las Vegas, Clark County, 2008
$PM_{2.5}$	24-hour	35 μg/m^3	–	10.2 μg/m^3 (29%)	North Las Vegas, Clark County, 2005
	Annual	15.0 μg/m^3	–	4.05 μg/m^3 (27%)	North Las Vegas, Clark County, 2005
Pb	30-day	–	1.5 μg/m^3	–	–
	Calendar quarter	1.5 μg/m^3	–	–	–
	Rolling 3-month	0.15 μg/m^3 [j]	–	–	–

a Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

b Monitored concentrations are the second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 the 98th percentile for 24-hour $PM_{2.5}$, and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

c Values in parentheses are background concentration levels as a percentage of NAAQS or SAAQS. Calculation of 1-hour SO_2 and NO_2 to NAAQS was not made, because no measurement data based on new NAAQS are available.

d Effective August 23, 2010.

e A dash indicates not applicable or not available.

f Effective April 12, 2010.

g CO standard for the area less than 5,000 ft (1,524 m) above mean sea level. CO standard for the area at or greater than 5,000 ft (1,524 m) above mean sea level is 6 ppm.

h The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

i O_3 standard for the Lake Tahoe Basin, #90, is 0.10 ppm.

j Effective January 12, 2009.

Sources: EPA (2010a,b); NAC 445B.22097.

lower than those presented in the table, except PM_{10} and $PM_{2.5}$, which can be either higher or lower.

PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or the modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, the EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would be located within 62 mi (100 km) of a sensitive Class I area. There are several Class I areas around the proposed Delamar Valley SEZ, none of which is situated within 62 mi (100 km) of the SEZ, in Arizona, Nevada, and Utah. The nearest Class I area is Zion NP in Utah (40 CFR 81.430), about 89 mi (143 km) east of the proposed Delamar Valley SEZ. This Class I area is not located downwind of prevailing winds at the proposed Delamar Valley SEZ (Figure 11.2.13.1-1). The next nearest Class I area is Grand Canyon NP in Arizona, which is about 98 mi (158 km) southeast of the SEZ.

11.2.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using HTFs, fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities could displace air emissions that would otherwise be released from fossil fuel power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Delamar Valley SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.2.13.3 below identifies SEZ-specific design features of particular relevance to the Delamar Valley SEZ.

11.2.13.2.1 Construction

The Delamar Valley SEZ has a relatively flat terrain; thus only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Appendix M, Section M.13. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[9] However, no receptors were modeled for PSD analysis at the nearest Class I area, Zion NP in Utah, because it is about 89 mi (143 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the Zion NP were selected as surrogates for the PSD analysis. For the Delamar Valley SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions of 3,000 acres (12.1 km^2) each and 6,000 acres (24.3 km^2) in total, in the southern portion of the SEZ, close to the nearest residence and the town of Alamo,

- Surface hourly meteorological data from Ely Yelland Field[10] and upper air sounding data from the Mercury/Desert Rock Airport for the 2005 to 2009 period, and

- A regularly spaced receptor grid over a modeling domain of 62 × 62 mi (100 km × 100 km) centered on the proposed SEZ, and additional discrete receptors at the SEZ boundaries.

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9 To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/SAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

10 The number of missing hours at the Ely Yelland Field amounts to about 17.7% of the total hours, which may not be acceptable for regulatory applications because that percentage exceeds the 10% limit defined by the EPA. However, because the wind patterns at Ely Yelland Field are more representative of wind at the Delamar Valley SEZ than the wind patterns at other airports (which have more complete data but are located in different topographic features), the former values were used for the screening analysis.

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 11.2.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 408 μg/m^3, which far exceeds the relevant standard level of 150 μg/m^3. Total 24-hour PM_{10} concentrations of 505 μg/m^3 would also exceed the standard level at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 9 μg/m^3 at the nearest residence, Alamo, and Ash Springs (about 9 mi (14 km) west-southwest, 11 mi [18 km] west, and 15 mi [24 km] west-northwest of the SEZ, respectively), about 5 μg/m^3 at Crystal Springs and Hiko, and about 1.5 μg/m^3 at Caliente and Panaca. Annual average modeled PM_{10} concentration increments and total concentration (increment plus background) at the SEZ boundary would be about 74.6 μg/m^3 and 96.6 μg/m^3, respectively, which are higher than the SAAQS level of 50 μg/m^3. Annual PM_{10} increments would be much lower, 0.2 μg/m^3 at Alamo and Ash Springs and 0.1 μg/m^3 or less at all nearby towns, including the nearest residence. Total 24-hour $PM_{2.5}$ concentrations would be 36.1 μg/m^3 at the SEZ boundary, which is slightly higher than the NAAQS level of 35 μg/m^3; modeled increments contribute about two times more than background concentration to this total. The total annual average $PM_{2.5}$ concentration would be 11.5 μg/m^3, which is below the NAAQS level of 15.0 μg/m^3. At the nearest residence, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 0.1 and 0.01 μg/m^3, respectively.

TABLE 11.2.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Delamar Valley SEZ

			Concentration (μg/m^3)				Percentage of NAAQS/SAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ SAAQS	Increment	Total
PM_{10}	24 hours	H6H	408	97	505	150	272	337
	Annual	–[d]	74.6	22	96.6	50	149	193
$PM_{2.5}$	24 hours	H8H	25.9	10.2	36.1	35	74	103
	Annual	–	7.5	4.1	11.5	15.0	50	77

a $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

b Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

c See Table 11.2.13.1-2.

d A dash = not applicable.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—Zion NP in Utah—would be about 4.0 and 0.08 $\mu g/m^3$, or 50% and 2.0% of the PSD increments for a Class I area, respectively. These surrogate receptors are more than 58 mi (93 km) from the Zion NP; thus predicted concentrations in Zion NP would be much lower than the above values (about 18% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed the standard levels used as a guideline at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Predicted total concentrations for annual $PM_{2.5}$ would be below the respective standard levels. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area (Zion NP in Utah). Construction activities are not subject to the PSD program, and the comparison provides only a screen for gauging the size of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearby federal Class I areas. SO_x emissions from engine exhaust would be very low, because programmatic design features would require ultra-low-sulfur fuel with a sulfur content of 15 ppm. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 69-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary.

11.2.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology if wet cooling was implemented (drift comprises low-level PM emissions). The type of emission sources caused by and offset by operation of a solar facility are discussed in Appendix M, Section M.13.4.

Potential air emissions displaced by the solar project development at the Delamar Valley SEZ are presented in Table 11.2.13.2-2. Total power generation capacity ranging from 1,471 to 2,648 MW is estimated for the Delamar Valley SEZ for various solar technologies (see Section 11.2.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). If the Delamar Valley SEZ were fully developed, it is expected that emissions avoided could be substantial. Development of solar power in the SEZ could result in avoided air emissions ranging from 6.8 to 12% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada (EPA 2009c). Avoided emissions could be up to 2.6% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities could displace up to 9.9% of SO_2, 3.7% of NO_x, and 6.6% of CO_2 emissions in the state of Nevada

TABLE 11.2.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Delamar Valley SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
16,552	1,471–2,648	2,578–4,640	3,637–6,546	3,119–5,615	0.021–0.037	2,002–3,604
Percentage of total emissions from electric power systems in Nevada[d]			6.8–12%	6.8–12%	6.8–12%	6.8–12%
Percentage of total emissions from all source categories in Nevada[e]			5.5–9.9%	2.1–3.7%	–[f]	3.7–6.6%
Percentage of total emissions from electric power systems in the six-state study area[d]			1.4–2.6%	0.84–1.5%	0.71–1.3%	0.76–1.4%
Percentage of total emissions from all source categories in the six-state study area[e]			0.77–1.4%	0.12–0.21%	–	0.24–0.43%

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and photovoltaic technologies) would be required.

[b] Assumed a capacity factor of 20%.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.82, 2.42, 1.6×10^{-5}, and 1,553 lb/MWh, respectively, were used for the state of Nevada.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] A dash indicates not estimated.

Sources: EPA (2009a,c); WRAP (2009).

(EPA 2009a; WRAP 2009). These emissions could be up to 1.4% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for about 93% of the total electric power generated in Nevada for which contribution of natural gas and coal combustion is comparable (EPA 2009c). Thus, solar facilities to be built in the Delamar Valley SEZ could be more important than those built in other states in terms of reducing fuel combustion–related emissions.

As discussed in Section 5.11.2.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x, associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for high-voltage lines during rain or very humid conditions. Since the Delamar Valley SEZ is located in an arid desert environment, these emissions would be small; potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

11.2.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.2.4, decommissioning/reclamation activities are similar to construction activities but are on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

11.2.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Delamar Valley SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

11.2.14 Visual Resources

11.2.14.1 Affected Environment

The proposed Delamar Valley SEZ is located in Lincoln County in southeastern Nevada, 45 mi (72 km) west of the Utah border. The SEZ occupies 16,552 acres (66.984 km^2) within the Delamar Valley, and extends approximately 3.0 mi (4.8 km) east to west and approximately 13 mi (21 km) north to south. The SEZ ranges in elevation from approximately 4,540 ft (1,380 m) in the southern portion to 4,760 ft (1,450 m) in the northern portion.

The SEZ lies within the Central Basin and Range Level III ecoregion, which is composed of northerly trending fault-block ranges and intervening drier basins (Bryce et al. 2003). Valleys, lower slopes, and alluvial fans are either shrub- and grass-covered, or shrub-covered. Higher elevation mountain slopes support woodland, mountain brush, and scattered forests. Land uses within the ecoregion include grazing with some irrigated cropland found in valleys near mountain water sources. At Level IV, the proposed Delamar Valley SEZ is located within the Tonopah Basin ecoregion, which is a transition between the Great Basin and the more southerly Mojave Desert. It is typified by broad, nearly flat to rolling valleys containing lake plains, scattered hills, alluvial fans, bajadas, sand dunes, and hot springs. Ephemeral washes occur. Surface water comes from springs and sporadic foothill precipitation events, but is generally scarce (Bryce et al. 2003).

Delamar Valley is bounded by mountain ranges to the east, southeast, and west, with open views to the north. The Delamar Mountains rise about 4.7 mi (7.6 km) east of the SEZ. The foothills of the South Pahroc Mountain range are located approximately 2.4 mi (3.9 km) west of the SEZ. These ranges include peaks that are generally between 3,000 and 5,000 ft (914 and 1,524 m) in elevation, but some peaks are over 7,000 ft (2,134 m). From north to south, the broad Delamar Valley extends approximately 20 mi (32 km) and 8.5 mi (13.7 km) wide. The SEZ and surrounding mountain ranges are shown in Figure 11.2.14.1-1.

Vegetation is generally sparse in much of the SEZ, with low-height shrubs, grasses, and bare soil. Vegetation within the SEZ is predominantly winterfat, with Joshua trees, spiny hopsage, and other low shrubs dominating the Delamar Valley floor. During an August 2009 site visit, the vegetation presented a limited range of muted colors, with medium to coarse textures, and generally low visual interest. Within the SEZ, soils are somewhat sandy, fine textured, and very light brown to tan in color.

The southern portion of the SEZ has more visual variety and scenic quality than the rest of the SEZ. A very flat playa (Delamar Lake) is located at the southern end of the SEZ, with nearly white soil that provides a strong visual contrast visible at great distances. Immediately west of the playa are large boulders and a rocky ridge that provide strong form, color, and texture contrast to the playa. They also contain rock art that attracts visitors. The northern portion of the SEZ is a broad, flat valley with distant mountains and is of low scenic quality. There are no visible water features; however, much of the SEZ collects surface water temporarily.

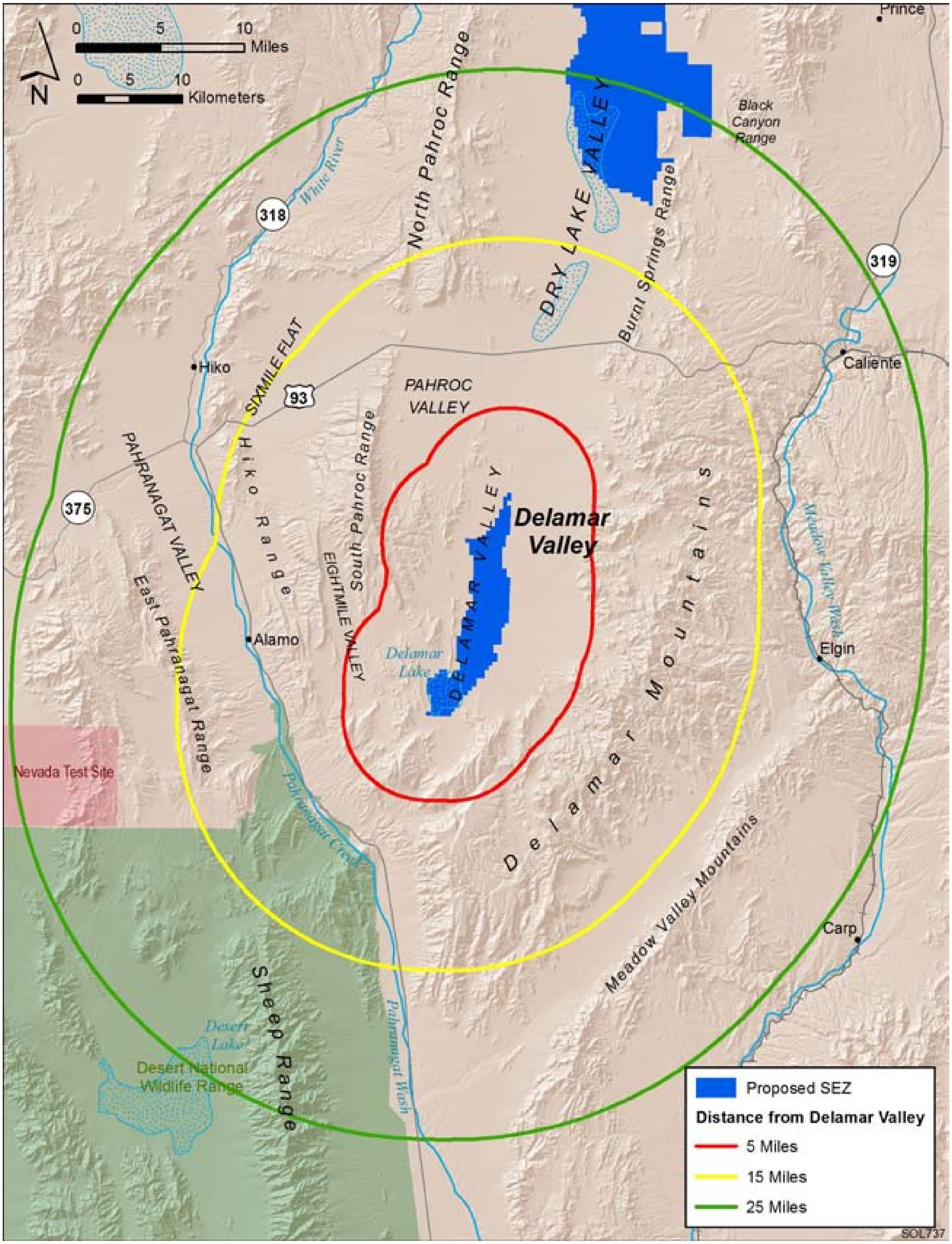

FIGURE 11.2.14.1-1 Proposed Delamar Valley SEZ and Surrounding Lands

Cultural disturbances visible within the SEZ include unpaved roads, transmission lines, fences, corrals, and trash. Delamar Lake is used for various recreational activities, including driving OHVs, racing, setting off pyrotechnics, and launching model rockets. Grazing occurs outside of the dry lakebed. These cultural modifications generally detract from the scenic quality of the SEZ; however, the SEZ is so large that from many locations within the SEZ these features are either not visible or are so distant as to have minimal effect on views. From most locations within the SEZ the landscape is generally natural in appearance, with little visible disturbance.

The general lack of topographic relief, water, and variety results in low scenic value within the SEZ itself; however, because of the flatness of the landscape and the breadth of the Delamar Valley, the SEZ and surrounding valley floor present a panoramic landscape with sweeping views of the surrounding mountains that add to the scenic values within the SEZ viewshed. The mountain slopes and peaks to the east and west of the SEZ are, in general, visually pristine. As viewed from the SEZ, most of the surrounding mountains appear to be devoid of vegetation, and their generally jagged, irregular form, and brown colors provide dramatic visual contrasts to the strong horizontal line, green vegetation, and light-colored soils of the valley floor, particularly when viewed from nearby locations within the SEZ. Panoramic views of the SEZ are shown in Figures 11.2.14.1-2, 11.2.14.1-3, and 11.2.14.1-4.

The BLM conducted a VRI for the SEZ and surrounding lands in 2004. The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or KOPs. Based on these three factors, BLM-administered lands are placed into one of four Visual Resource Inventory Classes, which represent the relative value of the visual resources. Classes I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas for which decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is presented in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI values for the SEZ are VRI Class 4, indicating low relative visual values. Most of the immediate surroundings are also VRI Class 4, with the exception of the area immediately to the east of the SEZ, which is VRI Class 3 (BLM 2009d). The BLM conducted a new VRI for the SEZ and surrounding lands in 2010; however, the VRI was not completed in time for the new data to be included in the draft PEIS. The new VRI data will be incorporated into the analyses presented in the final PEIS.

The *Ely District Record of Decision and Approved Resource Management Plan* (BLM 2008b) indicates that the site is managed as VRM Class IV, which permits major modification of the existing character of the landscape. More information about the BLM VRM program is presented in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

FIGURE 11.2.14.1-2 Approximately 180° Panoramic View of the Proposed Delamar Valley SEZ, Facing West across Delamar Flat toward South Pahroc Range from Stock Pond in the South–Central Portion of the SEZ

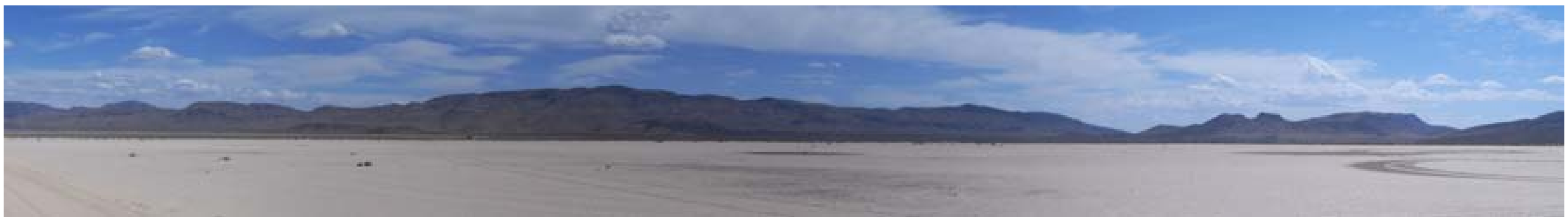

FIGURE 11.2.14.1-3 Approximately 120° Panoramic View of the Proposed Delamar Valley SEZ, Facing South toward Delamar Mountain WA from the Northern Boundary of Delamar Lake

FIGURE 11.2.14.1-4 Approximately 120° Panoramic View of the Proposed Delamar Valley SEZ from the Far Northern Portion of the SEZ, Facing South across the Delamar Flat, with Delamar Mountains at Left and Center and the South Pahroc Range on the Right

11.2.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Delamar Valley SEZ and surrounding lands, as well as the impacts of related projects (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section, as are SEZ-specific design features.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project, a relatively complete and accurate description of its major components, and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment used in this PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions, and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables and is not possible given the scope of this PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

11.2.14.2.1 Impacts on the Proposed Delamar Valley SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could be associated with solar facilities utilizing highly reflective surfaces or major light-emitting facility components (solar dish, parabolic trough, and power tower technologies), with somewhat lesser impacts expected for PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby. Additional, and potentially large impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed. For discussion of cumulative impacts, see Section 11.2.22.4.13 of this PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as viewed from nearby KOPs. The current VRM class designated for the SEZ is VRM Class IV. More information about impact determination using the BLM VRM program is presented in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

11.2.14.2.2 Impacts on Lands Surrounding the Proposed Delamar Valley SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.7). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were run to identify which lands surrounding the proposed SEZ are visible from the SEZ (see Appendix M for important information on assumptions and limitations of the methods used). Four viewshed analyses were run, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are presented in Appendix N.

Figure 11.2.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown and light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, and dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in this PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]) and transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 11.2.14.2-2 shows the results of a GIS analysis that overlays selected federal-, state-, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds, in order to illustrate which of these sensitive visual resource areas would have views of solar facilities within the SEZ and therefore are potentially subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground–middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

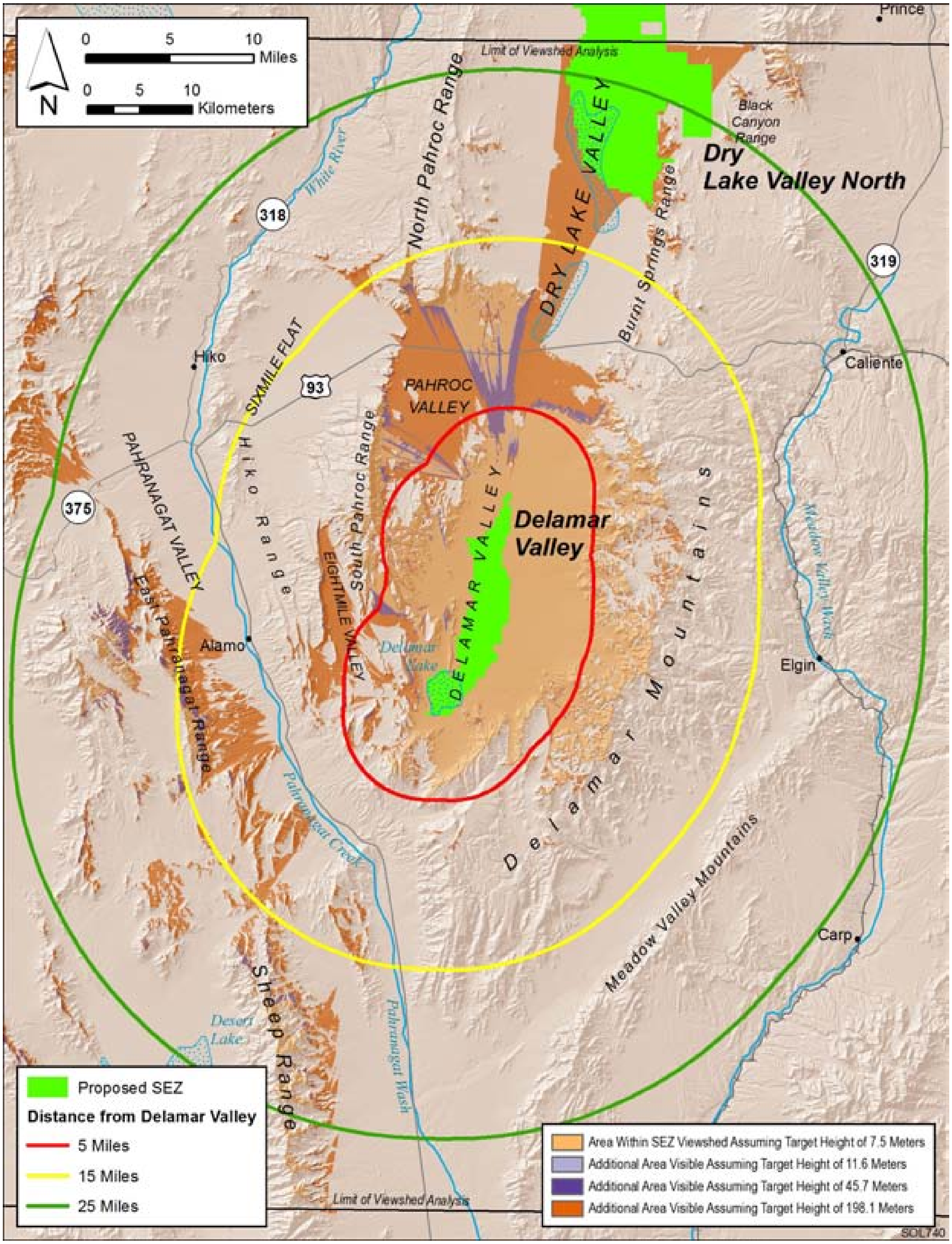

FIGURE 11.2.14.2-1 Viewshed Analyses for the Proposed Delamar Valley SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

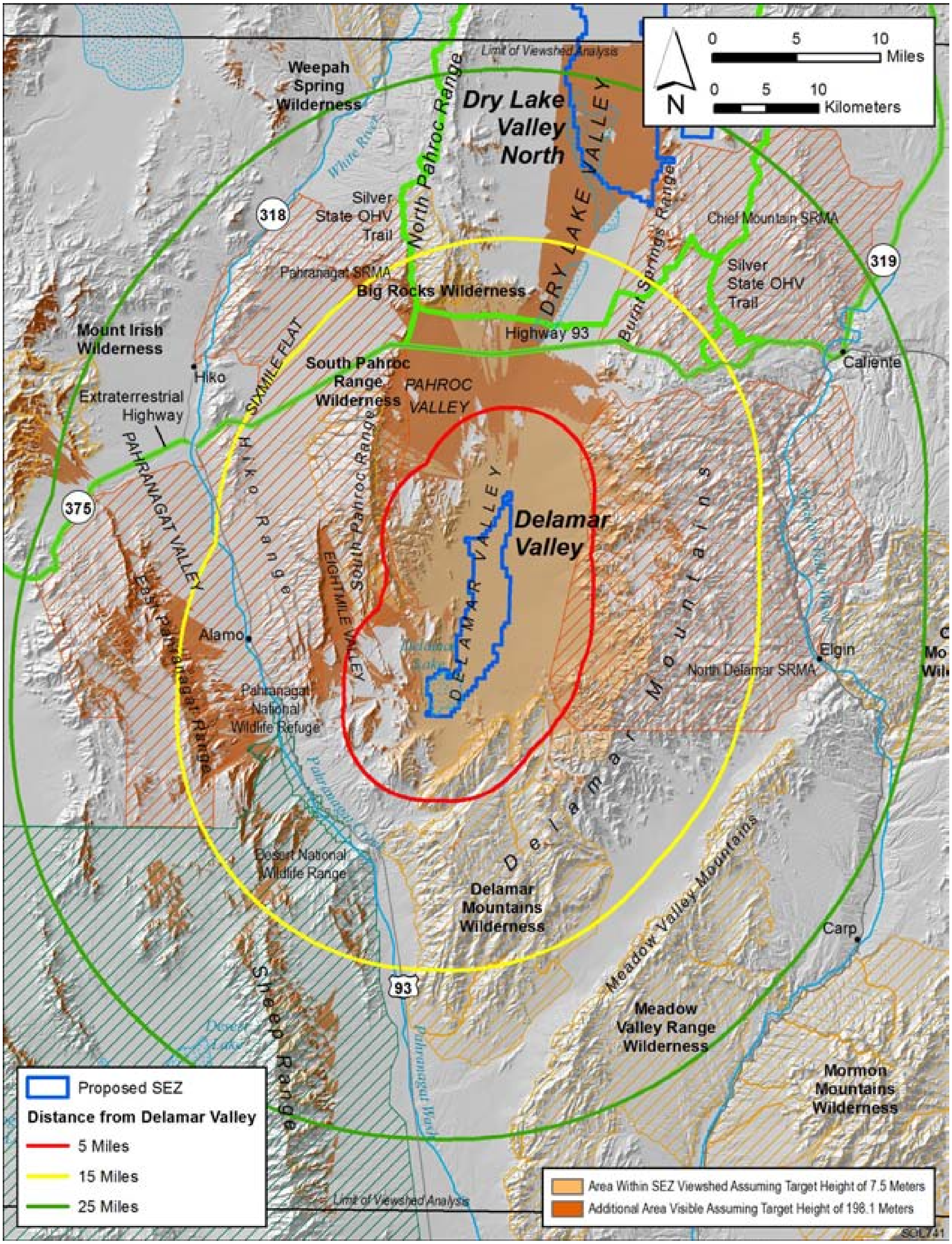

FIGURE 11.2.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Delamar Valley SEZ

The scenic resources included in the analysis were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

- All-American Roads, National Scenic Byways, State Scenic Highways, and BLM- and USFS-designated scenic highways/byways;

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Delamar Valley SEZ are discussed below. The results of this analysis are also summarized in Table 11.2.14.2-1. Further discussion of impacts on these areas is presented in Sections 11.2.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 11.2.17 (Cultural Resources) of this PEIS.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the seen landscape, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations where the project might be viewed from; and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

TABLE 11.2.14.2-1 Selected Potentially Affected Sensitive Visual Resources within 25-mi (40-km) Viewshed of the Proposed Delamar Valley SEZ, Assuming Power Tower Technology with a Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance		
			Visible between	
Feature Type	Feature Name and Total Acreage/ Length[a]	Visible within 5 mi	5 mi and 15 mi	15 mi and 25 mi
WAs	Big Rocks (12,929 acres)	0 acres	2,531 acres (20%)[b]	3 acres (0.2%)
	Delamar Mountains (111,060 acres)	5,179 acres (5%)[b]	663 acres (0.6%)	0 acres
	Mount Irish (28,283 acres)	0 acres	0 acres	198 acres (0.7%)
	South Pahroc Range (25,674 acres)	1,566 acres (6%)	4,846 acres (19%)	36 acres (0.1%)
National Wildlife Range	Desert (1,626,903 acres)	0 acres	4,948 acres (0.3%)	14,463 acres (0.9%)
NWR	Pahranagat (5,540 acres)	0 acres	10 acres (0.2%)	0 acres
SRMAs	Chief Mountain (111,151 acres)	0 acres	222 acres (0.2%)	1,549 acres (1%)
	North Delamar (202,839 acres)	9,947 acres (5%)	27,700 acres (14%)	0 acres
	Pahranagat (298,567 acres)	3,504 acres (1%)	35,341 acres (12%)	13,774 acres (5%)
Scenic Highways	U.S. 93 (149 mi, 240 km)	0 mi	8.8 mi	0 mi
	Silver State Trail	0 mi	14 mi	0 mi

[a] To convert acres to km^2, multiply by 0.004047; to convert mi to km, multiply by 1.609.

[b] Percentage of total feature area for areal features.

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

Wilderness Areas

- *Big Rocks*—Big Rocks Wilderness is a 12,929-acre (52.322 km^2) congressionally designated WA located 12 mi (19km) north–northwest of the SEZ. Recreational opportunities include climbing, bouldering, camping, hiking, backpacking, hunting, and horseback riding.

  As shown in Figure 11.2.14.2-2, solar energy facilities within the SEZ could be visible from the southern portion of the WA (approximately 2,534 acres [10.26 km^2] in the 650-ft [198.1-m] viewshed, or 20% of the total WA acreage, and 2,221 acres [8.988 km^2] in the 24.6-ft [7.5-m] viewshed, or 17% of the total WA acreage). The visible area of the WA extends to approximately 15mi (24 km) from the northern boundary of the SEZ.

  Figure 11.2.14.2-3 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the southern portion of the WA, approximately 14 mi (23 km) from the northernmost boundary of the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aid for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (139.9-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing approximately 100 MW of electric generating capacity. Four models were placed in the SEZ for this and other visualizations shown in this section of this PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

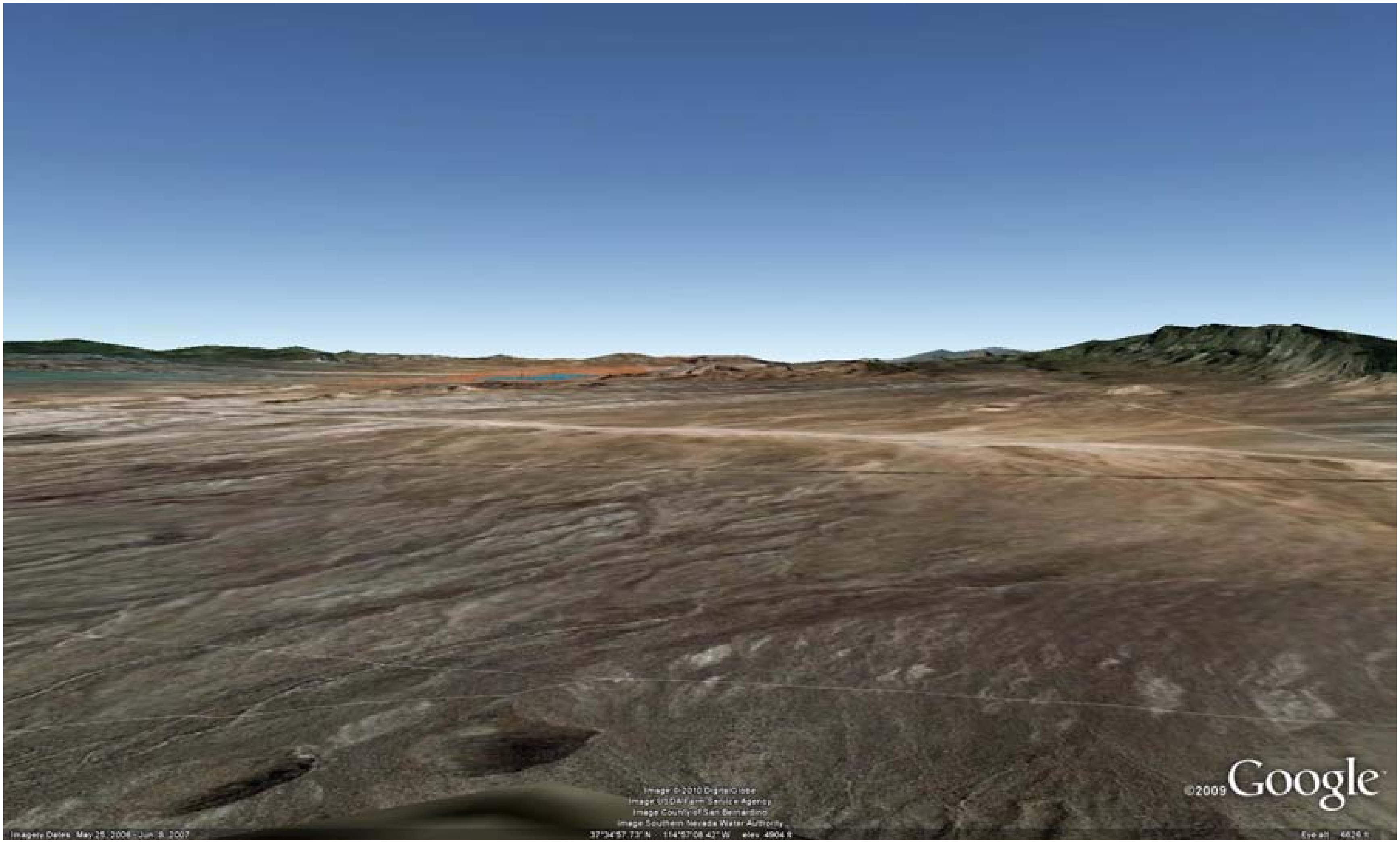

FIGURE 11.2.14.2-3 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Southern Portion of Big Rocks WA

The visualization suggests that as seen from the WA, the southern portion of the SEZ would be screened from view by the South Pahroc Range and, in addition, the horizontal angle of view would be along the narrow, north-south axis of the SEZ, so the SEZ would occupy a very small portion of the field of view. Furthermore, because of the relatively long distance to the SEZ, the vertical angle of view would be low, and solar facilities within the SEZ would be seen edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the strong line of the horizon, all of which would tend to reduce associated visual contrasts.

If power towers were located in the visible portions of the SEZ, when operating, they would likely appear as points of light under the southern horizon, against a backdrop of the valley floor. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location in the WA, and could be prominent in the dark night skies of this remote area.

The small apparent size of the SEZ and low angle of view suggest that under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected from solar development within the SEZ, as seen from Big Rocks WA.

- *Delamar Mountains*—Delamar Mountains is an 111,060-acre (449.444-km^2) congressionally designated WA located 1.8 mi (2.9 km) southeast of the SEZ at the point of closest approach. Recreational opportunities include camping, hiking, rock scrambling, backpacking, hunting, and horseback riding. The higher peaks in the central and eastern portions provide expansive views of nearby mountains and valleys, including the Delamar Dry Lake bed.

  As shown in Figure 11.2.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from portions of the northern part of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total approximately 5,827 acres (23.58 km^2) in the 650-ft (198.1-m) viewshed, or 5% of the total WA acreage, and 5,171 acres (20.93 km^2) in the 24.6-ft (7.5-m) viewshed, or 5% of the total WA acreage. The visible area of the WA extends to approximately 4.5 mi (7.2 km) from the southeastern corner of the SEZ; thus the entire visible area is within the BLM VRM program's foreground–middleground distance (5 mi [8 km]).

  Figure 11.2.14.2-4 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the northwestern portion of the WA (elevation approximately 6,340 ft [1,930 m]), approximately 2.8 mi (2.5 km) from the southeastern boundary of the SEZ. The viewpoint is about 1,800 ft (550 m) above the nearest point in the SEZ. The visualization suggests that from this viewpoint the SEZ would nearly fill the horizontal field of view. The SEZ would be visible as a wide band across the valley floor, and the proposed

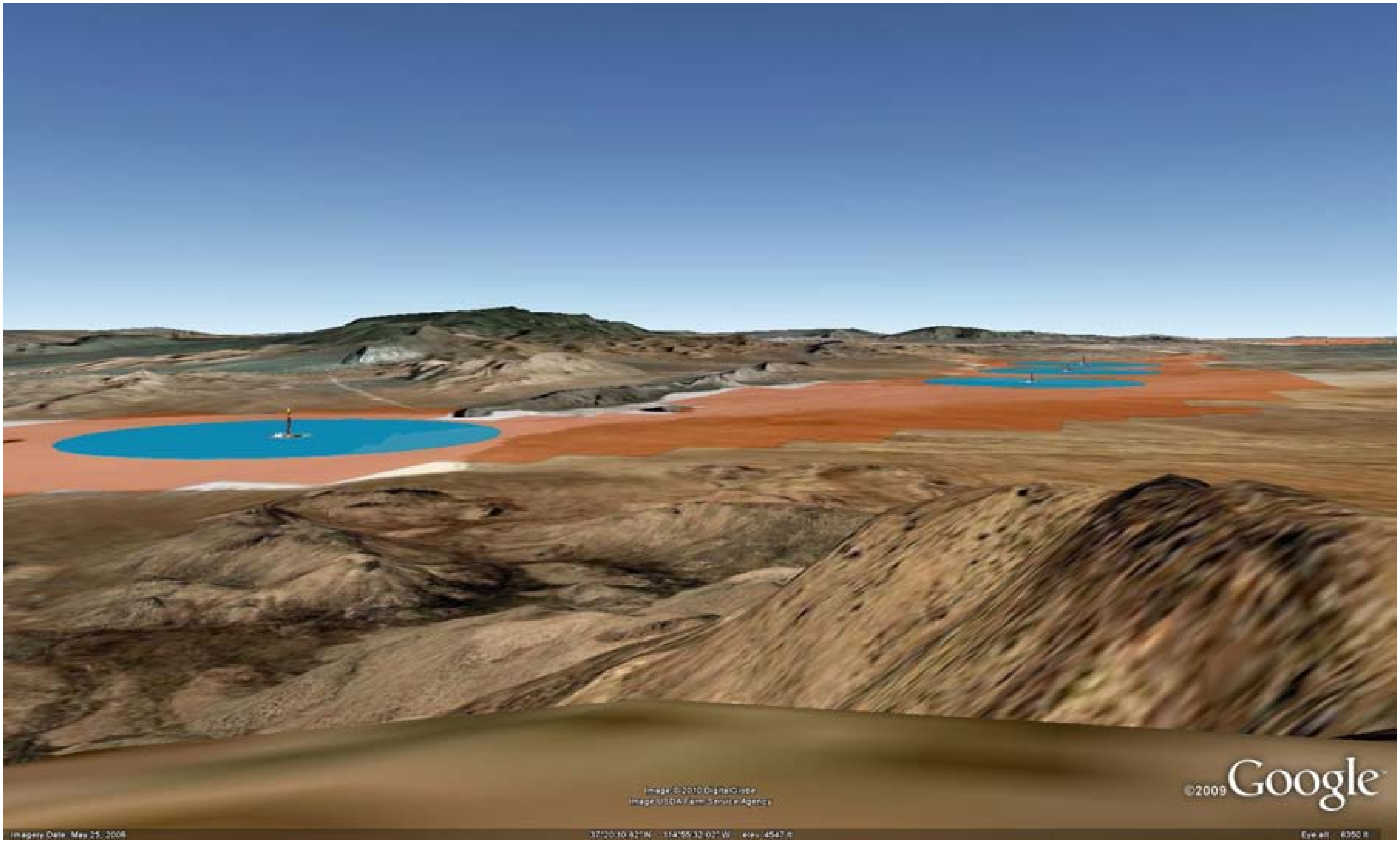

FIGURE 11.2.14.2-4 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Northwestern Portion of the Delamar Mountains WA

Dry Lake North SEZ would be visible in the far distance north of the Delamar Lake SEZ. The tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes and making the strong regular geometry of the collector/reflector arrays more apparent, and thus introducing form, texture, and color contrasts to an otherwise natural-appearing setting. Under the 80% development scenario analyzed in the PEIS, a variety of solar facilities within the SEZ would likely be visible, and the contrasting project layouts and associated infrastructure could appear cluttered and lacking in visual unity.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

When operating, the receivers of power towers within the SEZ would be visible as very bright nonpoint light sources (i.e., having cylindrical or rectangular surface area visible) against the backdrop of the valley floor. The tower structures would likely be visible. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that would likely be visible from this location and could be conspicuous, given the dark night skies typical of the area. Other lighting associated with solar facilities could be visible as well.

Visual contrasts associated with solar facilities within the SEZ would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other visibility factors. Under the 80% development scenario analyzed in the PEIS, Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, strong visual contrasts from solar energy development within the SEZ would be expected at this viewpoint.

Figure 11.2.14.2-5 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the side slope of a much lower elevation ridge in the northeastern portion of the WA (elevation approximately 5,100 ft [1,560 m]), approximately 3.1 mi (5.0 km) from the southeastern boundary of the SEZ. The visualization suggests that from this viewing angle and short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The relatively low elevation (approximately 500 ft [150 m] above the nearest point in the SEZ) would reduce the vertical angle of view, and the SEZ would be

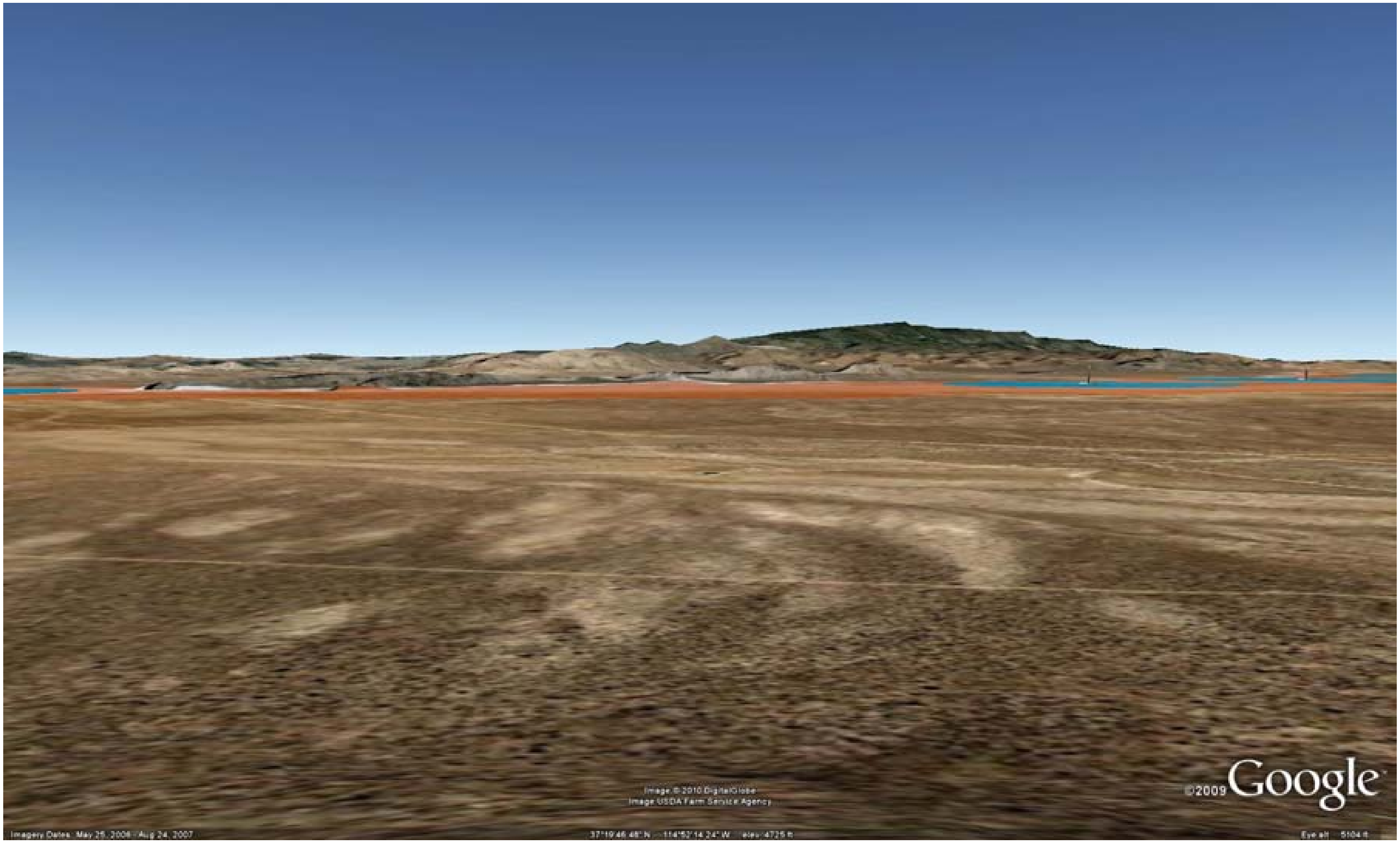

FIGURE 11.2.14.2-5 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Far Northeastern Portion of the Delamar Mountains WA

visible as a narrow band across the valley floor. The tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes slightly and making the strong regular geometry of the collector/reflector arrays somewhat more apparent.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible, and their structural details could be evident. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays, with color and texture contrasts dependent on the materials and surface treatments utilized in the facilities.

The receivers of operating power towers within the SEZ would be visible as very bright nonpoint light sources against the backdrop of the mountains across the Delamar Valley during the day and, if more than 200 ft (61 m) tall, would have navigation warning lights at night that could be conspicuous from this location. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected.

Overall, under the 80% development scenario, strong visual contrasts would be expected from solar energy facilities within the SEZ, as viewed from portions of the Delamar Mountains WA within the SEZ 25 mi (40 km) viewshed. The highest contrast levels would be expected at the highest elevations in the northwest portions of the WA, with slightly lower levels of contrast expected for lower elevations within the WA, where the lower viewing angle would decrease the apparent size and visual contrast of solar facilities within the SEZ.

- *Mount Irish*—Mount Irish Wilderness is a 22,283-acre (90.176-km^2) congressionally designated WA located 22 mi (35 km) northwest of the SEZ at the point of closest approach. Opportunities for recreation in this area include hiking, backpacking, horseback riding, photography, nature study, and hunting.

  As shown in Figure 11.2.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the far eastern portion of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total approximately 198 acres (0.801 km^2) in the 650-ft (198.1-m) viewshed, or 0.7% of the total WA acreage. None of the WA is within the 24.6-ft (7.5-m) viewshed. The area of the WA with potential visibility of solar facilities in the SEZ extends to beyond 25 mi (40 km) from the northwestern corner of the SEZ.

  The South Pahroc Range entirely screens the ground surface of the SEZ from view from the WA. Only the upper portions of sufficiently tall power towers within the SEZ would be visible from a very small area within the WA. From within this area, if power tower receivers were located at specific locations within the SEZ, the light atop the receiver towers might be visible as distant points of light just over the tops of the South Pahroc Range east–southeast of the WA. At night hazard warning lights on taller power towers might be visible. Under the 80% development scenario analyzed in the PEIS, expected visual contrasts associated with solar energy development within the SEZ would be minimal.

- *South Pahroc Range*—South Pahroc Range Wilderness is a 25,674-acre (103.90-km^2) congressionally designated wilderness area (WA) located 3.6 mi (5.8 km) west of the SEZ at the point of closest approach. Hiking, backpacking, horseback riding, camping, and rock climbing are popular activities in the WA, with scenic overlooks and wide vistas available; the WA provides vantage points for views of vast desert valleys, interrupted by chains of distant mountains.

  Within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the eastern edge of the mountain range within the WA (approximately 6,448 acres [26.09 km^2] in the 650-ft [198.1-m] viewshed, or 25% of the total WA acreage, and 5,007 acres [20.26 km^2] in the 24.6-ft [7.5-m] viewshed, or 20% of the total WA acreage). The visible area of the WA extends from the point of closest approach to approximately 6.5 mi (10.5 km) from the western boundary of the SEZ.

  Figure 11.2.14.2-6 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from Hyko Benchmark (elevation approximately 7,950 ft [2,420 m]) in the south central portion of the South Pahroc Range, approximately 6.5 mi (10.4 km) from the western boundary of the SEZ. The visualization suggests that almost the entire SEZ would be visible, and it would stretch across the horizontal field of view. Because of the relatively short distance to the SEZ and the large elevation difference, the vertical angle of view is relatively high. The SEZ would be visible as a broad band across the valley floor. The tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes and making the strong regular geometry of the collector/reflector arrays more apparent, and thus introducing form, texture, and color contrasts to an otherwise natural-appearing setting. Under the 80% development scenario analyzed in this PEIS, a variety of solar facilities within the SEZ would likely be visible, and the contrasting project layouts and associated infrastructure could appear cluttered and lacking in visual unity. Taller solar facility components, such as transmission towers, cooling towers, STG components, and plumes (if present) would likely be visible, and if so, could contrast substantially with the strongly horizontal and regular geometry of the collector/reflector arrays. The receivers of operating power towers within the SEZ would be visible as very bright nonpoint or point light sources against the backdrop of the valley floor during the day and, if more than 200 ft

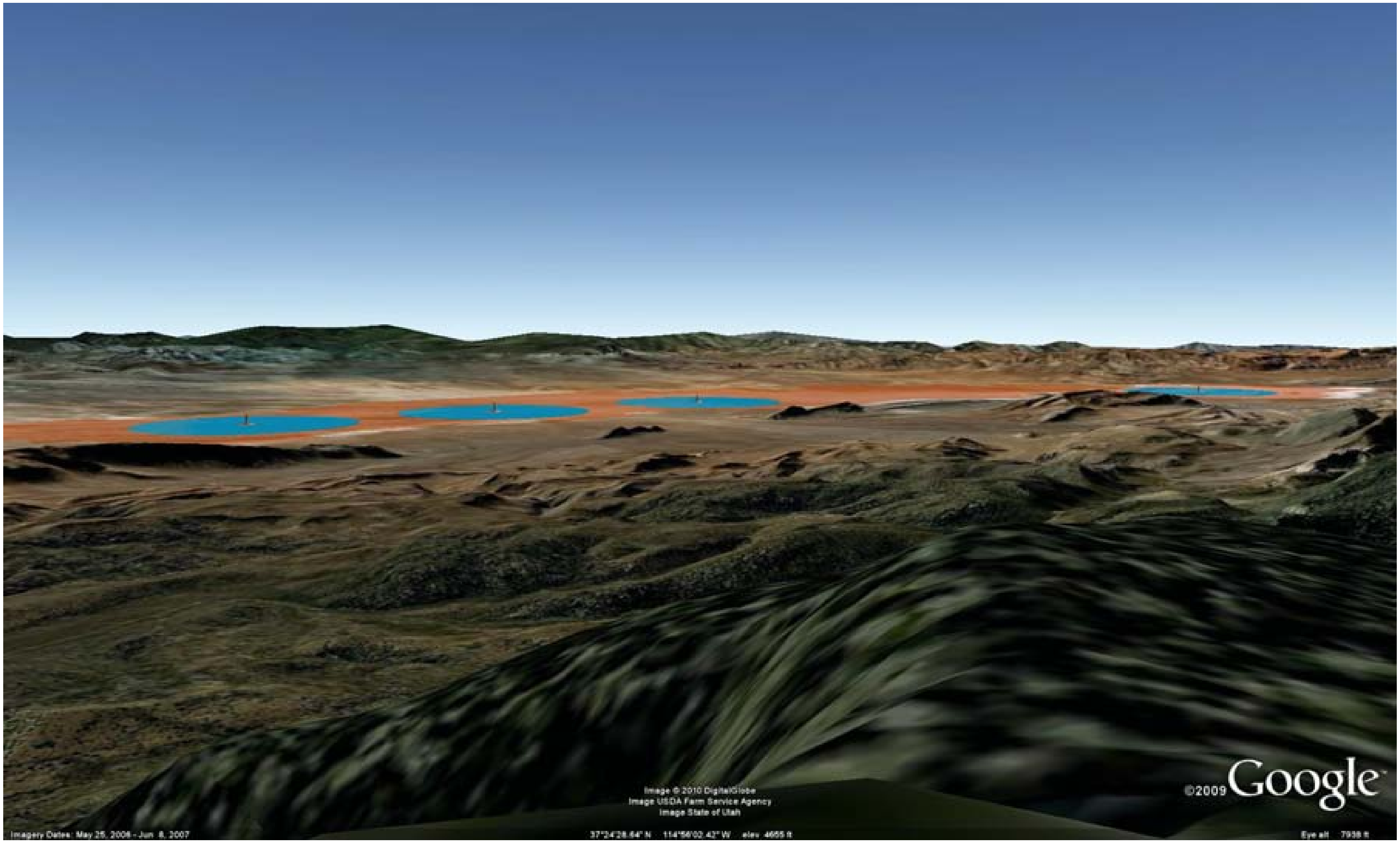

FIGURE 11.2.14.2-6 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Hyko Benchmark within the South Pahroc Range WA

(61 m) tall, would have navigation warning lights at night that could be conspicuous from this location. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected.

Figure 11.2.14.2-7 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed ridge in the far southern end of the WA (elevation approximately 6,160 ft [1,880 m]), approximately 4.5 mi (7.2 km) from the western boundary of the SEZ. This distance is within the BLM VRM program's foreground–middleground viewing distance. The visualization suggests that from this viewpoint the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The SEZ would be visible as a band across the valley floor. The tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes and making the strong regular geometry of the collector/reflector arrays more apparent, and thus introducing form, texture, and color contrasts to an otherwise natural-appearing setting. Under the 80% development scenario analyzed in this PEIS, a variety of solar facilities within the SEZ would likely be visible, and the contrasting project layouts and associated infrastructure could appear cluttered and lacking in visual unity. Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and could contrast substantially with the strongly horizontal and regular geometry of the collector/reflector arrays. The receivers of operating power towers within the SEZ would be visible as very bright nonpoint light sources against the backdrop of the valley floor, and if sufficiently tall, would have hazard warning lighting that could be conspicuous from this viewpoint, given the dark night skies typical in the vicinity of the SEZ. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected.

At lower elevations within the WA, intervening mountains screen much of the SEZ from view. Viewing angles are lower, further reducing the apparent size of solar facilities within the SEZ. Weak visual contrast would be expected for many of these locations.

In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location in the WA, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, where there were unobstructed views, contrasts would be expected to be weak to strong, as viewed from portions of the South Pahroc WA within the SEZ viewshed. The highest contrast levels would be expected at the highest elevations in the central and southern portions of the WA, with lower levels of contrast expected for lower elevations within the WA, where the lower

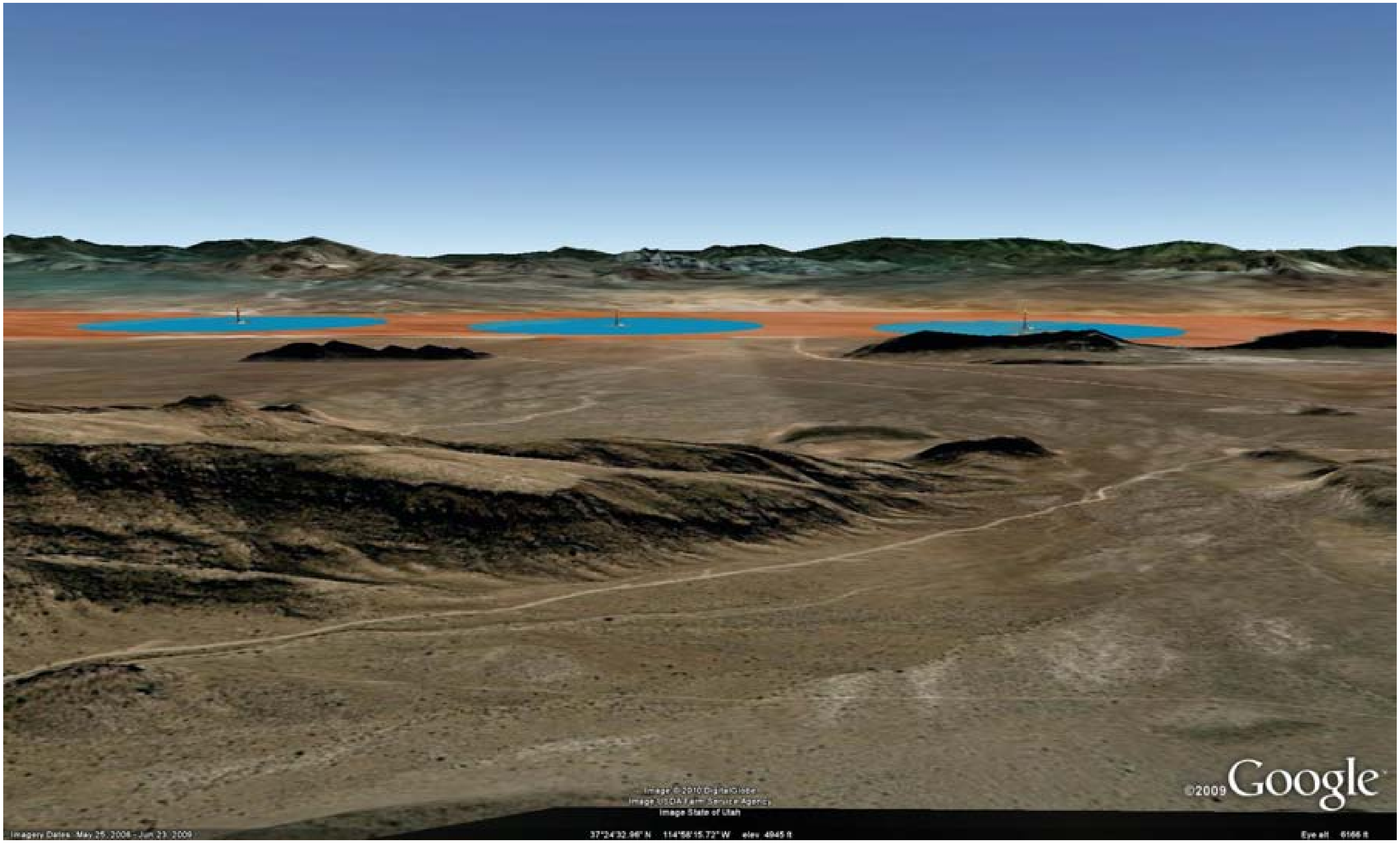

FIGURE 11.2.14.2-7 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Southern Portion of the South Pahroc Range WA

viewing angle and proximity of intervening mountains would decrease visibility of the SEZ.

National Wildlife Range

- *Desert*—The 1,626,903-acre (6,583.843-km^2) Desert National Wildlife Range is located 8.7 mi (14.0 km) west of the SEZ at the point of closest approach. The Wildlife Range contains six major mountain ranges, the highest rising from 2,500-ft (762-m) valleys to nearly 10,000 ft (3,048 m). Camping, hiking, backpacking, horseback riding, hunting, and bird watching are all popular activities enjoyed by refuge visitors.

  Approximately 19,411 acres (78.554 km^2), or 1% of the Wildlife Range, are within the 650-ft (198.1-m) viewshed of the SEZ, and 2,836 acres (11.477 km^2), 0.2% of the Wildlife Range, are within the 24.6-ft (7.5-m) viewshed. The portions of the Wildlife Range that would potentially have views of solar facilities within the SEZ extend from approximately 8.7 mi (14.0 km) from the SEZ to scattered locations within 24 mi (39 km) of the SEZ.

  Visibility of the SEZ ground surface from the Wildlife Range would be limited to the highest elevations within the range. From these viewpoints, the closest of which is approximately 17 mi (27 km) from the SEZ, the South Pahroc Range partially screens views of the SEZ and, in addition, the horizontal angle of view is along the narrow southwest-northeast axis of the SEZ, so the SEZ occupies a very small portion of the horizontal field of view. In addition, because of the long distance to the SEZ, the angle of view is very low, further decreasing visibility of the SEZ and any solar facilities within it. Weak visual contrasts from solar development within the SEZ would be expected for these viewpoints.

  The upper portions of sufficiently tall power tower receivers could be visible from a much greater area of the Wildlife Range, and from lower elevations, but views of the SEZ are partially screened by the South Pahroc Range, so views of power tower receivers would be limited to gaps in the intervening mountain range. Because the viewing direction is along the narrow southwest–northeast axis of the southern portion of the SEZ, the likelihood of seeing a power tower receiver within a gap is very low, and therefore expected visual contrasts would be minimal.

National Wildlife Refuge

- *Pahranagat*—The 5,540-acre (22.42-km^2) Pahranagat NWR is located 8.2 mi (13.2 km) southwest of the SEZ at the closest point of approach. Pahranagat

NWR was established to provide habitat for migratory birds, especially waterfowl.

Approximately 10 acres (0.04 km^2), or 0.2% of the NWR, are within the 650-ft (198.1-m) viewshed of the SEZ. None of the NWR is visible within the 24.6-ft (7.5-m) viewshed. Visibility is limited to two very small areas on the slopes of low hills on the far western edge of the NWR. The areas of visibility do not include trails or other user facilities. From these areas, the tops of sufficiently tall power towers might just be visible over the mountains of the South Pahroc Range, but the area of the SEZ within view is so small as to make this very unlikely. Visual impacts on the NWR would not be expected.

SRMAs

- *Chief Mountain*—The 111,151 acre (449.812 km^2) Chief Mountain SRMA is located approximately 10 mi (16 km) northeast of the SEZ, and portions of the SRMA are within the SEZ 650-ft (198.1-m) viewshed. Approximately 1,771 acres (7.167 km^2), or 2% of the SRMA, are within the 650-ft (198.1-m) viewshed of the SEZ, and 73 acres (0.30 km^2), 0.1% of the SRMA, are within the 24.6-ft (7.5-m) viewshed. The portions of the SRMA within the viewshed extend from approximately 12 mi (19.0 km) from the SEZ to scattered locations within 24 mi (39 km) of the SEZ.

  Areas within the SRMA with potential visibility of solar facilities within the SEZ are limited to small, scattered locations on the western slopes and peaks of the Burnt Springs Range. Within all but 73 acres of these areas, potential visibility of solar facilities within the SEZ would be limited to the upper portions of power towers located in a very small portion of the northern end of the SEZ, as nearly the entire SEZ is screened from view by mountains in the Burnt Springs Range south of the SRMA. Expected visual contrast levels observed from within the SRMA are likely to be minimal, based primarily on the extensive screening of the SEZ, but also the distance to the SEZ and the very low angle of view between viewpoints in the SRMA and the SEZ.

  North Delamar—The 202,839 acre (820.860 km^2) North Delamar SRMA is located approximately 3.3 mi (5.3 km) east of the SEZ at the point of closest approach, and much of the western portion of the SRMA is within the SEZ viewshed. The primary recreational values for the North Delamar SRMA include non-motorized recreation, equestrianism, hiking, and mountain biking (BLM 2007d).

  As shown in Figure 11.2.14.2-2, approximately 37,647 acres (152.35 km^2), or 19% of the SRMA, are within the 650-ft (198.1-m) viewshed of the SEZ, and 32,966 acres (133.41 km^2), 16% of the SRMA, are within the 24.6-ft (7.5-m) viewshed. The portions of the SRMA within the viewshed extend from the point of closest approach to within 11 mi (18 km) of the SEZ.

Figure 11.2.14.2-8 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from a road in the SRMA (elevation approximately 5,350 ft [1,630 m]) on a low ridge on the western slopes of the Delamar Mountains, approximately 4.8 mi (7.7 km) from the eastern boundary of the SEZ. The view is perpendicular to the SEZ's relatively long north-south axis. The visualization suggests that from this viewing angle and short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The relatively low elevation (approximately 740 ft [230 m] above the SEZ) would reduce the vertical angle of view, and the SEZ would be visible as a narrow band across the valley floor. The tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes slightly and making the strong regular geometry of the collector/reflector arrays somewhat more apparent.

Taller solar facility components, such as transmission towers, cooling towers, STG components, and plumes (if present) would likely be visible, and if so, could contrast substantially with the strongly horizontal and regular geometry of the collector/reflector arrays. The receivers of operating power towers within the SEZ would be visible as very bright nonpoint light sources against the backdrop of the valley floor or the mountains west of the SEZ during the day and, if more than 200 ft (61 m) tall, would have navigation warning lights at night that could be conspicuous from this location.. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected at this location.

Figure 11.2.14.2-9 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from a peak farther north and east than the viewpoint shown in Figure 11.2.14.2-8. The viewpoint is about 2,600 ft,(m) higher in elevation than the SEZ, and about 7.5 mi (12.1 km) east of the northernmost point in the SEZ. The view is oblique to the SEZ's relatively long north-south axis. The visualization demonstrates that moving further east into the SRMA, while increasing distance to the SEZ also increases the vertical angle of view as the viewpoints are closer to the peaks of the Delamar Mountains. From this viewpoint, the SEZ could be encompassed in one view, but would still cross much of the visible horizon, and the vertical angle of view is sufficiently high that the tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes slightly and making the strong regular geometry of the collector/reflector arrays somewhat more apparent.

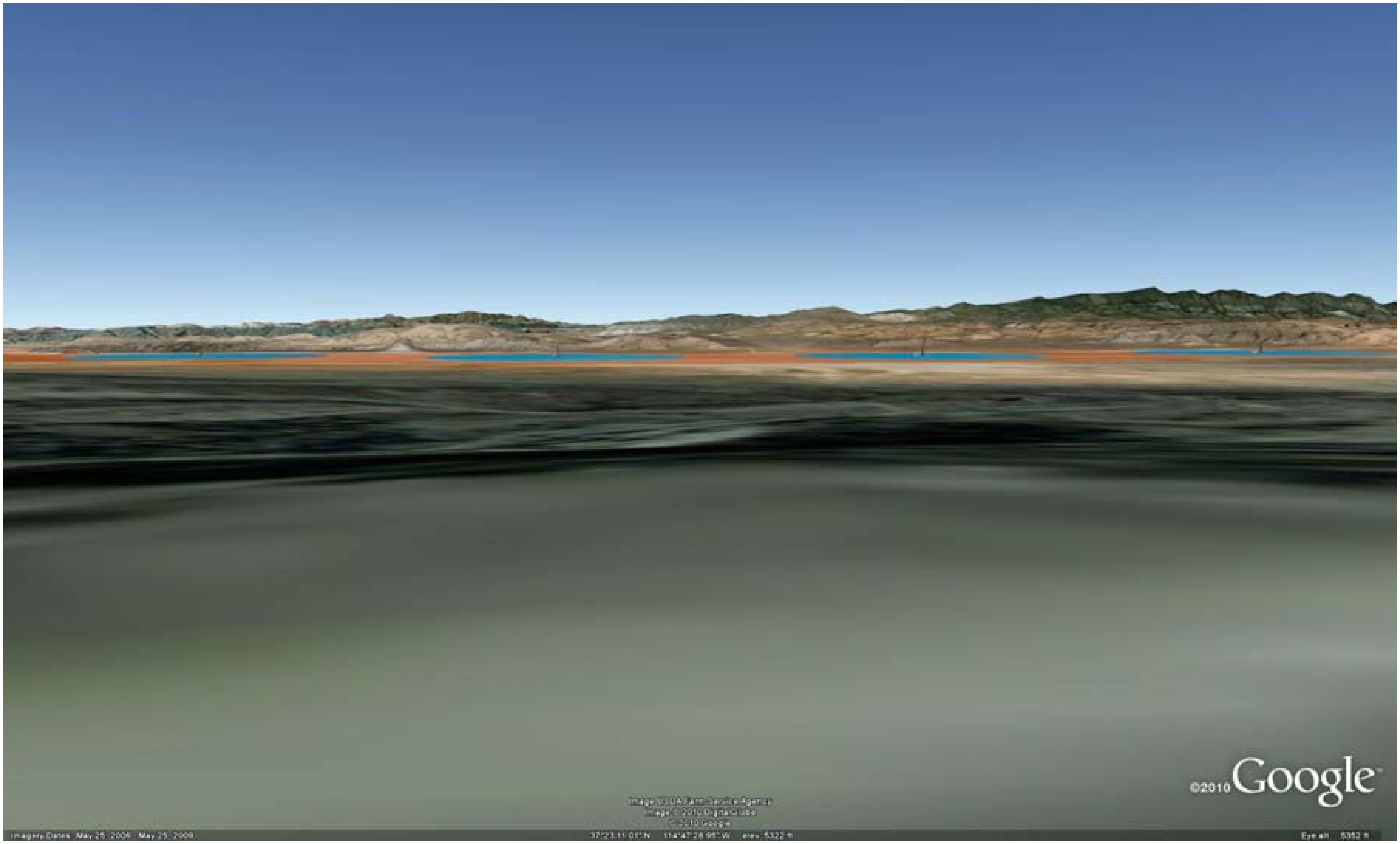

FIGURE 11.2.14.2-8 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Road within the North Delamar SRMA

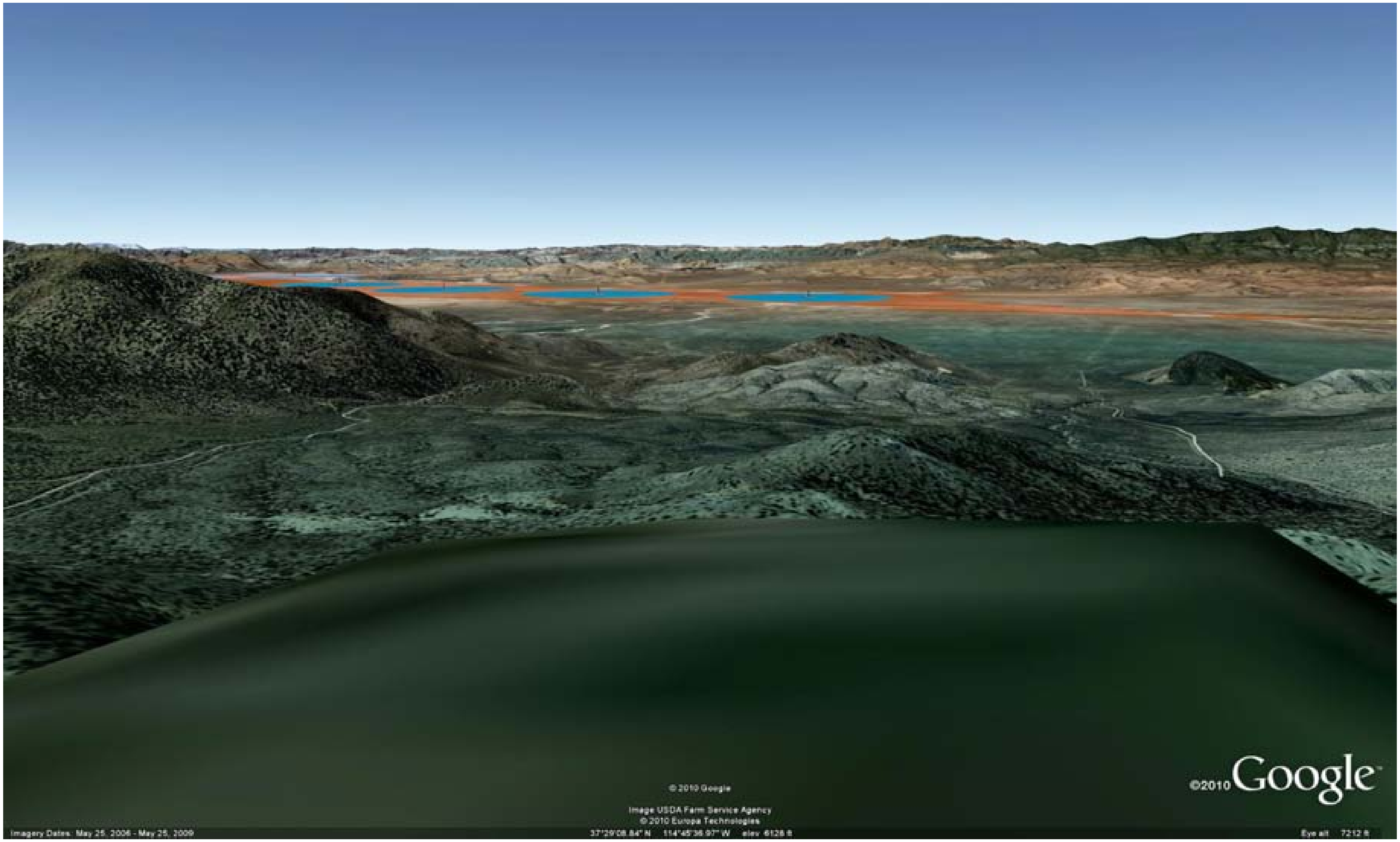

FIGURE 11.2.14.2-9 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Northern Portion of the North Delamar SRMA

Taller solar facility components, such as transmission towers, cooling towers, STG components, and plumes (if present) would likely be visible, and if so, could contrast with the strongly horizontal and regular geometry of the collector/reflector arrays. The receivers of operating power towers within the SEZ would be visible as very bright light sources against the backdrop of the valley floor during the day and, if sufficiently tall, would have navigation warning lights at night that could be conspicuous from this location. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected at this location.

In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location within the SRMA, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, where there were unobstructed views, contrasts would be expected to be strong for many viewpoints within the western portion of the SEZ, with contrasts not diminishing substantially until the viewpoints were far enough east in the SRMA that intervening mountains screened large portions of the SEZ from view.

- *Pahranagat*—The 298,567-acre (1,208.26-km^2) Pahranagat SRMA is located approximately 2.7 mi (4.4 km) west of the SEZ at the point of closest approach, and some areas within the eastern and southeastern portion of the SRMA are within the SEZ viewshed. The primary recreational values for Pahrangat SRMA include heritage tourism and motorized recreation (BLM 2007d).

  As shown in Figure 11.2.14.2-2, approximately 52,619 acres (212.94 km^2), or 18% of the SRMA, are within the 650-ft (198.1-m) viewshed of the SEZ, and 11,970 acres (48.441 km^2), 4% of the SRMA, are within the 24.6-ft (7.5-m) viewshed. The portions of the SRMA within the viewshed extend from the point of closest approach to within 24 mi (39 km) of the SEZ. Within the SRMA, visibility of solar facilities within the SEZ would be primarily from the eastern slopes of the South Pahroc Range, but with some visibility from the western slopes of the southern end of the South Pahroc Range, as well as the highest elevations in the Hiko, East Pahranagat and Pahranagat Ranges further to the west.

Figures 11.2.14.2-6 and 11.2.14.2-7 (see above under South Pahroc Range WA impact discussion) are Google Earth visualizations of the SEZ as seen from two viewpoints in the eastern portion of the SRMA. As discussed above, because of the short distance to the SEZ and the relatively high vertical angles of view from these elevated viewpoints, strong visual contrasts would be expected for portions of the SRMA with open views close to the SEZ. Lower contrast levels would be expected for viewpoints farther north in the SRMA, because the views would be oblique to the long north-south axis of the SEZ; and substantially lower contrast levels would be expected for viewpoints much farther west in the SRMA in the Hiko and especially the East Pahranagat and Pahranagat Ranges.

Scenic Highways

- *U.S. 93*—U.S. 93 is a nationally designated scenic byway that runs within 8.4 mi (13.5 km) north of the SEZ. It is 149 mi (240 km) long, with some of the highlights located between Caliente and Crystal Springs, Nevada. Approximately 8.8 mi (14.2 km) are within the 650-ft (198.1-m) viewshed of the SEZ, and 2.6 mi (4.2 km) of the byway are within the 24.6-ft (7.5-m) viewshed.

  For travelers approaching the SEZ from Caliente, north of the SEZ, the tops of sufficiently tall power tower receivers located in the northern portion of the SEZ would come into view about 20 mi (32 km) west of Caliente, and about 8.8 mi (14.2 km) from the SEZ. After the first appearance of power tower receiver lights, lower height facilities might become visible about 1 minute later and could remain in view for several minutes as travelers moved westward. Clear views would be interrupted periodically by low hills and rises between the highway and the SEZ, and eventually only the tops of power towers would be visible; they would disappear when westbound travelers reached Pahroc Summit Pass, 11 mi (17 km) northwest of nearest point in the SEZ, and approximately 29 mi (47 km) west of Caliente.

  Eastbound travelers on U.S. 93 would have a similar visual experience to westbound travelers, but might first see power tower receivers within the SEZ as they passed just east of Pahroc Summit Pass, about 14 mi (23 km) east of the intersection of U.S. 93 with State Route 375 south of Hiko. Similarly to westbound travelers, eastbound travelers might see lower height solar facilities within the SEZ briefly, then power tower receiver lights only, before leaving the SEZ viewshed about 13 mi (21 km) west of Caliente, and about 9 mi (14 km) north of the SEZ.

  Within the SEZ viewshed, U.S. 93 is slightly elevated with respect to the northern portion of the SEZ, and the angle of view between the highway and the SEZ is very low. Because U.S. 93 travelers would be looking down the relatively narrow north–south axis of the SEZ, the SEZ would occupy a very small portion of the horizontal field of view, with weak visual contrasts expected for travelers on U.S. 93.

- *Silver State Trail*—The Silver State Trail is a congressionally and BLM-designated scenic byway that passes within about 10 mi (16 km) of the SEZ. About 13 mi (21 km) of the byway are within the SEZ 650-ft (198.1-m) viewshed, and about 4 mi are within the 24.6 (7.5 m) viewshed.

The elevation of the Silver State Trail within the SEZ viewshed is generally between 400-600 ft (120-180 m) higher than the SEZ, and at 10 mi (16 km) or greater distance, the vertical angle of view from the trail to the SEZ is very low. Furthermore, the view from the trail to the SEZ is parallel to the SEZ's long and very narrow north-south axis, so that the SEZ would occupy a very small portion of the horizontal field of view as seen from the trail.

Because of the relatively long distance to the SEZ, the vertical angle of view would be low, and solar facilities within the SEZ would be seen edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the strong line of the horizon, all of which would tend to reduce associated visual contrasts. Taller solar facility components, such as transmission towers, could be visible, but some ancillary facilities might not be noticed by casual observers.

If power towers were located in the visible portions of the SEZ, when operating, they would likely appear as points of light under the southern horizon, against a backdrop of the valley floor. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location in the WA, and could be prominent in the dark night skies of this remote area.

Because of the small apparent size of the SEZ and the low angle of view from the trail to the SEZ, under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected from solar development within the SEZ, as seen from the Silver State Trail.

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. There is currently a 69-kV transmission line within the proposed SEZ, so construction and operation of a transmission line outside the proposed SEZ would not be required; however, transmission lines to connect facilities to the existing line would be required. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, based on the assumption that the existing 69-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. Note that, depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed, site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

Other Impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

11.2.14.2.3 Summary of Visual Resource Impacts for the Proposed Delamar Valley SEZ

Under the 80% development scenario analyzed in the PEIS, the SEZ would contain multiple solar facilities utilizing differing solar technologies, as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal, relatively uncluttered, and generally natural appearing landscape of the flat valley in which the SEZ is located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development due to major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within the SEZ.

The SEZ is in an area of low scenic quality, with some cultural disturbances already present. Local residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads.

Utility-scale solar energy development within the proposed Delamar Valley SEZ is likely to result in strong visual contrasts for views from some locations within the Delamar Mountains and South Pahrac Range WAs, and the Pahranagat and North Delamar SRMAs. Minimal to weak visual contrasts would be expected for other highly sensitive visual resource areas within 25 mi (40 km) of the SEZ.

11.2.14.3 SEZ-Specific Design Features and Design Features Effectiveness

The presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be substantially mitigated. Implementation of programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

While the applicability and appropriateness of some design features would depend on site- and project-specific information that would be available only after a specific solar energy project had been proposed, some SEZ-specific design features can be identified for the proposed Delamar Valley SEZ at this time, as follows:

- Within the SEZ, in areas visible from and within 3 mi (4.8 km) of the boundary of the Delamar Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives (see Table 12.2.14.3-1), as experienced from KOPs (to be determined by the BLM) within the WA, and in areas visible from between 3 and 5 mi (4.8 and 8 km), visual impacts should be consistent with VRM Class III management objectives. The VRM Class II consistency mitigation would affect approximately 2,080 acres (8.417 km^2) within the western portion of the SEZ. The VRM Class III consistency mitigation would affect approximately 5,485 additional acres (22.2 km^2).

- Within the SEZ, in areas visible from between 3 and 5 mi (4.8 and 8 km) of the boundary of the South Pahroc Range WA, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives, as experienced from KOPs (to be determined by the BLM) within the WA. The VRM Class III consistency mitigation would affect approximately 4,921 acres (19.9 km^2).

Because of the overlap in areas affected by the design features specified above, the total acreage affected by the design features is approximately 10,821 acres (43.79 km^2), or 65% of the total SEZ acreage. The acreage affected by VRM Class II consistency mitigation is 2,080 acres (8.417 km^2), or 13% of the total SEZ acreage. The acreage affected by VRM Class III consistency mitigation is 8,741 acres (35.37 km^2), or 53% of the total SEZ acreage. The areas subject to SEZ-specific design features requiring consistency with VRM Class II and Class III management objectives are shown in Figure 11.2.14.3-1.

TABLE 11.2.14.3-1 VRM Class Objectives

Class I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II	The objective to this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should both dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM (1986b).

Application of the SEZ-specific design features above would substantially reduce visual impacts associated with solar energy development within the SEZ, as well as on sensitive visual resource areas outside the SEZ but within the SEZ viewshed.

Application of the distance-based design feature to restrict allowable visual impacts associated with solar energy project operations within 5 mi (8 km) of the Delamar Mountains WA would substantially reduce potential visual impacts on the WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest. This design feature would also reduce impacts on the South Pahroc Range WA, the Pahranagat SRMA, and the North Delamar SRMA.

Application of the distance-based design feature to restrict allowable visual impacts associated with solar energy project operations between 3 and 5 mi (4.8 and 8 km) of the South Pahroc Range WA would substantially reduce potential visual impacts on the WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest. This design feature would also reduce impacts on the South Delamar Mountains WA, the Pahranagat SRMA, and the North Delamar SRMA.

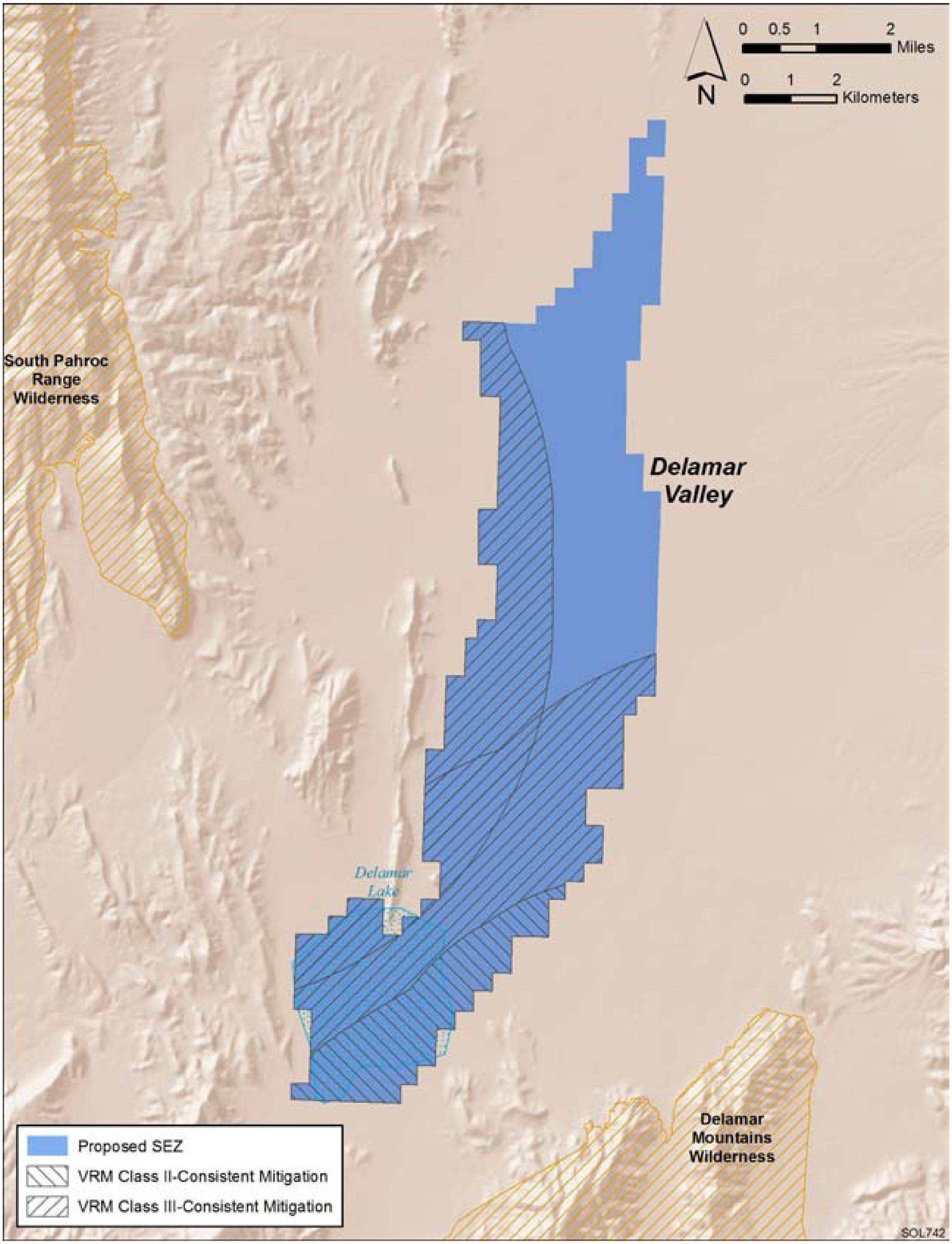

FIGURE 11.2.14.3-1 Areas within the Proposed Delamar Valley SEZ Affected by SEZ-Specific Distance-Based Visual Impact Design Features

11.2.15 Acoustic Environment

11.2.15.1 Affected Environment

The proposed Delamar Valley SEZ is located in southeastern Nevada, in the south central portion of Lincoln County. Neither the State of Nevada nor Lincoln County has established quantitative noise-limit regulations.

U.S. 93 runs east–west as close as about 8 mi (13 km) to the north of the proposed Delamar Valley SEZ and runs north–south as close as about 8 mi (13 km) to the west. State Route 317 runs north–south as close as 16 mi (26 km) to the east of the SEZ. There are numerous dirt roads that cross the SEZ or that access livestock facilities in the area. The nearest railroad runs about 16 mi (26 km) to the east of the SEZ. Nearby airports include Alamo Landing Field in Alamo and Lincoln County Airport in Panaca, which are located about 12 mi (19 km) west and 32 mi (51 km) northeast of the SEZ, respectively. No industrial activities other than grazing are located around the SEZ. Large-scale irrigated agricultural lands are situated in small agricultural towns along the Pahranagat Valley, which runs as close as about 8 mi (13 km) to the west of the SEZ, and at nearby towns such as Caliente and Panaca, which are more than 19 mi (31 km) northeast of the SEZ boundary. No sensitive receptors (e.g., residences, hospitals, schools, or nursing homes) exist around the proposed Delamar Valley SEZ. The nearest human receptors are located along U.S. 93, about 9 mi (14 km) west-southwest of the SEZ. Nearby population centers with schools include Alamo, about 11 mi (18 km) west of the SEZ; Caliente, about 22 mi (35 km) northeast of the SEZ; and Panaca, about 33 mi (53 km) northeast of the SEZ. Accordingly, noise sources around the SEZ include road traffic, aircraft flyover, and cattle grazing. Other noise sources are associated with current land use for various recreational activities around the SEZ, including OHV use, racing, setting off pyrotechnics, and model rocket launching. The proposed Delamar Valley SEZ is isolated and undeveloped; its overall character is considered wilderness to rural. To date, no environmental noise survey has been conducted around the SEZ. On the basis of the population density, the day-night average noise level (L_{dn} or DNL) is estimated to be 18 dBA for Lincoln County, well below the level typical of a rural area in the range of 33 to 47 dBA L_{dn} (Eldred 1982; Miller 2002).[11]

11.2.15.2 Impacts

Potential noise impacts associated with solar projects in the Delamar Valley SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment on the nearest residences (about 9 mi [14 km] to the west-southwest of the SEZ) would be anticipated to be minimal due to considerable separation distances. During the operations phase, potential noise impacts on the nearest residences would be anticipated to be minimal as well. However, if the Delamar Valley SEZ

[11] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during the daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

were fully developed, potential noise impacts on residences along the roads would likely be due to commuter, visitor, support, and delivery vehicular traffic to and from the SEZ. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed Delamar Valley SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional SEZ-specific design features (see Section 11.2.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2

11.2.15.2.1 Construction

The proposed Delamar Valley SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area, where key components (e.g., steam turbine/ generator) needed to generate electricity are located; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background level. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment and by temperature lapse conditions typical of daytime hours; thus noise attenuation to a 40-dBA level would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the southern SEZ boundary, estimated noise levels at the nearest residences would be about 17 dBA, which is well below a typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn}[12] at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas.

It is assumed that a maximum of two projects would be developed at any one time for SEZs greater than 10,000 acres (40.47 km^2) but less than 30,000 acres (121.4 km^2), such as the Delamar Valley SEZ. If two projects were to be built in the southern portion of the SEZ near the

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[12] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in day-night average noise level (L_{dn}) of 40 dBA.

nearest residences, noise levels would be about 3 dBA higher than the above-mentioned values. These levels would be still well below the typical daytime mean rural background level, and thus their contribution to the existing L_{dn} would be minimal.

In addition, noise levels are estimated at the specially designated areas within 5-mi (8-km) range from the Delamar Valley SEZ, which is the farthest distance that noise, except extremely loud noise, can be discernable. There are two specially designated areas within the range where noise might be an issue: Delamar Mountains WA, which is located as close as about 2 mi (3 km) south of the SEZ; and South Pahroc Range WA, which is located about 4 mi (6 km) northwest of the SEZ. For construction activities occurring near the SEZ boundary close to the specially designated areas, noise levels are estimated to be about 35 and 28 dBA at the boundaries of the Delamar Mountains WA and South Pahroc Range WA, respectively, which are lower than the typical daytime mean rural background level of 40 dBA. As discussed in Section 5.10.2, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, construction noise from the SEZ is not likely to adversely affect nearby specially designated areas.

Depending on the soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearest residences would be anticipated to be negligible, considering the distance to the nearest residences (about 9 mi [14 km] from the SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction within the proposed Delamar Valley SEZ would cause negligible unavoidable but localized short-term noise impacts on neighboring communities, even when construction activities would occur near the southern SEZ boundary, close to the nearest residences.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 69-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a negligible component of construction impacts and would be temporary in nature.

11.2.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area, commuter/visitor/support/delivery traffic within and around the solar facility, and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and fire-water pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southern SEZ boundary, the predicted noise level would be about 23 dBA at the nearest residences, located about 9 mi (14 km) from the SEZ boundary, which is much lower than typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[13]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. As for construction, if two parabolic trough and/or power tower facilities were operating around the nearest residences, combined noise levels would be about 3 dBA higher than the above-mentioned values. These levels are still well below the typical daytime mean rural background level of 40 dBA, and their contribution to existing L_{dn} level would be minimal. However, day-night average noise levels higher than those estimated above using simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Delamar Valley SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong

13 Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[14] within 1 or 2 mi (1.6 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are the lowest. To estimate the day-night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residence (about 9 mi [14 km] from the SEZ boundary) would be 33 dBA, which is slightly higher than the typical nighttime mean rural background level of 30 dBA. However, noise level would be much lower than this value if considering an air absorption algorithm among other attenuation mechanisms. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 41 dBA L_{dn} at the nearest residences, even if TES were used at a solar facility. In consequence, operating parabolic trough or power tower facilities using TES and located near the southern SEZ boundary could result in minimal adverse noise impacts on the nearest residences, depending on background noise levels and meteorological conditions.

Associated with operation of solar facilities located near the southern SEZ boundary and using TES, the estimated daytime level of 37 dBA at the boundary of the Delamar Mountains WA is lower than the typical daytime mean rural background level of 40 dBA, while the estimated nighttime level of 47 dBA is much higher than the typical nighttime mean rural background level of 30 dBA. For a facility near the west-central SEZ boundary, daytime and nighttime noise levels at the Big Dune ACEC are estimated to be 31 and 41 dBA, respectively. As discussed in Section 5.10.2, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, operation noise from the SEZ is not likely to adversely affect the nearby specially designated areas.

In the permitting process, refined noise propagation modeling would be warranted along with measurement of background noise levels.

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the proposed Delamar Valley SEZ, on the basis of the assumption of dish engine facilities of up to 1,471 MW total capacity (covering 80% of the total area, or 13,242 acres [53.6 km^2]), up to 58,850 25-kW dish engines could be employed. For a large dish engine facility, about a thousand step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

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14 A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, for example, about 50 dBA at 1.0 mi (1.6 km) and 47 dBA at 2 mi (3 km) from the boundary of the squarely-shaped dish engine solar field, both of which are higher than typical daytime mean rural background level of 40 dBA. However, these levels would occur at somewhat shorter distance than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed dish engines were placed all over the Delamar Valley SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residences, about a 9-mi (14-km) distance from the SEZ boundary, would be about 34 dBA, which is below the typical daytime mean rural background level of 40 dBA. Assuming 12-hour daytime operation, the estimated 41 dBA L_{dn} at these residences is well below the EPA guideline of 55 dBA L_{dn} for residential areas. Considering other noise attenuation mechanisms, noise levels at the nearest residences would be lower than estimated values in the above and thus potential impacts on nearby residences would be anticipated to be minimal.

For dish engines placed all over the SEZ, estimated noise levels would be about 44 and 43 dBA at the boundaries of the Delamar Mountains WA and South Pahroc Range WA, respectively, which are a little higher than the typical daytime mean rural background level of 40 dBA. However, dish engine noise from the SEZ is not likely to adversely affect wildlife at the nearby specially designated areas (Manci et al. 1988).

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the proposed Delamar Valley SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be negligible.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and not be heard at the nearest residence, assuming a 9.5-mi (15-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 9 mi [14 km] to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be negligible.

For impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of 230-kV transmission line towers would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. Corona noise includes high-frequency components, considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts unless a residence was located close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The proposed Delamar Valley SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residences from corona noise along transmission lines within the SEZ would be negligible.

11.2.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and much of the same equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minimal and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus negligible.

11.2.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. Due to the considerable separation distances, activities within the proposed Delamar Valley SEZ during construction and operation would be anticipated to cause only minimal increases in noise levels at the nearest residences and specially designated areas. Accordingly, no SEZ-specific design features are required.

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11.2.16 Paleontological Resources

11.2.16.1 Affected Environment

The surface geology of the proposed Delamar Valley SEZ is composed predominantly of thick alluvial deposits (over 100 ft thick) ranging in age from Pliocene to Holocene, with playa deposits of similar age in the southern portion of the SEZ. The total acreage of the alluvial deposits within the SEZ is 7,894 acres (32 km^2) or nearly 73% of the SEZ; there are 2,992 acres (12 km^2) of playa deposits that constitute 27% of the SEZ. In the absence of a PFYC map for Nevada, a preliminary classification of PFYC Class 3b is assumed for the playa deposits. Class 3b indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.8 for a discussion of the PFYC system). A preliminary classification of PFYC Class 2 is assumed for the young Quaternary alluvial deposits, similar to that assumed for the proposed Amargosa Valley SEZ (Section 11.1.16). Class 2 indicates that the potential for the occurrence of significant fossil material is low.

11.2.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in 73% of the proposed Delamar Valley SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above and are classified as PFYC Class 2, further assessment of paleontological resources in most of the SEZ is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. The potential for impacts on significant paleontological resources in the remaining 27% of the SEZ is unknown. A more detailed investigation of the playa deposits is needed prior to project approval. A paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 (BLM 2007e) and IM2009-011 (BLM 2008c). Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found to be present within the Delamar Valley SEZ. Impacts will be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as those that could occur through looting or vandalism, are unknown but unlikely because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

Approximately 8 mi (13 km) of access road is anticipated to connect to U.S. 93 to the north of the SEZ, resulting in approximately 58 acres (0.23 km^2) of disturbance in areas predominantly composed of alluvial sediments (preliminarily classified as PFYC Class 2). Direct impacts during construction are not anticipated in PFYC Class 2 areas, and new areas of high paleontological potential are not likely to be made more accessible as a result of this new access pathway. Although it is assumed elsewhere in this document that 8 mi (13 km) of access road is anticipated to connect to U.S. 93 in the southwest portion of the SEZ, this alternative route would cross a portion of the Hiko Range in an area of increased elevation and rock outcrops. The amount of disturbance is essentially the same (58 acres [0.23 km^2]), but the disturbance would occur in both alluvial sediments (PFYC Class 2) and areas of residual deposits in igneous and metamorphic rocks (volcanics are typically classified as PFYC Class 2 areas). Direct impacts during construction are not anticipated in PFYC Class 2 areas. No new transmission lines are currently anticipated for the proposed Delamar Valley SEZ. Impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing excavation of the resource, if warranted. Depending on the significance of the find, it could also result in some modification to the project footprint. Since the SEZ is located in an area partially classified as PFYC Class 3b, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources were uncovered during surface-disturbing activities.

11.2.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

If the geological deposits are determined to be as described above and are classified as PFYC Class 2, mitigation of paleontological resources within 73% of the proposed Delamar Valley SEZ and the access road corridor is not likely to be necessary. The need for and the nature of any SEZ-specific design features for the remaining 27% of the SEZ would depend on the results of future paleontological investigations.

11.2.17 Cultural Resources

11.2.17.1 Affected Environment

11.2.17.1.1 Prehistory

The proposed Delamar Valley SEZ is located in the Great Basin region. The earliest known use of the area was likely during the Paleoindian Period, sometime between 12,000 and 10,000 years B.P. Surface finds of Paleoindian fluted projectile points, the hallmark of the Clovis culture, have been found in the area, but no sites with any stratigraphic context have been excavated. The Clovis culture is characterized by the aforementioned fluted projectile point and a hunting and gathering subsistence economy that followed migrating herds of Pleistocene mega fauna. The ambiguity of Paleoindian occupation in the Great Basin has given rise to the assumption that the people of this time period may have been inclined to subsist off of the lake and marsh habitats provided by the ancient Pleistocene pluvial lakes that occupied large portions of the Great Basin; consequently, these sites are difficult to find because they have been buried by the ebb and flow of the pluvial lakes. The cultural material associated with the pluvial lake habitations is referred to as the Western Pluvial Lakes Tradition. It is likely that these people did not rely entirely on the marshland habitats, but were nomadic hunters and gatherers who relied on both wetland resources and resources located away from the pluvial lakes. The archaeological assemblage associated with this cultural tradition is characterized by stemmed projectile points, leaf-shaped bifaces, scrapers, crescents, and in some cases ground stone tools for milling plant material. Often, projectile points and tools were made from locally procured obsidian, sources of which are not far from the proposed Delamar Valley SEZ; South Pahroc is just 5 mi (8 km) to the northwest of the SEZ, and Kane Springs Wash and Meadow Valley Wash are about 15 mi (24 km) to the southeast. Exploiting these sources of obsidian and collecting raw materials for tool manufacture were a part of a larger resource exploitation system in which groups moved in seasonal rounds to take advantage of resources in different localities (Haarklau et al. 2005; Fowler and Madsen 1986; Hockett et al. 2008).

The Archaic Period in the region began with the recession of most of the pluvial lakes in the area around about 8,000 to 6,000 B.P. and extended until about 4,000 B.P. Archaic period groups likely still congregated around marsh areas but also utilized the vast system of caves that can be found in the mountains of the Great Basin. The settlement system in some areas was likely based around a central base camp, with temporary extractive camps located on the margins of the territory to exploit resources that were not in the immediate vicinity of the base camp. Some of the key Archaic Period sites in the area near the proposed Delamar Valley SEZ are Stuart Rockshelter in the lower Meadow Valley Wash area, and Etna Cave, Conway Shelter, and O'Malley Shelter in the upper portions of the Meadow Valley Wash area, just northeast of the proposed Delamar Valley SEZ. The Lake Lahontan Basin, the site of a large Pleistocene pluvial lake that was located northeast of the proposed Delamar Valley SEZ, was also a place where several early Archaic period sites have been documented; the Archaic archaeological assemblage from these sites maintains some cultural continuity with the previous period, consisting of large notched points, leaf-shaped bifaces, scrapers, drills, gravers, and manos and metates (Fowler and Madsen 1986; Neusius and Gross 2007).

The Middle Archaic Period, from 4,000 to 1,500 B.P., saw the climatic shift known as the Little Pluvial, a wetter and cooler climate that caused some of the pluvial lakes to fill back up. The cultural material of this time period is similar to the Early Archaic, with an increased concentration of milling stones and mortars and pestles, and the appearance of normally perishable items that become well preserved in the arid Great Basin climate, such as wicker baskets, split-twig figurines, duck decoys, and woven sandals (Neusius and Gross 2007).

In the vicinity of the proposed Delamar Valley SEZ, the Late Archaic Period began around 1,500 B.P. and extended until about 800 B.P. This period saw major technological shifts, evidenced by smaller projectile points that were more useful because groups began using bow-and-arrow technology instead of atlatl and dart technology, and changes in subsistence techniques, particularly in the use of horticulture. In some areas, the Formative Era began around 1,500 B.P., and the proposed Delamar Valley SEZ is situated in an area that borders both the Formative Fremont and Virgin Anasazi cultures. In areas where these Formative cultures were not present, the Late Archaic lifeways persisted. The Fremont culture was located in most of Utah, north of the Colorado, Escalante, and Virgin Rivers, and in portions of eastern Nevada and western Colorado. The culture is characterized by the use of horticulture and hunting and gathering subsistence practices, distinctive gray-ware pottery, rod-and-bundle basketry, anthropomorphic rock art, and leather moccasins. The Virgin Anasazi culture was an extension of the Puebloan groups from the American Southwest into the Great Basin region. These groups brought with them the knowledge of horticulture, which they utilized on the floodplains of the river valleys they inhabited. Pueblo Grande de Nevada, located south of the proposed Delamar Valley SEZ near Overton, Nevada, is a prime example of the extensive settlements of the Virgin Anasazi culture in the vicinity of the SEZ. Characteristic of this period are gray-ware ceramics (sometimes decorated), rock art and intaglios, bedrock milling features, and turquoise mining. Both the Fremont and Virgin Anasazi groups had left the region by about 800 to 1,000 B.P., at which time Numic-speaking groups migrated into the region; however, the exact timing of these events are unclear and are a subject for further research in the region. These Numic-speaking people were the antecedents of the Southern Paiute, and the archaeological assemblage associated with this time period consists of Desert series projectile points, brown-ware ceramics, unshaped manos and millingstones, incised stones, mortars and pestles, and shell beads. The expression of a Numic period is questioned by contemporary Native American groups in the region because they see themselves as being descents of the Anasazi, having occupied the area since the beginning of time, and do not perceive of a disconnect between Virgin Anasazi and Numic periods (Fowler and Madsen 1986).

11.2.17.1.2 Ethnohistory

The proposed Delamar Valley SEZ is located within the traditional use area of the Southern Paiute. Southern Paiute groups tended to be wide ranging and often shared resources. The SEZ lies between the core areas of the Panaca and Pahranagat Bands (Kelly 1934; Kelly and Fowler 1986). The Pahranagat Band was centered on the Pahrangat Valley just to the west of

Delamar Valley, but Pahranagat people are reported to have lived at the southern end of the Delamar Valley. The Panaca Band was centered in Meadow Valley, about 34 mi (55 km) to the northeast. Delamar Valley and its surroundings appear to be more important to Pahranagat descendants than Panaca descendants (Stoffle and Dobyns 1983). Close to the northwestern boundary of Southern Paiute territory, the area may also have been known to the Western Shoshone.

Southern Paiute

A more general account of the Southern Paiutes is given in Section 11.1.17.1.2. This section deals primarily with those Southern Paiutes associated with the Delamar Valley. The proposed Delamar Valley SEZ falls within *Paranayi*, the western subdivision of the Southern Paiute Nation (Stoffle et al. 1997). Situated in the Delamar Valley and on Delamar Flat, it is just under 9 mi (14 km) northeast of the springs, lakes, and wetlands of the Pahranagat Valley.

The Pahranagat Band was a relatively small division of the Southern Paiutes. Like other Southern Paiute bands, it was centered on a spring-fed ribbon oasis. In Pahranagat Valley, they planted crops along lake margins and practiced some irrigation. They were also known to burn plots and scatter seeds in the burnt areas. They supplemented their food supply by fishing and by hunting in the surrounding mountains and hills. Hunters appealed for supernatural aid using means including a special mountain sheep song (Kelly and Fowler 1986). The Panaca Band base camps planted crops in Meadow Valley near present-day Panaca and Pioche and harvested pine nuts in the surrounding hills (Stoffle and Dobyns 1983).

The arrival of Europeans in the New World initially had indirect, although serious, effects on the Southern Paiutes. The Southern Paiute bands suffered from the spread of Old World diseases and the depredations of the slave trade that supplied Spanish and Mexican markets. The development of mining in the 1860s brought Euro-Americans to this part of Nevada in earnest. Mining communities, and the farming communities to support them, sprang up. The newcomers deprived the Paiutes of their traditional water sources and reduced the game and other wild foods they depended on. As Euro-American settlements grew and traditional resources declined, the Southern Paiute were drawn into the new economy, often serving as transient wage labor (Kelly and Fowler 1986). The 1889 discovery of gold in the hills east of the valley resulted in the excavation of extensive mines and the founding of the town of Ferguson, later renamed Delamar, about 6 mi (9 km) east of the proposed SEZ (Paher 1970).

In 1865, an initial attempt by the U.S. government to settle the Southern Paiutes in northeastern Utah among their traditional enemies, the Utes, failed. The Moapa River Reservation was established in 1875, and many members of the Paharangat Band eventually found a home there. Members of the Panaca Band were more likely to settle among the Indian Peaks and Cedar Bands in Utah. The Utah reservations were terminated in 1954, but the bands were restored to a federal trust relationship in 1980 (Stoffle and Dobyns 1983; Kelly and Fowler 1986).

Western Shoshone

The Western Shoshone are ethnically similar Central Numic speakers who traditionally occupied the northwestern flank of Southern Paiute territory—stretching from eastern California through central Nevada into northwestern Utah and southern Idaho. They interacted peacefully with the Southern Paiutes, with whom they were on good terms and may have shared the resources of the Paharangat Valley and its environs (Thomas et al. 1986). For more information on the Western Shoshone see Section 11.1.17.1.2.

11.2.17.1.3 History

The Great Basin was one of the last areas of the continental United States to be fully explored. The harsh and rugged landscape deterred most European and American explorers until the late 18th century. The earliest documented European presence in the Great Basin region was the Dominguez-Escalante Expedition that began in July of 1776. Two Catholic priests, Fathers Francisco Atanasio Dominguez and Silvestre Velez de Escalante were looking for a route from the Spanish capital city of Santa Fe to the Spanish settlement of Monterey on the California coast. Due to poor weather the group did not end up completing their intended journey, but the maps and journals describing their travels and encounters would prove valuable to later explorers who traversed the area, such as Spanish/New Mexican traders and Anglo-American fur trappers traveling the Old Spanish Trail in the 1820s and 1830s (BLM 1976).

Further exploration of the Great Basin occurred in 1826 with fur-trapping expeditions, one conducted by Peter Ogden of the Hudson Bay Company, and the other by Jedediah Smith of the Rocky Mountain Fur Company. Both men were seeking new beaver fields; Ogden took a more northerly route through Elko, Pershing, and Humbolt Counties, and Smith entered near the proposed Delamar Valley SEZ at Mesquite and traveled into California. When Smith entered California he was detained by Mexican authorities and ordered to go back the way he came; however, he decided instead to travel farther north in California and cut across central Nevada, further exploring the Nevada region. Fur trapping never became a lucrative enterprise in Nevada; however, these trailblazers paved the way for later explorers and mappers, such as John C. Frémont. Frémont was a member of the Topographical Engineers, and was commissioned to map and report on the Great Basin area in 1843 and 1844. The results of his work gained wide circulation and were of great importance in understanding the topography of the Great Basin, both for official use and by those moving westward to seek new homes and fortunes (Elliott 1973).

Nevada and the larger Great Basin region provided a corridor of travel for those seeking to emigrate west. Several heavily traveled trails crossed the region, although none were particularly close to the proposed Delamar Valley SEZ. The Old Spanish Trail was an evolving trail system generally established in the early 19th century, but it tended to follow earlier established paths used by earlier explorers and Native Americans. The 2,700 mi (4,345 km) network of trails passes through six states, beginning in Santa Fe, New Mexico, and ending in Los Angeles, California. The closest portion of the congressionally designated Old Spanish National Historic Trail to the proposed SEZ is where it follows the Virgin River, about 50 mi

(80 km) to the southeast. Mormons also frequently used the Old Spanish Trail in emigrating farther west to Nevada, Arizona, and California, and the trail is often referred to as the Old Spanish Trail/Mormon Road. Another notable trail that crossed Nevada was the California Trail, a trail that followed portions of the notable Oregon Trail farther east of Nevada, then broke off from that trail and continued through the northern portion of Nevada along the Humbolt River until it reached California. The Pony Express Trail, a mail route that connected Saint Joseph, Missouri, to Sacramento, California, entered Nevada northeast of Ely and exited just south of Lake Tahoe (von Till Warren 1980).

With the ratification of the Treaty of Guadalupe Hidalgo in 1848 closing out the Mexican-American War, the area came under American control. In 1847, the first American settlers arrived in the Great Basin, among them Mormon immigrants under the leadership of Brigham Young, who settled in the Valley of the Great Salt Lake in Utah. They sought to bring the entire Great Basin under their control, establishing an independent State of Deseret. From its center in Salt Lake City, the church sent out colonists to establish agricultural communities in surrounding valleys and missions to acquire natural resources such as minerals and timber. Relying on irrigation to support their farms, the Mormons often settled in the same places the Fremont and Virgin Anasazi had centuries before. The result was a scattering of planned agricultural communities from northern Arizona to southern Idaho and parts of Wyoming, Nevada, and southern California. Mormon settlements near the proposed Delamar Valley SEZ were located at Crystal Springs, about 18 mi (29 km) to the northwest of the SEZ, and Clover Valley, about 28 mi (45 km) to the east of the SEZ (Paher 1970; Fehner and Gosling 2000).

Nevada's nickname is the "Silver State;" it is so named for the Comstock Lode strike in 1859 in Virginia City, about 400 mi (643 km) north of the proposed Delamar Valley SEZ. This was the first major silver discovery in the United States, and with the news of the strike hopeful prospectors flocked to the area in an effort to capitalize on the possible wealth under the surface of the earth. The discovery of the Comstock Lode led to the creation of Virginia City and other nearby towns that served the population influx. The population increase due to mining was so dramatic that in 1850 there were less than a dozen non-native persons in the state of Nevada; by 1860 there were 6,857, and by 1875 an estimated 75,000 people had settled within the boundaries of the Nevada territory. The Comstock Lode strike is important to the history of Nevada not just because of the population growth and significant amount of money that was consequently brought to the area, but also because of several technological innovations that were created and employed in the mines, including the use of square-set timbering. This technique kept loose soil from collapsing on miners, a concept that was eventually employed around the world in other mines (Paher 1970).

Mining for valuable deposits occurred in all regions of the state of Nevada, including in the vicinity of the proposed Delamar Valley SEZ. The closest mining district to the proposed SEZ was the Delamar Mine. Gold was initially discovered by farmers from Pahranagat in 1890 and 1891, leading to the formation of the Ferguson District in 1892. It is surmised that Native Americans may have been mining for the gold over a dozen years prior to the whites. Captain John C. De Lamar of Montana purchased the principal claim, renamed it Delamar and stepped up the development of the mine. During the years 1895 to 1900 the Delamar Mine was the most prosperous mine in Nevada, as most of the state was in a mining decline. The Delamar mining camp was known as “the maker of widows” due to the high frequency of deaths caused by silicosis, a lung disease brought about by the inhalation of high amounts of silica dust or “Delamar dust.” A small cemetery associated with the mine overlooks the Delamar Valley within 5 mi (8 km) of the SEZ. Despite the prevalence of the disease, people continued to work this rich mine until the late 1920s and early 1930s. The Pioche Mine was one of the most notorious mining districts in Lincoln County. Located in the Highland Range, to the northeast of the Delamar Valley SEZ, Pioche was a violent Wild West town that was also one of the most prosperous districts in the county. Other nearby mines included the Highland Mine and the Bristol Mine, both to the north of the SEZ, and Hiko to the west of the SEZ (Paher 1970).

The construction of railroads in Nevada was often directly related to mining activities in the state. It was necessary to construct intrastate rail lines to move ore from mines to mills; the Pioche to Bullionville Railroad was the closest line to the proposed Delamar Valley SEZ, but interstate railroads were also critical to the development of the economy. The San Pedro–Los Angeles–Salt Lake Railroad was constructed in 1905, connecting two of the most populous cities in the American West, Salt Lake City and Los Angeles. This still-used rail line is located to the east of the proposed Delamar Valley SEZ, as it passes through Caliente through the Meadow Valley Wash on its way to Las Vegas. The infamous Transcontinental Railroad was constructed between 1863 and 1869, connecting Sacramento, California, and Omaha, Nebraska, passing through the Nevada towns of Reno, Wadsworth, Winnemucca, Battle Mountain, Elko, and Wells, and changing the manner in which people traversed the United States.

Nevada’s desert-mountain landscape has made it a prime region for use by the U.S. military for several decades. Beginning in October 1940, President Franklin D. Roosevelt established the Las Vegas Bombing and Gunnery Range, a 3.5-million-acre (14,000-km^2) parcel of land northwest of Las Vegas, near Indian Springs, Nevada. The main purpose of the range was to serve as air-to-air gunnery practice, but at the end of WWII the gunnery range was closed. It was reopened at the start of the Cold War in 1948, recommissioned as the Las Vegas Air Force Base, and later renamed Nellis Air Force Base in 1950 (Fehner and Gosling 2000).

Prior to dropping the atomic bomb on the Japanese cities of Nagasaki and Hiroshima, the only testing of nuclear weapons on U.S. soil was at the Trinity site, near Los Alamos Laboratory in Alamogordo, New Mexico. Tests of nuclear weapons had been conducted at the newly acquired Marshall Islands in the Pacific, but due to logistical constraints, financial expenditures, and security reasons, a test site for nuclear weapons was needed in a more convenient region. Project Nutmeg commenced in 1948 as a study to determine the feasibility and necessity of a test site in the continental U.S. It was determined that due to public relations issues, radiological safety, and security issues a continental test site should only be pursued in the event of a national emergency. In 1949, that emergency occurred when the Soviet Union conducted their first test of a nuclear weapon and the Korean War started in the summer of 1950. Five initial test sites were proposed: Alamogordo/White Sands Missile Range in New Mexico, Camp LeJeune in North Carolina, the Las Vegas–Tonopah Bombing and Gunnery Range in Nevada, a site in central Nevada near Eureka, and Utah’s Dugway Proving Ground/Wendover Bombing Range. Several factors were considered when making the final decision, including fallout patterns, prevailing winds and predictability of weather, terrain, downwind populations, security, and public awareness and relations, with the Las Vegas–Tonopah Bombing and Gunnery Range being chosen as the NTS by President Truman in December 1950.

Covering 1,375 mi^2 (2213 km^2), the NTS is a part of the Las Vegas–Tonopah Bombing and Gunnery Range; it stretches from Mercury, Nevada, in the southeast to Pahute Mesa in the northwest. The first set of nuclear tests was conducted in January 1951; originally named FAUST (First American Drop United States Test) and later renamed Ranger, these bombs were detonated over Frenchman Flat, an area about 45 mi (72 km) southwest of the proposed Delamar Valley SEZ. Tests were also later conducted at Yucca Flat, an area located northwest of Frenchman Flat, in an effort to minimize the effect of the blasts on the population of Las Vegas, which reported some disturbances (non-radiological in nature) from the series of tests conducted at Frenchman Flat. Tests were also conducted at Jackass Flats, to the west of the proposed Delamar Valley SEZ, and Pahute Mesa, located to the north and west of the proposed Delamar Valley SEZ. Nuclear tests were conducted in an effort to test new weapons concepts, proof-test existing weapons, test the impact of nuclear weapons on manmade structures and the physical environment, and conduct experimental testing in search of possible peaceful uses, specifically the Pluto ramjet, Plowshare, and Rover rocket programs. The Pluto ramjet project was funded by the Air Force to design a system that could propel a vehicle at supersonic speeds and low altitudes, while the Rover rocket was a design for a nuclear-powered rocket for space travel. The Plowshare project was an attempt to show that nuclear weapons could be effective in moving large amounts of earth for canal and harbor construction. None of these three projects resulted in any sustained results in terms of the goals they were seeking, but they were important in their contribution to the overall work done at the NTS. In the fall of 1958, President Dwight Eisenhower declared a moratorium on nuclear testing, with the Soviet Union following suit until 1961 when testing resumed on both behalves. However, this testing was performed mostly underground at the NTS, with most atmospheric tests being conducted in the Pacific. The last atmospheric test at the NTS was on July 17, 1962, with the Limited Test Ban Treaty signed by the U.S. and Soviet Union on August 5, 1963, ending nuclear testing in the atmosphere, ocean, and space. The last underground nuclear detonation at the NTS was on September 23, 1992, after which Congress declared a moratorium on nuclear testing. In 1996, a Comprehensive Test Ban Treaty was proposed by an international organization, but it has yet to be ratified by the U.S. Senate; however, nuclear tests have not been conducted since. In total, 1,021 of the 1,149 nuclear detonations performed by the U.S. during the Cold War were conducted at the NTS (Fehner and Gosling 2000).

Within the proposed Delamar SEZ are a landing strip and two drop zones used by Nellis Air Force Base and the DoD, an area encompassing about 2,590 acres (10 km^2). The 15,000-ft (4,600-m) long landing strip is located in the southern portion of the SEZ on the dry lake bed; the drop zones are located on the southeast and northwest sides of the dry lake. Through use permits obtained from the BLM, the United States Air Force conducted loading and takeoff operations, refueling exercises, reloading exercises, and search-and-rescue training support exercises in periodic increments from the 1960s through the 1980s. Edwards Air Force Base also used the airstrip for an emergency landing strip for the X-15 aircraft flight test program (Scott 1994).

11.2.17.1.4 Traditional Cultural Properties—Landscape

The Southern Paiutes have traditionally taken a holistic view of the world, in which the sacred and profane are inextricably intertwined. According to their traditions, they were created in their traditional use territory and have a divine right to the land along with a responsibility to manage and protect it. Landscapes as a whole are often culturally important. An adverse effect on one part diminishes the rest (Stoffle 2001). From a Southern Paiute perspective, landscapes include places of power. Among the most important such places are sources of water; peaks, mountains, and elevated features; caves; distinctive rock formations; and panels of rock art. Places of power are important to the religious beliefs of the Southern Paiute. They may be sought out for individual vision quests or healing and may likewise be associated with culturally important plant and animal species. The view from such a point of power or the ability to see from one important place to another can be an important element of its integrity (Stoffle and Zedeño 2001b). Landscapes as a whole are tied together by a network of culturally important trails (Stoffle and Dobyns 1983; Stoffle and Zedeño 2001a).

The proposed Delamar Valley SEZ is situated close to the Paharangat Valley ribbon oasis, which includes lakes and spring-fed wetlands. It was an area of traditional Southern Paiute base camps and gardens. Located less than 10 mi (16 km) from Paharangat Valley, the southern end of Delamar Valley was likewise the site of Paharangat base camps (Stoffle and Dobyns 1983). These are reflected in the rock art panels and rock shelters located on the eastern face of a rocky ridge along the western boundary of proposed SEZ. Caves, rock art panels, and former dwelling places are all culturally significant features for the Southern Paiutes.

The southern end of the proposed SEZ appears to be at the center of a culturally important landscape. A potential access road linking the SEZ to U.S. 93, which follows the Pahranagat Valley, would pass through this area. In the past, Pahranagat descendents from the Moapa River Reservation identified the southern Pahranagat Valley and the Delamar Mountains as places of greatest concern. They ranked Kane Springs Wash, located just east of the Delamar Mountains, Delamar Dry Lake, and the historic town of Delamar as only slightly less important (Stoffle and Dobyns 1983).

11.2.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources

In the proposed Delamar Valley SEZ, 9 surveys have been conducted within the boundaries of the SEZ, covering approximately 3.4% of the SEZ, and 17 additional surveys have been conducted within 5 mi (8 km) of the SEZ. Of the nine surveys conducted within the boundaries of the SEZ, five have been linear surveys, and the other four were block surveys. A total of eight sites have been documented in the proposed Delamar Valley SEZ, six prehistoric sites and two historic sites. Another 47 sites have been documented within 5 mi (8 km) of the proposed SEZ; of these, 39 are prehistoric, and 8 are historic (de DuFour 2009).

The Delamar Valley SEZ has the potential to yield significant cultural resources, especially prehistoric sites in the areas around the dry lake at the south end of the SEZ, as well as in alluvial fans located on the outer portions of the SEZ and within a 5 mi (8 km) radius

(Drews and Ingbar 2004). Around the dry lake bed in the SEZ is a site that has significant potential for eligibility for inclusion on the NRHP. This site is a small lithic scatter of obsidian flakes and projectile points, possible metate fragments, and fire-cracked rock, with the possibility of subsurface deposits. Another potentially eligible site is located on an alluvial fan in the eastern portion of the SEZ. This site is also a lithic scatter of obsidian flakes, likely dating to the Archaic period, and its potential subsurface deposits could provide information about Archaic settlement patterns. The other prehistoric sites in the Delamar SEZ are isolated projectile points (Rose Spring and Archaic points), grinding stone fragments, and dispersed lithic scatters. Two historic sites, one an isolated bottle, the other an historic telegraph line, are likely not eligible for inclusion on the NRHP; the telegraph line connected Delamar Mine to Bullfrog Mine, but has been previously vandalized and may not retain sufficient integrity. The Delamar Mine itself is within 6 mi (10 km) of the SEZ, and its associated cemetery is within 5 mi (8 km) overlooking the valley and the northern section of the SEZ from the northeast in the Delamar Mountains. Numerous rock art sites are in close proximity to the western edge of the SEZ boundary, and artifacts were noted in the western portion of the SEZ during an initial visit to the valley.

The BLM has designated several locations within relatively close proximity to the proposed Delamar Valley SEZ as ACECs because of their significant cultural value. The Pahroc Rock Art ACEC is located about 10 mi (16 km) to the north of the proposed Delamar Valley SEZ, at the south end of the North Pahroc Range. The Shooting Gallery ACEC is located about 15 mi (24 km) to the west of the SEZ, just west of Alamo. The name "Shooting Gallery" was applied to the district because there is evidence that prehistoric people created hunting blinds and a system of channels made of rocks to corral and hunt large game. The Mount Irish ACEC is located about 30 mi (48 km) to the northwest of the proposed Delamar SEZ, near Hiko, and is noted for its rock art and prehistoric camp sites. There are several other areas that contain culturally sensitive material and meet the criteria for ACEC designation, but in the interest of protecting the resources the BLM has not designated other ACECs, since it is presumed that ACEC designation could bring unwanted attention to the sites, including increased potential for vandalism.

National Register of Historic Places

Two sites within the proposed Delamar Valley SEZ have the potential to be eligible for inclusion in the NRHP, as mentioned above, and are associated with the dry lake area and alluvial fan areas. Within 5 mi (8 km) of the SEZ are 10 sites that exhibit potential significance for inclusion in the NRHP. These sites, eight of which are rock shelters, are all prehistoric in nature. All of the potentially eligible sites within the 5-mi (8-km) buffer are located to the west of the SEZ in the South Pahroc Range and surrounding area; most also consist of petroglyphs and/or pictographs. Several of the sites have diagnostic pottery; two of the sites contain Paiute ceramics, two others contain both Fremont and Paiute style ceramics, and one of those two sites could possibly contain Virgin Anasazi ceramic sherds. The other two sites include the largest single concentration of patterned-body anthropomorphs and peanut-bodied anthropomorphs (also referred to as Pahranagat Man) and a hunting camp and chipping station.

In addition, nine other properties are listed in the NRHP within Lincoln County. Three of these properties are prehistoric sites: the White River Narrows Archaeological District, located about 30 mi (48 km) northwest of the proposed SEZ; the Black Canyon Petroglyph Site in the Pahranagat National Wildlife Refuge, south of Alamo, about 7 mi (11 km) southwest of the Delamar Valley SEZ; and the Panaca Summit Archaeological District, about 40 mi (64 km) northwest of the SEZ. The other properties listed in the NRHP in Lincoln County are historic sites near the towns of Caliente and Pioche, both located to the northeast of the SEZ.

11.2.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Delamar Valley SEZ; however, further investigation is needed at the project-specific level. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. The Delamar Valley SEZ has a high potential for containing prehistoric sites, especially in the dry lake area at the southern end of the SEZ; a potential for historic sites also exists. The largest potential for direct impacts on significant cultural values is in the dry lake area and the alluvial fans, located on the southern and outer portions of the SEZ. At least two of the sites recorded in these portions of the SEZ have been determined to be potentially eligible for listing in the NRHP. The history of the landing strip should also be investigated further. Section 5.15 discusses the types of impacts that could occur on any significant cultural resources found to be present in the Delamar Valley SEZ. Impacts will be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

Indirect impacts on cultural resources outside of the SEZ boundary, such as through looting or vandalism, are possible in the rock shelter and petroglyph sites immediately west of the SEZ and also to the east toward the old mining town of Delamar. Visual impacts on traditional cultural properties identified either in the Pahroc Range or in the Delamar Mountains would occur. Subsurface sites would likely not be impacted because programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

Approximately 8 mi (13 km) of access road is anticipated to connect to U.S. 93 to the north of the SEZ, resulting in approximately 58 acres (0.23 km^2) of disturbance. Impacts on cultural resources are possible in areas related to the access ROW, since new areas of potential cultural significance could be directly impacted by construction or opened to increased access from road use. Indirect impacts, such as vandalism or theft, could occur if significant resources are located in close proximity to the ROW. Programmatic design features assume that the necessary surveys, evaluations, and consultation will occur for the ROW, as with the project footprint within the SEZ. In this particular area, a couple of small surveys have been conducted that traverse the potential corridor. One site, a lithic scatter, has been recorded. The site consists of metate fragment and a stone tool fragment (either a projectile point or a blade fragment) and was not evaluated for eligibility for listing in the NRHP (de DuFour 2009). Although it is assumed elsewhere in this document that 8 mi (13 km) of access road is assumed to connect to U.S. 93 to the southwest of the SEZ, this alternative route could result in a greater potential for impacts on cultural resources. The amount of disturbance is essentially the same (58 acres [0.23 km^2]), but the disturbance would occur in an area of higher elevation, higher cultural sensitivity, and increased potential for rock shelters and rock art. No surveys have been previously conducted in the vicinity of this potential corridor (de DuFour 2009). No needs for new transmission have currently been identified, assuming existing lines would be used; therefore, no additional areas of cultural concern would be made accessible as a result of transmission development within the proposed Delamar Valley SEZ. However, impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

11.2.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features, cultural awareness training for the workforce, and measures for addressing possible looting/vandalism issues through formalized agreement documents, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

- Avoidance of significant resources clustered in specific areas, such as those in the vicinity of the dry lake, is recommended.

Impacts on the viewsheds of areas of traditional cultural importance either in the west side of the Delamar Mountains to the east or the east side of the Pahroc Range to the west, if they are identified as such by the affected Tribes, would not be fully mitigable other than through avoidance of the valley. However, some mitigation options for visual impacts are provided in Section 11.2.14.

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11.2.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns that are specific to Native Americans or to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Delamar Valley SEZ, Section 11.2.17 discusses archaeological sites, structures, landscapes, and traditional cultural properties; Section 11.2.8 discusses mineral resources; Section 11.2.9.1.3 discusses water rights and water use; Section 11.2.10 discusses plant species; Section 11.2.11 discusses wildlife species, including wildlife migration patterns; Section 11.2.13 discusses air quality; Section 11.2.14 discusses visual resources; Sections 11.2.19 and 11.2.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21.

11.2.18.1 Affected Environment

The proposed Delamar Valley SEZ falls within the Tribal traditional use area generally attributed to the Southern Paiute (Kelly and Fowler 1986), although the Paiutes often shared resources with the Western Shoshone, and the Western Shoshone may have been familiar with this border region. All federally recognized Tribes with Southern Paiute or Western Shoshone roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 11.2.18.1-1. Details of government-to-government consultation efforts are presented in Chapter 14; a listing of all federally recognized Tribes contacted for this PEIS is found in Appendix K.

11.2.18.1.1 Territorial Boundaries

Southern Paiutes

The traditional territory of the Southern Paiutes lies mainly in the Mojave Desert, stretching from California to the Colorado Plateau. It generally follows the right bank of the Colorado River (heading downstream), including its tributary streams and canyons in southern Nevada and Utah, including most of Clark and Lincoln Counties in Nevada and extending as far north as Beaver County in Utah (Kelly and Fowler 1986). This area has been judicially recognized as the traditional use area of the Southern Paiute by the Indian Claims Commission (Clemmer and Stewart 1986; Royster 2008).

Western Shoshone

The Western Shoshone traditionally occupied a swath of the central Great Basin stretching from Death Valley in California through central Nevada and northwestern Utah to

TABLE 11.2.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed Delamar Valley SEZ

Tribe	Location	State
Chemehuevi Indian Tribe	Havasu Lake	California
Colorado River Indian Tribes	Parker	Arizona
Confederated Tribes of the Goshute Reservation	Ibapah	Utah
Duckwater Shoshone Tribe	Duckwater	Nevada
Ely Shoshone Tribe	Ely	Nevada
Kaibab Paiute Tribe	Fredonia	Arizona
Las Vegas Paiute Tribe	Las Vegas	Nevada
Moapa Band of Paiutes	Moapa	Nevada
Pahrump Paiute Tribe	Pahrump	Nevada
Paiute Indian Tribe of Utah	Cedar City	Utah
Cedar Band	Cedar City	Utah
Indian Peak Band	Cedar City	Utah
Kanosh Band	Kanosh	Utah
Koosharem Band	Cedar City	Utah
Shivwits Band	Ivins	Utah
San Juan Southern Paiute Tribe	Tuba City	Arizona
Skull Valley Band of Goshute Indians	Grantsville	Utah

southeastern Idaho (Thomas et al. 1986). The proposed Delamar Valley SEZ lies within the northern margins of Southern Paiute territory in an area of shared use (Stoffle and Dobyns 1983).

11.2.18.1.2 Plant Resources

Native Americans continue to make use of a wide range of indigenous plants for food, medicine, construction materials, and other uses. The vegetation present at the proposed Delamar Valley SEZ is described in Section 11.2.10. The cover types present at the proposed SEZ are mostly in the Inter-Mountain Basins series. Mixed Salt Desert Scrub predominates. There is a substantial area of Playa in the southern end of the proposed SEZ and areas of Greasewood Flat, Semi-Desert Shrub Steppe, and Mojave Mid-elevation Desert Scrub (USGS 2005a). The proposed SEZ is sparsely vegetated. As shown in Table 11.2.18.1-2, the proposed SEZ is likely to contain some plants used by Native Americans for food and/or medicinal purposes (Stoffle et al. 1999; Stoffle and Dobyns 1983). Project-specific analyses will be needed to determine their presence at any proposed building site.

11.2.18.1.3 Other Resources

Southern Paiutes with ties to the area of the proposed SEZ rate springs as one of the most important resources in their cultural landscape. Water is an essential prerequisite for life in the arid areas of the Great Basin. As a result, water holds a key place in the religion of native

TABLE 11.2.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Delamar Valley SEZ

Common Name	Scientific Name	Status
Food		
Buckhorn Cholla	*Cylindropuntia acanthocarpa*	Possible
Buckwheat	*Eriogonum inflatum*	Observed
Cholla Cactus	*Cylindropuntia* spp.	Observed
Dropseed	*Sporobolus* spp.	Possible
Greasewood	*Sarcobatus vermiculatus*	Likely
Indian Rice Grass	*Oryzopsis hymenoides*	Observed
Iodine Bush	*Allenrolfea occidentalis*	Possible
Juniper	*Juniperus* spp.	Possible
Muhly	*Muhlenbergis porteri*	Possible
Wolfberry	*Lycium andersonii*	Possible
Yucca	*Yucca* spp.	Observed
Medicine		
Greasewood	*Sacarbatus vermiculatus*	Likely
Mormon Tea	*Ephedra* spp.	Observed
Sagebrush	*Artemesia tridentate*	Possible
Saltbush	*Atriplex* spp.	Observed

Sources: Field visit; USGS (2005a); Stoffle and Dobyns (1983); Stoffle et al. (1999).

cultures. Great Basin cultures consider all water sacred and purifying. Springs are often associated with powerful beings, and hot springs in particular figure in Southern Paiute creation stories. Water sources are often associated with rock art. Water sources are seen as connected, so damage to one damages all (Fowler 1991; Stoffle and Zedeño 2001a). There are springs located to the west of the proposed SEZ. Tribes are also sensitive regarding the use of scarce local water supplies for the benefit of far distant communities and recommend that the determination of adequate water supplies should be a primary consideration in determining whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

Wildlife likely to be found in the proposed Delamar Valley SEZ is described in Section 11.2.11. Mountain sheep, deer, and rabbit are the animals of concern most often mentioned by Native Americans with local ties (Stoffle and Dobyns 1983). The proposed SEZ provides suitable habitat for mule deer (*Odocoileus hemionus*), black-tailed jackrabbit (*Lepus californicus*), and desert cottontail (*Sylvilagus audubonii*). The mountains on either side of the valley provide suitable habitat for mountain sheep (*Ovis canadensis*), which may sometimes be present on the valley floor. Other animals traditionally important to the Southern Paiute include lizards, which are likely to occur in the proposed SEZ, and the golden eagle (*Aquila chrysaetosi*). The proposed SEZ falls within the range of the wide-ranging eagle (USGS 2005b). Animals important to affected Native American tribes likely to be found within the proposed SEZ are listed in Table 11.2.18.1-3.

Other natural resources traditionally important to Native Americans include salt, clay for pottery, and naturally occurring mineral pigments for the decoration and protection of the skin (Stoffle and Dobyns 1983). Of these, clay beds are possible in the dry lake within the proposed SEZ (see Section 11.2.7).

11.2.18.2 Impacts

In the past, when energy projects have been proposed, Great Basin Native Americans have expressed concern over project impacts on a variety of resources. They tend to take a holistic view of their traditional homeland. For them, cultural and natural features are inextricably bound together. Effects on one part have ripple effects on the whole. Western distinctions between the sacred and the secular have no meaning in their traditional worldview (Stoffle and Dobyns 1983). While no comments specific to the proposed Delamar Valley SEZ have been received from Native American Tribes to date, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. When commenting on past projects in the Delamar Valley, the Southern Paiute have expressed concern over adverse effects on a wide range of resources. Geophysical features and physical cultural remains are discussed in Section 11.2.17.1.4. Such features are often seen as important because they are the location of or have ready access to a range of plant, animal, and mineral resources (Stoffle et al. 1997). Resources considered important include food plants, medicinal plants, plants used in basketry, and plants used in construction; large game animals, small game animals, and birds; and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those likely to be found within the proposed Delamar Valley SEZ are discussed in Section 11.2.18.1.2.

The southern end of Delamar Valley has been identified as an area where the Paharangat Band of Southern Paiutes resided. In this area, there is likely a cultural landscape important to the Southern Paiute that would include the rockshelters and petroglyphs panels just beyond the western boundary of the proposed SEZ, the Delamar Lake playa, Delamar Mountains, the historic town of Delamar, and Kane Spring Wash. Associated with these features are plants and animals of traditional cultural importance. Although the proposed SEZ is sparsely vegetated, its proximity to a traditionally settled area suggests that the area was used historically by the Southern Paiute. An access road approaching the southern end of the proposed SEZ from the west is more likely to affect this potential cultural landscape than routes that follow Delamar Valley northward from the SEZ to U.S. 93. Any construction of solar energy facilities has the potential to disturb this landscape and its viewshed. Consultation with the affected Tribes should be undertaken to determine the aspects of the culturally important features that render them significant.

As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that there will be Native American concerns expressed over potential visual and other effects on specific resources and any culturally important landscapes within or adjacent to the proposed SEZ. Since solar energy facilities cover large tracts of land, even taking into account

TABLE 11.2.18.1-3 Animal Species used by Native Americans as Food whose Range Includes the Proposed Delamar Valley SEZ

Common Name	Scientific Name	Status
Mammals		
Badger	*Taxidea taxus*	All year
Black-tailed jackrabbit	*Lepus californicus*	All year
Bobcat	*Lynx rufus*	All year
Coyote	*Canis latrans*	All year
Cottontails	*Silvilagus* spp.	All year
Woodrats	*Neotoma* spp.	All year
Gray fox	*Urocyon cinereoargenteus*	All year
Kangaroo rats	*Dipodomys* spp.	All year
Kit fox	*Vulpes macotis*	All year
Mule deer	*Odocoileus hemionus*	All year
Pocket gopher	*Thomomys bottae*	All year
Pocket mice	*Perognathus* spp.	All year
Porcupine	*Erethizon dorsatum*	All year
Pronghorn	*Antilocapra americana*	All year
Red fox	*Vulpes vulpes*	All year
Rock squirrel	*Spermophilus variegatus*	All year
White-tailed antelope squirrel	*Ammospermophilus leucurus*	All year
White-tailed jackrabbit	*Lepus townsendii*	All year
Birds		
Burrowing owl	*Athene cunicular*	Summer
Common raven	*Corvus corax*	All year
Golden eagle	*Aquila chrysaetos*	All year
Great horned owl	*Bubo virginianus*	All year
Mourning Dove	*Callipepla gambelii*	All year
Northern mockingbird	*Mimus polyglottos*	All year
Sage grouse	*Centrocercus urophasianus*	All year
Sandhill crane	*Grus Canadensis*	Spring/fall
Swainson's hawk	*Buteo swainsoni*	Summer
Reptiles		
Desert horned-lizard	*Phrynosoma platyrhinos*	All year
Desert tortoise	*Gopherus agassizii*	Possible
Large lizards	Various species	All year

Sources: Field visit; USGS (2005b); Fowler (1986).

the implementation of programmatic design features, it is unlikely that avoidance of all resources important to Native Americans would be possible.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' water rights and the potential for groundwater contamination issues.

11.2.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate impacts of potential concern to Native Americans, such as avoidance of sacred sites, water resources, and tribally important plant and animal species are provided in Appendix A, Section A.2.2. Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 11.2.17.3, in addition to programmatic design features for historic properties discussed in Appendix A, Section A.2.2.

The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with the affected Tribes listed in Table 11.2.18.1-1.

11.2.19 Socioeconomics

11.2.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Delamar Valley SEZ. The ROI is a three-county area comprising Clark and Lincoln Counties in Nevada and Iron County in Utah. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and non-payroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

11.2.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 944,909 (Table 11.2.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was higher in Lincoln County (5.1%) than in Iron County (3.4%) and Clark County (3.2%). At 3.2%, growth rates in the ROI as a whole were higher than the average rate for Nevada (2.7%).

In the ROI in 2006, the services sector provided the highest percentage of employment at 59.3%, followed by wholesale and retail trade at 14.9% and construction (11.7%) (Table 11.2.19.1-2). Within the three counties in the ROI, the distribution of employment across

TABLE 11.2.19.1-1 ROI Employment in the Proposed Delamar Valley SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Clark County, Nevada	675,693	922,878	3.2
Lincoln County, Nevada	1,114	1,731	5.1
Iron County, Utah	14,571	20,300	3.4
ROI	691,582	944,909	3.2
Nevada	978,969	1,282,012	2.7
Utah	1,080,441	1,336,556	2.1

Sources: U.S. Department of Labor (2009a,b).

TABLE 11.2.19.1-2 ROI Employment in the Proposed Delamar Valley SEZ by Sector, 2006

	Clark County		Lincoln County		Iron County		ROI	
Industry	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	213	0.0	130	16.1	934	7.0	1,277	0.1
Mining	522	0.1	38	4.7	10	0.1	570	0.1
Construction	100,817	11.6	60	7.4	1,829	13.8	102,706	11.7
Manufacturing	25,268	2.9	0	0.0	1,732	13.1	27,000	3.1
Transportation and public utilities	38,529	4.4	70	8.7	363	2.7	38,962	4.4
Wholesale and retail trade	128,498	14.8	309	38.3	2,650	20.0	131,407	14.9
Finance, insurance, and real estate	56,347	6.5	24	3.0	646	4.9	57,044	6.5
Services	516,056	59.6	343	42.6	5,068	38.2	521,500	59.3
Other	105	0.0	0	0.0	10	0.1	115	0.0
Total	866,093		806		13,250		880,149	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009a,b).

sectors is different from that of the ROI as a whole, with employment in services (59.6%) higher in Clark County than in the ROI as a whole, while employment in wholesale and retail trade (14.8%), and agriculture (0.0%) were lower than in other counties in the ROI.

11.2.19.1.2 ROI Unemployment

The average rate in Lincoln County over the period over the period 1999 to 2008 was 5.2%, slightly higher than the rate in Clark County (5.0%), and higher than the rate for Iron County (Table 11.2.19.1-3). The average rate in the ROI over this period was 5.0%, the same as the average rate for Nevada. Unemployment rates for the first 11 months of 2009 contrast with rates for 2008 as a whole; in Clark County, the unemployment rate increased to 11.1%, while in Lincoln County the rate reached 8.0%, and it increased to 6.4% in Iron County. The average rates for the ROI (11.0%) and for Nevada as a whole (11.0%) were also higher during this period than the corresponding average rates for 2008.

11.2.19.1.3 ROI Urban Population

The population of the ROI in 2006 to 2008 was 57% urban. The largest city, Las Vegas, had an estimated 2008 population of 562,849; other large cities in Clark County include Henderson (253,693) and North Las Vegas (217,975) (Table 11.2.19.1-4). In addition, there are two smaller cities in the county, Mesquite (16,528) and Boulder City (14,954). There are a number of unincorporated urban areas in Clark County that are not included in the urban population, meaning that the percentage of the county population not living in urban areas is overstated. The largest urban area in Iron County, Cedar City, had an estimated 2008 population of 28,439; other urban areas in the county in include Enoch (5,076) and Parowan (2,606) (Table 11.2.19.1-4). In addition, there are three other urban areas in the county, Paragonah (477), Kanaraville (314) and Brian Head (126). Most of these cities and towns are less than 100 mi (160 km) from the site of the proposed SEZ.

Population growth rates in the ROI have varied over the period 2000 to 2008 (Table 11.2.19.1-4). North Las Vegas grew at an annual rate of 8.3% during this period, with higher than average growth also experienced in Mesquite (7.3%), Enoch (4.9%), and Henderson (4.7%). Las Vegas (2.1%), Brian Head (0.8%),,Caliente (0.7%) and others experienced a lower growth rate between 2000 and 2008, while Boulder City (0.0%), experienced a static growth rate during this period.

11.2.19.1.4 ROI Urban Income

Median household incomes vary across urban areas in the ROI. Of the four cities for which data are available for 2006 to 2008, Henderson ($67,886) and North Las Vegas ($60,506) had median incomes in 2006 to 2008 that were higher than the average for Nevada ($56,348) and Utah ($56,484), while median incomes in Las Vegas ($55,113) and Cedar City ($41,318) were slightly lower than both state averages (Table 11.2.19.1-4).

TABLE 11.2.19.1-3 ROI Unemployment Rates for the Proposed Delamar Valley SEZ (%)

Location	1999–2008	2008	2009[a]
Clark County, Nevada	5.0	6.6	11.1
Lincoln County, Nevada	5.2	5.4	8.0
Iron County, Utah	4.1	4.2	6.4
ROI	5.0	6.5	11.0
Nevada	5.0	6.7	11.0
Utah	4.1	3.4	5.2

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

TABLE 11.2.19.1-4 ROI Urban Population and Income for the Proposed Delamar Valley SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Boulder City, Nevada	14,966	14,954	0.0	65,049	NA[b]	NA
Brian Head, Utah	118	126	0.8	56,732	NA	NA
Caliente, Nevada	1,123	1,191	0.7	33,260	NA	NA
Cedar City, Nevada	20,527	28,439	4.2	41,719	41,318	–0.1
Enoch, Utaj	3,467	5,076	4.9	48,112	NA	NA
Henderson, Nevada	175,381	253,693	4.7	72,035	67,886	–0.7
Kanarraville, Utah	311	314	0.1	44,258	NA	NA
Las Vegas, Nevada	478,434	562,849	2.1	56,739	55,113	–0.3
Mesquite, Utah	9,389	16,528	7.3	52,005	NA	NA
North Las Vegas, Nevada	115,488	217,975	8.3	56,299	60,506	0.2
Paragonah, Utah	470	477	0.2	43,721	NA	NA
Parowan, Utah	2,565	2,606	0.2	41,749	NA	NA

[a] Data are averages for the period 2006 to 2008.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009b–d).

Growth rates between 1999 and 2006 to 2008 were small in North Las Vegas (0.2%), and negative in Henderson (–0.7%), Las Vegas (–0.3%), and Cedar City (–0.1%). The average median household income growth rate as a whole over this period was –0.2% for Nevada, and –0.5% in Utah.

11.2.19.1.5 ROI Population

Table 11.2.19.1-5 presents recent and projected populations in the ROI and for the two states as a whole. Population in the ROI stood at 1,927,930 in 2008, having grown at an average annual rate of 4.0% since 2000. Growth rates for ROI were higher than those in Nevada (3.4%) over the same period.

Both counties in the ROI experienced growth in population between 2000 and 2008; population in Clark County grew at an annual rate of 4.0%, while population grew by 3.4% in Iron County and 1.4% in Lincoln County. The ROI population is expected to increase to 2,782,449 by 2021 and to 2,865,746 by 2023.

11.2.19.1.6 ROI Income

Total personal income in the ROI stood at $75.2 billion in 2007 and has grown at an annual average rate of 4.9% over the period 1998 to 2007 (Table 11.2.19.1-6). Per-capita income also rose over the same period at a rate of 1.0%, increasing from $36,099 to $39,847. Per-capita incomes were higher in Clark County ($40,307) than in Lincoln County ($26,858) and Iron County ($21,922) in 2007. Growth rates in total personal income have been higher in Clark County than in Iron County and Lincoln County. Personal income growth rates in the ROI were

TABLE 11.2.19.1-5 ROI Population for the Proposed Delamar Valley SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Clark County, Nevada	1,375,765	1,879,093	4.0	2,710,303	2,791,161
Lincoln County, Nevada	4,165	4,643	1.4	5,350	5,412
Iron County, Utah	33,779	44,194	3.4	66,796	69,173
ROI	1,413,709	1,927,930	4.0	2,782,449	2,865,746
Nevada	1,998,257	2,615,772	3.4	3,675,890	3,779,745
Utah	2,233,169	2,727,343	2.5	3,546,228	3,666,248

Sources: U.S. Bureau of the Census (2009e,f); Nevada State Demographers Office (2008).

TABLE 11.2.19.1-6 ROI Personal Income for the Proposed Delamar Valley SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Clark County, Nevada			
Total income[a]	45.7	74.1	5.0
Per-capita income	36,509	40,307	1.0
Lincoln County, Nevada			
Total income[a]	0.1	0.1	0.7
Per-capita income	24,711	24,121	-0.2
Iron County, Utah			
Total income[a]	0.7	0.9	3.5
Per-capita income	21,352	21,922	0.3
ROI			
Total income[a]	46.5	75.2	4.9
Per-capita income	36,099	39,847	1.0
Nevada			
Total income[a]	68.9	105.3	4.3
Per-capita income	37,188	41,022	1.0
Utah			
Total income[a]	61.9	82.4	2.9
Per-capita income	28,567	31,003	0.8

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of Census (2009e,f).

higher than the rate for Nevada (4.3%) and Utah (2.9%), but per-capita income growth rates in Clark County were the same as, while rates in Lincoln County and Iron County were lower than in Nevada as a whole (1.0%) and Utah (0.8%) as a whole.

Median household income in 2006 to 2008 varied from $41,173 in Lincoln County to $42,687 in Iron County and $56,954 in Clark County (U.S. Bureau of the Census 2009d).

11.2.19.1.7 ROI Housing

In 2007, more than 774,400 housing units were located in the three ROI counties, with about 97% of these located in Clark County (Table 11.2.19.1-7). Owner-occupied units compose approximately 60% of the occupied units in the three counties, with rental housing making up 40% of the total. Vacancy rates in 2007 were 29.3% in Lincoln County, 23.4% in Iron County, and 12.2% in Clark County; with an overall vacancy rate of 12.5% in the ROI, there were 97,010 vacant housing units in the ROI in 2007, of which 39,291 are estimated to be rental units that would be available to construction workers. There were 10,707 units in seasonal, recreational, or occasional use in the ROI at the time of the 2000 Census, with 1.5% of housing units in Clark County, 14.6% in Iron County, and 14.0% in Lincoln County used for seasonal or recreational purposes.

Housing stock in the ROI as a whole grew at an annual rate of 4.3% over the period 2000 to 2007, with 198,818 new units added to the existing housing stock (Table 11.2.19.1-7).

The median value of owner-occupied housing in 2000 to 2008 varied between $80,300 in Lincoln County, $112,000 in Iron County, and $139,500 in Clark County (U.S. Bureau of the Census 2009g).

11.2.19.1.8 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 11.2.19.1-8. In addition, three Tribal governments are located in the ROI, with members of other Tribal groups located in the county, but whose Tribal governments are located in adjacent counties or states.

11.2.19.1.9 ROI Community and Social Services

This section describes educational, health-care, law enforcement, and firefighting resources in the ROI.

Schools

In 2007, the three-county ROI had a total of 347 public and private elementary, middle, and high schools (NCES 2009). Table 11.2.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Iron County schools (21.2) is higher than that in Clark County (19.0) and Lincoln County schools (13.3), while the level of service is much higher in Lincoln County (18.2) than elsewhere in the ROI, where there are fewer teachers per 1,000 population (Iron County 9.3, Clark County 8.7).

TABLE 11.2.19.1-7 ROI Housing Characteristics for the Proposed Delamar Valley SEZ

Parameter	2000	2007[a]
Clark County, Nevada		
Owner-occupied	302,834	393,453
Rental	209,419	268,572
Vacant units	47,546	92,144
Seasonal and recreational use	8,416	NA
Total units	559,799	754,169
Lincoln County, Nevada		
Owner-occupied	1,156	1,204
Rental	384	400
Vacant units	638	664
Seasonal and recreational use	305	NA
Total units	2,178	2,268
Iron County, Utah		
Owner-occupied	7,040	8,387
Rental	3,587	5,387
Vacant units	2,991	4,202
Seasonal and recreational use	1,986	NA
Total units	13,618	17,976
ROI		
Owner-occupied	311,030	403,044
Rental	213,390	274,359
Vacant units	51,175	97,010
Seasonal and recreational use	10,707	NA
Total units	575,595	774,413

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h-j).

TABLE 11.2.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed Delamar Valley SEZ

Governments	
City	
Boulder City, Nevada	Kanaraville, Utah
Brian Head, Utah	Las Vegas, Nevada
Caliente, Nevada	Mesquite, Utah
Cedar City, Nevada	North Las Vegas
Enoch, Utah	Paragonah, Utah
Henderson,. Nevada	Parowan, Utah
County	
Clark County, Nevada	Iron County, Utah
Lincoln County, Nevada	
Tribal	
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada	
Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada	
Paiute Indian Tribe of Utah	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

TABLE 11.2.19.1-9 ROI School District Data for the Proposed Delamar Valley SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Clark County, Nevada	303,448	15,930	19.0	8.7
Lincoln County, Nevada	1,074	81	13.3	18.2
Iron County, Utah	8,522	402	21.2	9.3
ROI	313,044	16,413	19.1	8.7

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

Health Care

The total number of physicians (4,220) and the number of physicians per 1,000 population (2.3) in Clark County is higher than in Iron County (55, 1.3) and in Lincoln County (2, 0.4) (Table 11.2.19.1-10).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 11.2.19.1-11). Lincoln County has 26 officers and would provide law enforcement services to the SEZ; there are 3,214 officers in Clark County and 31 officers in Iron County. Levels of service of police protection per 1,000 population are 5.8 in Lincoln County, 1.7 in Clark County, and 0.7 in Iron County. Currently, there are 1,000 professional firefighters in the ROI (Table 11.2.19.1-11).

11.2.19.1.10 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction

TABLE 11.2.19.1-10 Physicians in the Proposed Delamar Valley SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Clark County, Nevada	4,220	2.3
Lincoln County, Nevada	2	0.4
Iron County, Utah	55	1.3
ROI	4,277	2.3

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

TABLE 11.2.19.1-11 Public Safety Employment in the Proposed Delamar Valley SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Clark County, Nevada	3,214	1.7	991	0.5
Lincoln County, Nevada	26	5.8	1	0.2
Iron County, Utah	31	0.7	8	0.2
ROI	3,271	1.7	1,000	0.5

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism and illicit drug use, mental health, and divorce, which might be used as indicators of social change, are presented in Tables 11.2.19.1-12 and 11.2.19-1.13, respectively.

There is some variation in the level of crime across the ROI, with higher rates of violent crime in Clark County (8.0 per 1,000 population) than in Lincoln County (1.3) and Iron County (1.2) (Table 11.2.19.1-12). Property-related crime rates are also higher in Clark County (34.5) than in Iron County (23.7) and Lincoln County (7.3); overall crime rates in Clark County (42.5) were higher than in Iron County (24.9) and Lincoln County (8.6).

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAHMSA region in which the ROI is located. There is slight variation across the two regions in which the three counties are located; rates for alcoholism and mental health are slightly higher in the region in which Clark County is located (Table 11.2.19.1-13).

11.2.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 11.2.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In

TABLE 11.2.19.1-12 County and ROI Crime Rates for the Proposed Delamar Valley SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
Clark County, Nevada	15,505	8.0	66,905	34.5	82,410	42.5
Lincoln County, Nevada	6	1.3	34	7.3	40	8.6
Iron County, Utah	56	1.2	1,085	23.7	1,141	24.9
ROI	15,567	8.1	68,024	35.3	83,591	43.4

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 11.2.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Delamar Valley SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Nevada Clark	8.2	2.7	10.5	–[d]
Nevada Rural (includes Lincoln County)	8.0	2.7	9.5	–
Utah Southwest Region (includes Iron County)	5.6	2.5	11.3	–
Nevada				6.5
Utah				3.6

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence on or abuse of alcohol or illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] A dash indicates date not available.

Sources: SAMHSA (2009); CDC (2009).

addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar facilities, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 240,631 people were employed in the ROI in the various sectors identified as recreation, constituting 26.1% of total ROI employment (Table 11.2.19.1-14). Recreation spending also produced almost $9,455 million in income in the ROI in 2007. The primary sources of recreation-related employment were hotels and lodging places and eating and drinking places.

11.2.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of facilities employing various solar energy technologies are analyzed in detail in subsequent sections.

TABLE 11.2.19.1-14 Recreation Sector Activity in the Proposed Delamar Valley SEZ ROI, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	4,681	147.6
Automotive rental	2,909	118.3
Eating and drinking places	105,589	3,230.5
Hotels and lodging places	116,751	5,620.2
Museums and historic sites	285	17.8
Recreational vehicle parks and campsites	352	10.1
Scenic tours	5,448	221.7
Sporting goods retailers	4,436	88.4
Total ROI	240,631	9,454.7

Source: MIG, Inc. (2010).

11.2.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Delamar Valley SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy facilities are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar facilities in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodations otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy development in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, and delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 0.1% in regional population during construction of the trough technology, with smaller increases for the power tower, dish engine and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, because of the lack of available housing to accommodate all in-migrating workers and families in smaller rural communities in the ROI and insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar projects on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar facilities are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

Livestock Grazing Impacts

Cattle ranching and farming supported 95 jobs, and $1.3 million in income in the ROI in 2007 (MIG, Inc. 2010). The construction and operation of solar facilities in the Delamar Valley SEZ could result in a decline in the amount of land available for livestock grazing, resulting in total (direct plus indirect) impacts of the loss of four jobs and $0.1 million in income in the ROI. There would also be a decline in grazing fees payable to the BLM and to the USFS by individual permittees based on the number of AUMs required to support livestock on public land. Assuming the 2008 fee of $1.35 per AUM, grazing fee losses would amount to $1,036 annually on land dedicated to solar facilities in the SEZ.

Access Road Impacts

The impacts of construction of an access road connecting the Delamar Valley SEZ could include the addition of 169 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 11.2.19.2-1). Construction activities in the peak year would constitute less than 1% of total ROI employment. Access road construction would also produce $6.7 million in ROI income. Direct sales taxes would each be $0.2 million; direct income taxes in Utah would be less than $0.1 million.

Total operations (maintenance) employment impacts in the ROI (including direct and indirect impacts) of an access road would be less than 1 job during the first year of operation (Table 11.2.19.2-1) and would also produce less than $0.1 million in income. Direct sales taxes would be less than $0.1 million in the first year, with direct income taxes of less than $0.1 million.

TABLE 11.2.19.2-1 ROI Socioeconomic Impacts of an Access Road Connecting the Proposed Delamar Valley SEZ[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	97	<1
Total	169	<1
Income[b]		
Total	6.7	<0.1
Direct state taxes[b]		
Sales	0.2	<0.1
Income	<0.1	<0.1
In-migrants (no.)	0	0
Vacant housing[c] (no.)	0	0
Local community service employment		
Teachers (no.)	0	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts assume 8 mi (13 km) of access road is required for the Delamar Valley SEZ. Construction impacts are assessed for the peak year of construction. Although gravel surfacing might be used, the analysis assumes the access road will be paved.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

Construction and operation of an access road would not require the in-migration of workers and their families from outside the ROI; consequently, no impacts on housing markets in the ROI would be expected, and no new community service employment would be required in order to meet existing levels of service in the ROI.

11.2.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are presented in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) would be required for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of two projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 6,000 acres (24 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower and 2022 for the minimum facility size for dish engine and PV, and 2023 was assumed for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 6,048 jobs (Table 11.2.19.2-2). Construction activities would constitute 0.4% of total ROI employment. A solar facility would also produce $369.5 million in income. Direct sales taxes would be $2.4 million; direct income taxes in Utah would be $0.2 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 1,486 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility

TABLE 11.2.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Delamar Valley SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	3,488	577
Total	6,048	890
Income[b]		
Total	369.5	33.6
Direct state taxes[b]		
Sales	2.4	0.3
Income	0.2	<0.1
BLM payments		
Acreage-related fee	NA	1.0
Capacity fee[d]	NA	17.4
In-migrants (no.)	1,486	74
Vacant housing[c] (no.)	743	66
Local community service employment		
Teachers (no.)	13	1
Physicians (no.)	3	0
Public safety (no.)	3	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,200 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,648 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

construction on the number of vacant rental housing units would not be expected to be large, with 743 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 13 new teachers, 3 physicians, and 3 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 890 jobs (Table 11.2.19.2-2). Such a solar facility would also produce $33.6 million in income. Direct sales taxes would be $0.3 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $1.0 million, and solar generating capacity fees, at least $17.4 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 74 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 66 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 2,409 jobs (Table 11.2.19.2-3). Construction activities would constitute 0.2 % of total ROI employment. Such a solar facility would also produce $147.2 million in income. Direct sales taxes would be $0.9 million; direct income taxes in Utah would be $0.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with

TABLE 11.2.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Delamar Valley SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	1,389	298
Total	2,409	405
Income[b]		
Total	147.2	14.0
Direct state taxes[b]		
Sales	0.9	<0.1
Income	0.1	<0.1
BLM payments		
Acreage-related fee	NA	1.0
Capacity fee[d]	NA	9.7
In-migrants (no.)	592	38
Vacant housing[c] (no.)	296	34
Local community service employment		
Teachers (no.)	5	0
Physicians (no.)	1	0
Public safety (no.)	1	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,471 MW.

b Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

592 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 296 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.5% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 5 new teachers, 1 physician, and 1 public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 405 jobs (Table 11.2.19.2-3). Such a solar facility would also produce $14.0 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $1.0 million, and solar generating capacity fees, at least $9.7 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 38 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 34 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 979 jobs (Table 11.2.19.2-4). Construction activities would constitute 0.1% of total ROI employment. Such a solar facility would also produce $59.8 million in income. Direct sales taxes would be $0.4 million; direct income taxes in Utah would be less than $0.1 million.

TABLE 11.2.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Delamar Valley SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	565	290
Total	979	394
Income[b]		
Total	59.8	13.6
Direct state taxes[b]		
Sales	0.4	<0.1
Income	<0.1	<0.1
BLM payments		
Acreage-related fee	NA	1.0
Capacity fee[d]	NA	9.7
In-migrants (no.)	241	37
Vacant housing[c] (no.)	120	33
Local community service employment		
Teachers (no.)	2	0
Physicians (no.)	1	0
Public safety (no.)	1	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,471 MW.

b Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers that would reside in Utah.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 241 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 120 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.2% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 394 jobs (Table 11.2.19.2-4). Such a solar facility would also produce $13.6 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $1.0 million, and solar generating capacity fees, at least $9.7 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 37 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 33 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 457 jobs (Table 11.2.19.2-5). Construction activities would constitute less than 0.1 % of total ROI employment. Such solar

TABLE 11.2.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Delamar Valley SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	263	29
Total	457	39
Income[b]		
Total	27.9	1.4
Direct state taxes[b]		
Sales	0.2	<0.1
Income	<0.1	<0.1
BLM payments		
Acreage-related fee	NA	1.0
Capacity fee[d]	NA	7.7
In-migrants (no.)	112	4
Vacant housing[c] (no.)	56	3
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,471 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h) , assuming full build-out of the site.

development would also produce $27.9 million in income. Direct sales taxes would be $0.2 million; direct income taxes in Utah would be less than $0.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 112 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 56 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 39 jobs (Table 11.2.19.2-5). Such a solar facility would also produce $1.4 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $1.0 million, and solar generating capacity fees, at least $7.7 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with four persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with three owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

11.2.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Delamar Valley SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

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11.2.20 Environmental Justice

11.2.20.1 Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register,* Volume 59, page 7629, Feb. 11, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority**. Persons who identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origins may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income**. Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 11.2.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

Minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Nevada, 17.0% of the population is classified as minority, while 10.1% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

In the Utah portion of the 50-mi (80-km) radius, 9.3% of the population is classified as minority, while 17.0% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does

TABLE 11.2.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Delamar Valley SEZ

Parameter	Nevada	Utah
Total population	12,838	5,101
White, non-Hispanic	10,659	4,625
Hispanic or Latino	1,353	242
Non-Hispanic or Latino minorities	826	234
One race	593	177
Black or African American	101	7
American Indian or Alaskan Native	393	149
Asian	51	11
Native Hawaiian or Other Pacific Islander	21	2
Some other race	27	8
Two or more races	233	57
Total minority	2,179	476
Low-income	1,295	865
Percentage minority	17.0	9.3
State percentage minority	17.2	15.9
Percentage low-income	10.1	17.0
State percentage low-income	10.5	9.4

Source: U.S. Bureau of the Census (2009k,l).

not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

Figures 11.2.20.1-1 and 11.2.20.1-2 show the locations of the low-income and minority population groups, respectively, within the 50-mi (80-km) radius around the boundary of the SEZ.

At the individual block group level there are low-income populations in one census block group, located in Iron County to the west of Cedar City, including the towns of Newcastle and Modena, which has a low-income population that is more than 20 percentage points higher than the state average. There are no other block groups exceeding the 20% threshold in the 50-mi (80-km) area, and there are no block groups with low-income or minority populations that exceed 50% of the total population in the block group, and the number of minority individuals does not exceed the state average by 20 percentage points or more at the individual block group level.

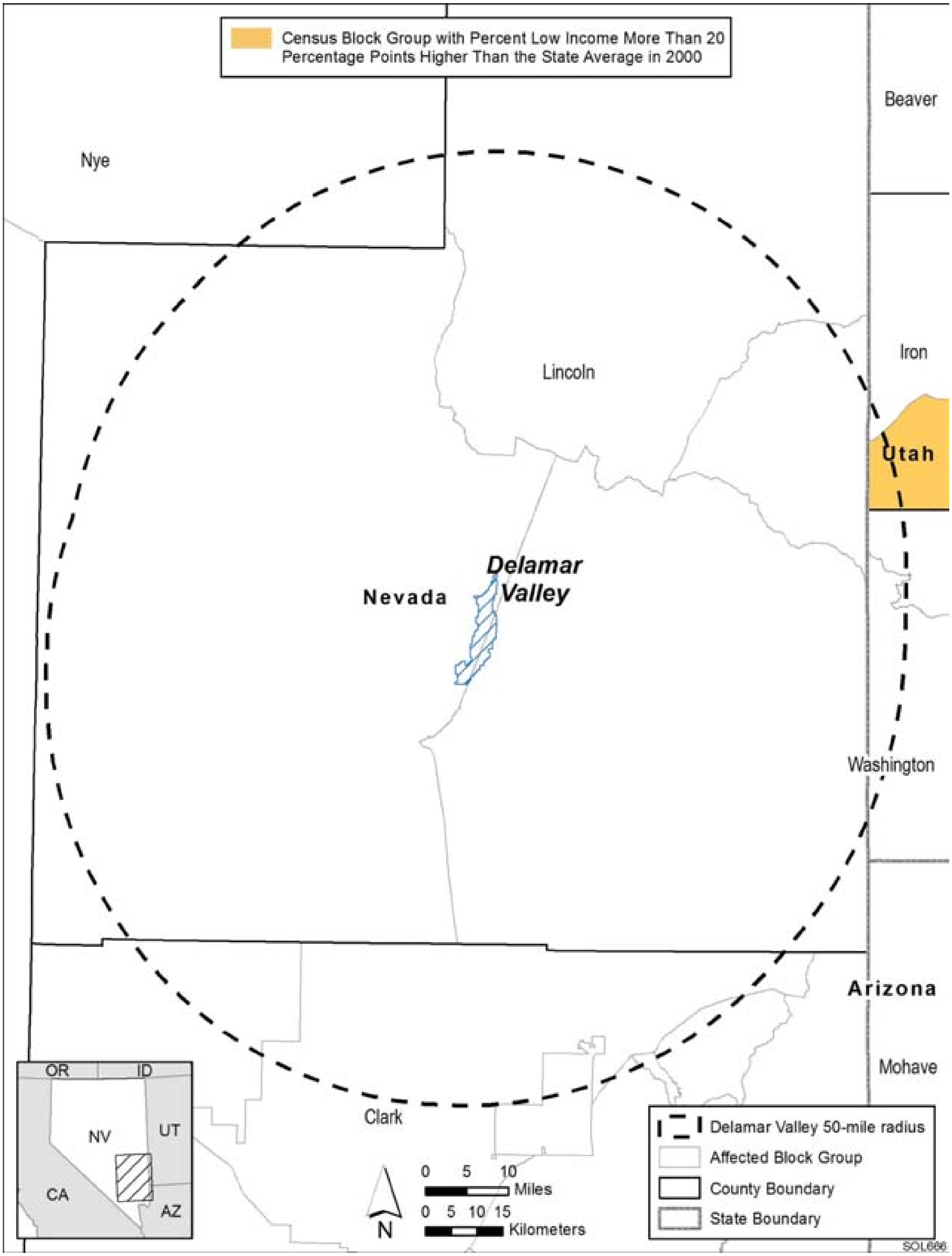

FIGURE 11.2.20.1-1 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Delamar Valley SEZ

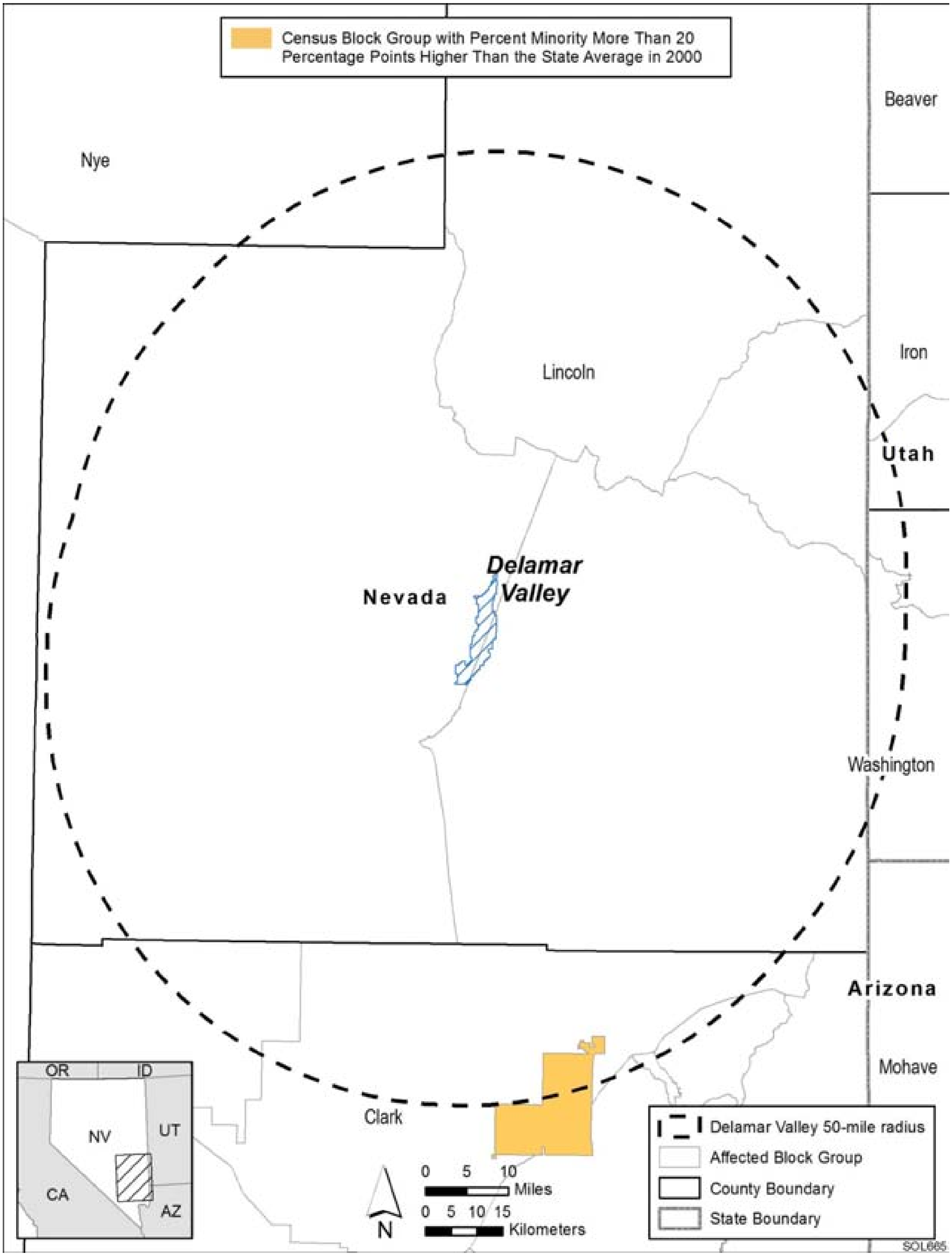

FIGURE 11.2.20.1-2 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Delamar Valley SEZ

A single block group with minority populations more than 20 percentage points higher than the state average is located to the northeast of Las Vegas, associated with the Moapa River Indian Reservation.

11.2.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of the programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed Delamar Valley SEZ include noise and dust during the construction; noise and EMF effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (Section 11.2.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects could disproportionately affect minority populations. Because there are low-income populations within the 50-mi (80-km) radius, there could also be impacts on low-income populations.

11.2.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Delamar Valley SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

11.2.21 Transportation

The proposed Delamar Valley SEZ is accessible by road and rail. One U.S. highway serves the immediate area, and a major railroad is in the vicinity. A small airport with a dirt runway is nearby with major airport facilities farther away in Las Vegas. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

11.2.21.1 Affected Environment

U.S. 93 runs north–south, approximately 8 to 14 mi (13 to 23 km) to the west of the proposed Delamar Valley SEZ and also east–west, approximately 8 mi (13 km) to the north of the SEZ, as shown in Figure 11.2.21.1-1. Approximately 16 to 21 mi (26 to 34 km) east of the SEZ, State Route 317 passes from the north to south, going south from Caliente to Elgin, an abandoned railroad town. The town of Alamo is west of the Delamar Valley SEZ on U.S. 93. The Las Vegas metropolitan area is approximately 90 mi (145 km) to the south of the SEZ along U.S. 93. Several local unimproved dirt roads cross the SEZ from U.S. 93. As listed in Table 11.2.21.1-1, U.S. 93 carries an average traffic volume of about 1,600 to 1,900 vehicles per day west of the SEZ and about 650 to 740 vehicles per day north of the SEZ (NV DOT 2010). State Route 317 carries less than 100 vehicles per day in the vicinity of the Delamar Valley SEZ (NV DOT 2010). OHV use in the SEZ and surrounding area has been designated as "Limited to travel on designated roads and trails" (BLM 2010c).

The UP Railroad serves the region. The main line passes through Las Vegas on its way between Los Angeles and Salt Lake City. The railroad passes west of the proposed Delamar Valley SEZ where it parallels State Route 317. The nearest rail access is in Caliente to the northeast of the SEZ.

The nearest public airport, owned by the BLM, is the Alamo Landing Field Airport. The airport is west of the SEZ off of U.S. 93 with two dirt runways, 2,500- and 5,000-ft (762- and 1,524-m) long, both in fair condition (FAA 2009) as listed in Table 11.2.21.1-2. The second closest public airport is the Lincoln County Airport, a small local airport about a 15-mi (24-km) drive to the north of Caliente in Panaca. The airport has one asphalt runway, 4,260-ft (1,408-m) long, in fair condition (FAA 2009). Alamo Landing Field Airport and Lincoln County Airport do not have any scheduled commercial passenger or freight service.

North Las Vegas Airport and McCarran International Airport provide the major public air services in the area. North Las Vegas Airport, a regional airport about a 95-mi (153-km) drive to the southwest of Alamo, does not have scheduled commercial passenger service but caters to smaller private and business aircraft (Clark County Department of Aviation 2010). In 2008, 22,643 and 23,950 passengers arrived at and departed from North Las Vegas Airport, respectively (BTS 2008). Farther to the south in Las Vegas, approximately a 102-mi (164-km) drive from Alamo, McCarran International Airport is served by all major U.S. airlines. In 2008, 20.43 million and 20.48 million passengers arrived at and departed from McCarran International Airport, respectively (BTS 2008). About 83.2 million lb (37.7 million kg) of freight departed and 117 million lb (53.2 million kg) arrived at McCarran in 2008 (BTS 2008).

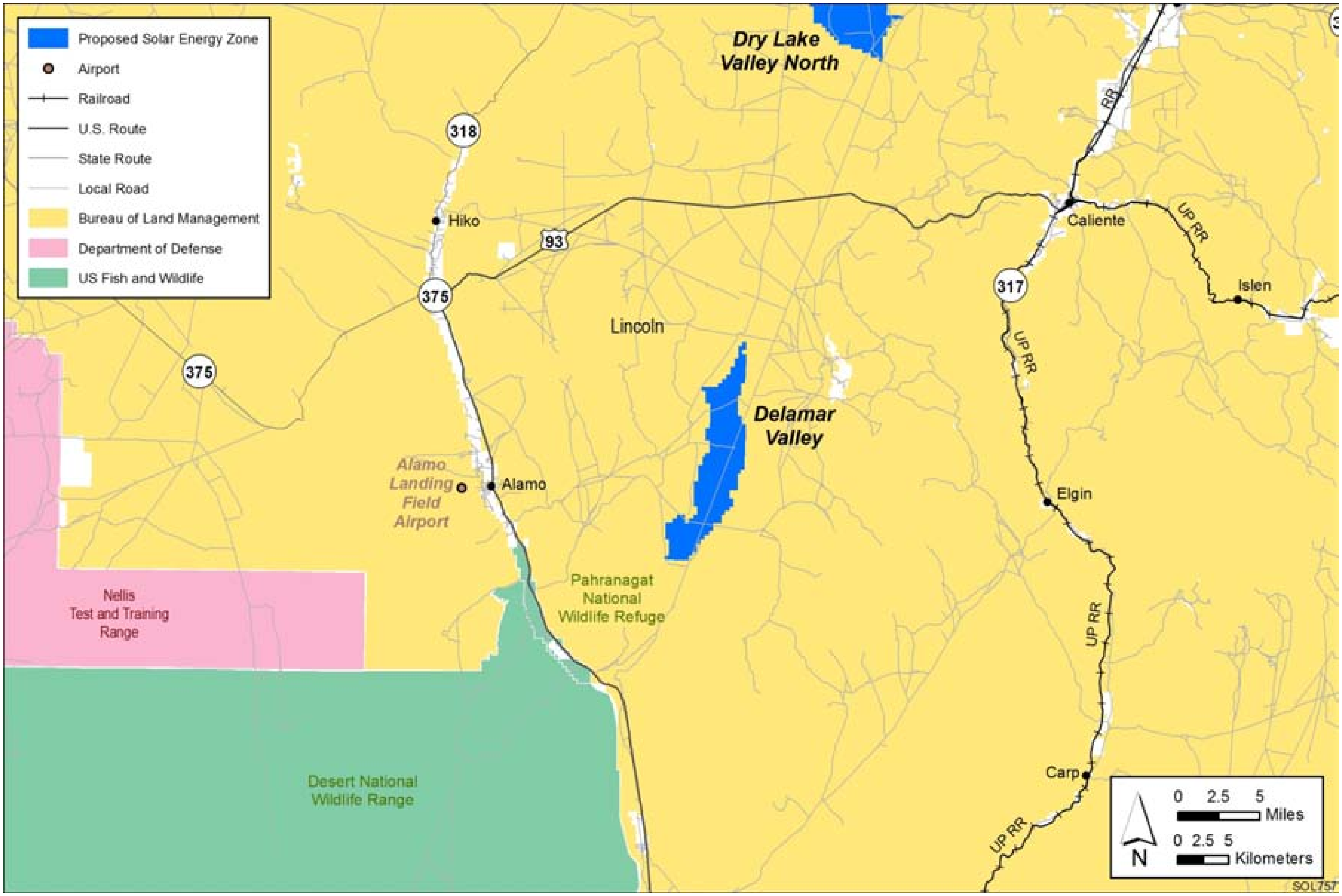

FIGURE 11.2.21.1-1 Local Transportation Network Serving the Proposed Delamar Valley SEZ

TABLE 11.2.21.1-1 AADT on Major Roads near the Proposed Delamar Valley SEZ for 2009

Road	General Direction	Location	AADT (vehicles)
U.S. 93	North–South	North of I-15 Junction (I-15 Exit 64)	2,300
		South of Alamo	1,900
		South of State Route 318	1,600
		North of State Route 375	650
		South of State Route 317 by Caliente	740
		North of Caliente	1,400
State Route 317	North–South	6 mi south of U.S. 93	80
		3 mi south of Elgin	30
State Route 318	North–South	West of junction with U.S. 93	1,100
		1.6 mi north of junction with State Route 375	1,200
State Route 375	East–West	West of junction with State Route 318	200

Source: NV DOT (2010).

Nellis Air Force Base, available only to military aircraft, lies closer to the proposed Delamar Valley SEZ than North Las Vegas Airport on the northwestern edge of the Las Vegas metropolitan area. Nellis Air Force Base is one of the largest fighter bases in the world and is involved in conducting advanced fighter training. Operations occur over the NTTR, which offers 4,700 mi^2 (12,173 km^2) of restricted land (U.S. Air Force 2010). Part of the eastern edge of the NTTR is approximately 18 mi (29 km) to the west–southwest of the southwestern portion of the SEZ.

11.2.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum) or possibly 4,000 vehicle trips per day if two larger projects were to be developed at the same time. The volume of traffic on U.S. 93 to the west of the proposed Delamar Valley SEZ would represent an increase in traffic of about 100 or 200% for one or two projects, respectively, should all traffic access the SEZ in that area. Such traffic levels would also represent an increase of about 250 or 500% of the traffic currently encountered on the east–west portion of U.S. 93 to the north of the SEZ for one or two projects, respectively.

Because higher traffic volumes would be experienced during shift changes, traffic on U.S. 93 would experience minor slowdowns during these time periods in the area of exits in the vicinity of the SEZ where projects are located. Local road improvements would be necessary on

TABLE 11.2.21-2 Airports Open to the Public in the Vicinity of the Proposed Delamar Valley SEZ

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Alamo Landing Field	Directly east of the SEZ on U.S. 93	BLM	2,500 (762)	Dirt	Fair	5,000 (1,524)	Dirt	Fair
Lincoln County	Northeast of the SEZ in Panaca, a 70-mi (113-km) drive from Alamo	Lincoln County	4,620 (1,408)	Asphalt	Fair	NA[b]	NA	NA
North Las Vegas	Near I-15 in North Las Vegas, a 95-mi (34-km) drive from Alamo	Clark County	4,202 (1,281)	Asphalt	Good	5,000 (1,524)	NA	Good
			5,004 (1,525)	Asphalt	Good	NA	NA	NA
McCarran International	Off I-15 in Las Vegas, about 102 mi (164 km)	Clark County	8,985 (2,739)	Concrete	Good	9,775 (2,979)	Concrete	Good
			10,526 (3,208)	Asphalt	Good	14,510 (4,423)	Asphalt	Good
			6,196 (1,889)	Asphalt	Good	7,161 (2,183)	Asphalt	Good

[a] Source: FAA (2009).

[b] NA = not applicable.

any portion of U.S. 93 that might be developed so as not to overwhelm the local access roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any designated as open within the proposed SEZ, open routes crossing areas issued ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

11.2.21.3 Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed Delamar Valley SEZ. The programmatic design features described in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented

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11.2.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Delamar Valley SEZ in Lincoln County, Nevada. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The land surrounding the Delamar Valley SEZ is undeveloped and no permanent residents live in the area. The nearest population center is the small community of Alamo about 9 mi (14 km) from the western boundary of the SEZ. The Pahranagat NWR and the Desert National Wildlife Range are located southwest of the SEZ. Two WAs are located near the Delamar Valley SEZ: the Delamar Mountains WA is located south of the SEZ, and the South Pahroc Range is northwest of the SEZ. Five other WAs are within 50 mi (80 km) of the SEZ. The BLM administers approximately 82% of the lands in the Ely District that contains the Delamar SEZ. In addition, the proposed Dry Lake Valley North SEZ is located about 20 mi (32 km) to the north, the proposed East Mormon Mountain SEZ is located about 40 mi (64 km) to the southeast, and the Dry Lake SEZ is located about 51 mi (82 km) to the south of the Delamar Valley SEZ, and for some resources, the geographic extents of impacts from multiple SEZs overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the Delamar Valley SEZ is identified in Section 11.2.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 11.2.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 11.2.22.3. Cumulative impacts for each resource area are discussed in Section 11.2.22.4.

11.2.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Delamar Valley SEZ is provided in Table 11.2.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than visual resources). Most of the lands around the SEZ are administered by the BLM, the USFWS, or the DoD; there are also some Tribal lands at the Moapa River Reservation about 44 mi (70 km) south of the SEZ. The BLM administers approximately 78% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 11.2.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Delamar Valley SEZ

Resource Area	Geographic Extent
Land Use	Central Lincoln County–Delamar Valley
Specially Designated Areas and Lands with Wilderness Characteristics	Central Lincoln County
Rangeland Resources	
Grazing	Central Lincoln County
Wild Horses and Burros	A 50-mi (80-km) radius from the center of the Delamar Valley SEZ
Recreation	Central Lincoln County
Military and Civilian Aviation	Central Lincoln County
Soil Resources	Areas within and adjacent to the Delamar Valley SEZ
Minerals	Central Lincoln County
Water Resources	
Surface Water	Jumbo Wash and another intermittent stream, several ephemeral washes, and the dry Delamar Lake
Groundwater	Delamar Valley, Pahranagat Valley, and Coyote Springs Valley groundwater basins, White River Groundwater Flow System
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Delamar Valley SEZ
Vegetation, Wildlife, and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Delamar Valley SEZ, including portions of Lincoln, Clark, and Nye Counties in Nevada, and Washington and Iron Counties in Utah
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Delamar Valley SEZ
Acoustic Environment (noise)	Areas adjacent to the Delamar Valley SEZ
Paleontological Resources	Areas within and adjacent to the Delamar Valley SEZ
Cultural Resources	Areas within and adjacent to the Delamar Valley SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Delamar Valley SEZ for other properties, such as traditional cultural properties.
Native American Concerns	Delamar Valley and surrounding mountain ranges; viewshed within a 25-mi (40-km) radius of the Delamar Valley SEZ.
Socioeconomics	Lincoln and Clark Counties in Nevada, Iron County in Utah
Environmental Justice	Lincoln County
Transportation	U.S. 93; State Routes 317, 318, 375

11.2.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable;" that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;

- Proposals in a detailed design phase;

- Proposals listed in formal NOIs published in the *Federal Register* or state publications;

- Proposals for which enabling legislations has been passed; and

- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 11.2.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 11.2.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

11.2.22.2.1 Energy Production and Distribution

On February 16, 2007, Governor Jim Gibbons signed an Executive Order to encourage the development of renewable energy resources in Nevada (Gibbons 2007a). The Executive Order requires all relevant state agencies to review their permitting processes to ensure the timely and expeditious permitting of renewable energy projects. On May 9, 2007, and June 12, 2008, the governor signed Executive Orders creating the Nevada Renewable Energy Transmission Access Advisory Committee Phase I and Phase II that will propose recommendations for improved access to the grid system for renewable energy industries (Gibbons 2007b, 2008). In May 28, 2009, the Nevada legislature passed a bill modifying the Renewable Energy Portfolio Standards (Nevada Senate 2009). The bill requires that 25% of the electricity sold to be produced by renewable energy sources by 2025.

No existing and only one foreseeable energy production facility are located within a 50-mi (80-km) radius from the center of the Delamar Valley SEZ. The 50-mi (80-km) area includes portions of Lincoln, Clark, and Nye Counties in Nevada, and Washington and Iron Counties in Utah. Reasonably foreseeable future actions related to energy distribution are identified in Table 11.2.22.2-1 and described in the following sections.

Renewable Energy Development

Renewable energy ROW applications on public land are considered in two categories, fast-track and regular-track applications. Fast-track applications, which apply principally to solar energy facilities, are those applications on public lands for which the environmental review and public participation process is under way and the applications could be approved by December 2010. A fast-track project would be considered foreseeable because the permitting and environmental review processes would be under way. There are no fast-track projects within 50 mi (80 km) of the proposed Delamar Valley SEZ. Regular-track proposals are considered potential future projects, but not necessarily foreseeable projects, since not all applications would be expected to be carried to completion. These proposals are considered together as a general level of interest in development of renewable energy in the region. In addition, foreseeable projects on private land are considered. One such project, the BrightSource Energy Solar Project, has been identified and is discussed below.

TABLE 11.2.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Delamar Valley SEZ

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Development			
BrightSource Coyote Springs Project; 960 MW, solar tower	Planning stage	Terrestrial habitats, wildlife, water, visual, cultural, socioeconomics	33 mi (53 km) south of the SEZ
Transmission and Distribution Systems			
Southwest Intertie Project	FONSI issued July 30, 2008 In-service in 2010	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes through the SEZ
One Nevada Transmission Line Project	Draft Supplemental EIS Nov. 30, 2009	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes through the SEZ
Zephyr and Chinook Transmission Line Project	Permit Applications in 2011/2012	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes near or through the SEZ

BrightSource Energy Solar Project. BrightSource Energy is planning to build a 960 MW solar thermal powered facility on private land at the Coyote Springs Investment Development Project at the junction of US 93 and State Route 168. The facility will utilize the Luz Power Tower, which consists of thousands of mirrors that reflect sunlight onto a boiler filled with water sitting on top of a tower. The high temperature steam produced is piped to a conventional turbine that generates electricity. The station will utilize a dry-cooling system. The site, approximately 7,680 acres (31 km^2) in size, would be located 33 mi (53 km) south of the SEZ (BrightSource Energy 2009).

Pending Solar and Wind ROW Applications on BLM-Administered Lands. Applications for right-of-way grants that have been submitted to the BLM include two pending solar projects and one pending authorization for wind site testing that would be located within 50 mi (80 km) of the Delamar Valley SEZ (BLM 2010d). No applications for geothermal projects have been submitted. Table 11.2.22.2-2 lists these applications and Figure 11.2.22.2-1 shows their locations.

The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The number and type of projects listed in Table 11.2.22.2-2 are an indication of the level of interest in development of renewable energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in general for their potential aggregate effects.

Wind testing would involve some relatively minor activities that could have some environmental effects, mainly the erection of meteorological towers and monitoring of wind conditions. These towers may or may not employ guy wires and may be 200 ft (60 m) high.

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Energy Transmission and Distribution Projects

The following proposed transmission line projects, which would run through or near the proposed Delamar Valley SEZ, are considered reasonably foreseeable projects.

TABLE 11.2.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Delamar Valley SEZ[a,b]

Serial Number	Applicant	Application Received	Size (acres)[c]	MW	Technology	Status	Field Office
Solar Applications							
NVN-84467	Pacific Solar Investments Inc	Dec. 7, 2007	11,000	1,000	CSP/Trough	Pending	Las Vegas
NVN-86350	Solar Reserve LLC	Oct. 2, 2008	7,680	180	CSP/Tower	Pending	Caliente
Wind Applications							
NVN-87970	Pacific Wind Development	-[d]	-	-	Wind	Pending Wind Site Testing	Las Vegas

[a] Source: BLM (2009c).

[b] Information for pending solar and pending wind energy projects downloaded from *GeoCommunicator* (BLM and USFS 2010b).

[c] To convert acres to km^2, multiply by 0.004047.

[d] A dash indicates data not available.

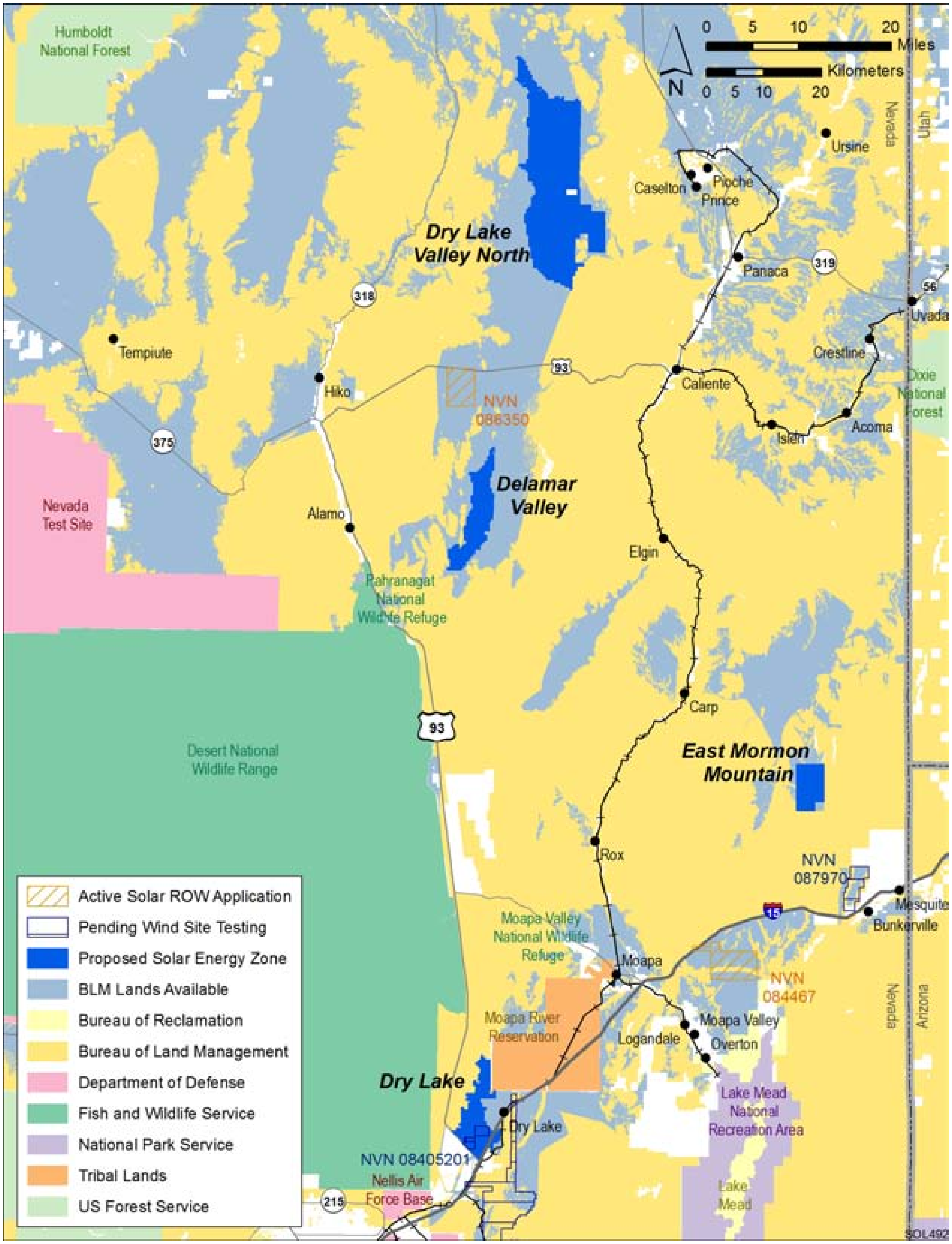

FIGURE 11.2.22.2-1 Locations of Renewable Energy Project ROW Applications on Public Land within a 50-mi (80-km) Radius of the Proposed Delamar Valley SEZ

Southwest Intertie Project (SWIP). The SWIP is a 520-mi (830-km) long single-circuit, overhead 500-kV transmission line project. The first phase, the Southern Portion, is a 264-mi (422-km) long transmission line that begins at the existing Harry Allen Substation located in Dry Lake, Nevada, and extends north to a proposed substation about 18 mi (29 km) northwest of Ely, Nevada. The transmission line will pass through the SEZ. It will consist of self-supporting, steel-lattice and steel-pole H-frame structures placed 1,200 to 1,500 ft (366 to 457 m) apart. The SWIP is expected to be completed in 2010. Construction could have potential impacts to the Mojave Desert Tortoise (BLM 2007a).

One Nevada Transmission Line Project. NV Energy proposes to construct and operate a 236-mi (382-km) long, 500-kV transmission line with fiber optic telecommunication and appurtenant facilities in White Pine, Nye, Lincoln, and Clark Counties. It will consist of self-supporting, steel-lattice and steel-pose H-frame structures, placed 900 to 1,600 ft (274 to 488 m) apart. The width of the right-of-way is 200 ft (61 m). The proposed action includes new substations outside the ROI of the Delamar Valley SEZ. The transmission line would be within the SWIP utility corridor that passes through the SEZ. Construction could have potential impacts to the Mojave Desert Tortoise (BLM 2009e).

Zephyr and Chinook Transmission Line Project. TransCanada is proposing to construct two 500-kV high-voltage direct current transmission lines. The Zephyr project would originate in southeastern Wyoming. The Chinook project would originate in south central Montana. Both would travel along the same corridor from northern Nevada, passing near or through the SEZ, and terminate in the El Dorado Valley south of Las Vegas. Construction is expected to be complete in 2015 or 2016 (TransCanada 2010).

11.2.22.2.2 Other Actions

Other major ongoing and foreseeable actions identified within 50 mi (80 km) of the proposed Delamar Valley SEZ are listed in Table 11.2.22.2-3 and described in the following subsections.

Arizona Nevada Tower Corporation (ANTC). ANTC has constructed seven cellular telephone signal relay towers in Lincoln County along the U.S. 93 corridor between Coyote Springs Valley and the town of Pioche. Four of the seven sites are 100-ft (30.5-m) square parcels. The remaining three are 50 ft × 100 ft (15.7 m × 30.5 m), 50 ft × 120 ft (15.7 m × 36.6 m) and 100 ft × 200 ft (30.5 m × 61.0 m). Utility corridors were extended to six of the sites to supply electricity. Solar cells are the primary source of power for the Alamo Peak site, with wind generation as the backup. The towers are steel lattice, three-sided and free standing, and each tower base is a 30-ft (9-m) square concrete slab. The towers at Alamo Peak and Highland Peak are 125 ft (38.1 m) high, and the other five are 195 ft (59.4 m) high (BLM 2007b).

TABLE 11.2.22.2-3 Other Major Actions near the Proposed Delamar Valley SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Arizona Nevada Tower Corporation Communication Sites	EA issued April 2007	Terrestrial habitats, wildlife, cultural resources	East, west ,and southwest of the SEZ
Patriot Communication Exercises in Lincoln County	DEA April 2008	Terrestrial habitats, wildlife, soils	North of the SEZ
Caliente Rail Realignment	FEIS June 2008	Terrestrial habitats, wildlife cultural resources	25 mi (40 km) north of the SEZ
Delamar Valley Groundwater Testing/Monitoring Wells	EA and FONSI issued Sept. 2009	Terrestrial habitats, wildlife cultural resources	Within the SEZ
Meadow Valley Gypsum Project	EA and FONSI issued 2008	Terrestrial habitats, wildlife, soils, socioeconomics	Southeast of the SEZ
Clark, Lincoln and White Pine Counties Groundwater Development Project	DEIS expected in March 2011	Terrestrial habitats, wildlife, groundwater	Within the SEZ
Lincoln County Land Act Groundwater Development and Utility ROW	FEIS issued May 2009	Terrestrial habitats, wildlife, groundwater	Southeast of the SEZ
Coyote Springs Investment Development Project	FEIS issued Sept. 2008, ROD issued Oct. 2008	Terrestrial habitats, wildlife, water, socioeconomics	20-33 mi (32-53 km) south of the SEZ
Kane Springs Groundwater Development Project	FEIS issued Feb. 2008	Terrestrial habitats, wildlife, groundwater	20 mi (32 km) south of the SEZ
Alamo Industrial Park and Community Expansion	Preliminary Design Report Jan. 2000. FEIS issued Jan. 2010.	Terrestrial habitats, wildlife, socioeconomics	10 mi (16 km) west of the SEZ
Meadow Valley Industrial Park	FEIS issued Jan. 2010	Terrestrial habitats, wildlife, socioeconomics	20 mi (32 km) northeast of the SEZ
NV Energy Microwave and Mobile Radio Project	Preliminary EA issued March 2010	Terrestrial habitats, wildlife cultural resources	Two of the sites 40 mi (64 km) west of SEZ, one site 50 mi (80 km) northwest of SEZ
U.S. 93 Corridor Wild Horse Gather	EA issued Dec. 28, 2009	Terrestrial habitats, wildlife	North of the SEZ
Silver King Herd Management Area Wild Horse Gather	Preliminary EA issued June 10, 2010	Terrestrial habitats, wildlife	North of the SEZ
Eagle Herd Management Area Wild Horse Gather	Preliminary EA issued Dec. 17, 2009	Terrestrial habitats, wildlife	Northeast of the SEZ
Ash Canyon Sagebrush Restoration and Fuels Reduction Project	Preliminary EA issued May 2010	Terrestrial habitats, wildlife	22 mi (35 km) northeast of the SEZ
Pioche/Caselton Wildland Urban Interface Project	Preliminary EA issued May 2010	Terrestrial habitats, wildlife	35 mi (57 km) northeast of the SEZ

[a] Projects in later stages of agency environmental review and project development.

Other Ongoing Actions

Patriot Communications Exercise in Lincoln County. The U.S. Air Force at Nellis Air Force Base has acquired a 15-year Communications Use Lease to support ground-based radar/communications exercises at fourteen 5.7-acre (0.023-km^2) sites. A maximum of five exercises would be conducted annually for a period of 15 years. Three of the sites are along U.S. 93 about 10 mi (16 km) north of the SEZ (BLM 2008d).

Other Foreseeable Actions

Caliente Rail Alignment. The DOE proposes to construct and operate a railroad for the shipment of spent nuclear fuel and high-level radioactive waste to the geologic repository at Yucca Mountain, Nevada. The rail line would begin near Caliente, Nevada, and extend north; then turn in a westerly direction, passing about 25 mi (40 km) north of the SEZ, to a location near the northwest corner of the NTTR; and then continue south–southwest to Yucca Mountain. The rail line would range in length from approximately 328 mi (528 km) to 336 mi (541 km), depending upon the exact location of the alignment and would be restricted to DOE shipments. Over a 50-year period, 9,500 casks containing spent nuclear fuel and high-level radioactive waste, and approximately 29,000 rail cars of other materials, including construction materials, would be shipped to the repository. An average of 17 one-way trains per week would travel along the rail line. Construction of support facilities—interchange yard, staging yard, maintenance-of-way facility, rail equipment maintenance yard, cask maintenance facility, and Nevada Rail Control Center and National Transportation Operation Center—would also be required. Construction would take 4 to 10 years and cost $2.57 billion. Construction activities would occur inside a 1000-ft (300-m) wide ROW for a total footprint of 40,600 acres (164 km^2) (DOE 2008).

Delamar Valley Groundwater Testing/Monitoring Wells. The Southern Nevada Water Authority (SNWA) intends to construct two to four groundwater wells within two 2.5-acre (0.010-km^2) (a 1.0-acre [0.004-km^2] long-term and a 1.5-acre [0.006-km^2] short-term) locations in the Delamar Valley. The dimensions for the long-term ROW would be 168 ft × 260 ft (51 m × 79 m), and the dimensions for the short-term ROW would be 330 ft × 330 ft (100 m × 100 m) for each site. Two 12-in. (0.30-m) and two 20-in. (0.51-m) wells would be drilled to between 2,200 and 2,400 ft (670 and 730 m) deep. Access to the well sites would be from both existing roads and a new 809-ft (247-m) long access road. Water generated during the tests would be discharged into the natural drainage network around the sites. At the completion of hydraulic testing, SNWA will continue to record data to establish baseline ranges of the groundwater levels in the area (BLM 2009f).

Meadow Valley Gypsum Project. The Meadow Valley Gypsum Project is proposing to mine gypsum on 21.2 acres (0.0858 km^2) of public land, about 35 mi (56 km) southeast of the

SEZ. A total of 46.7 acres (0.189 km^2) would be disturbed during the 10-year lifetime of the project. A 1.5-mi (2.5-km) access road and a 1.8-acre (0.0073-km^2) railroad siding would be constructed (BLM 2007c).

Clark, Lincoln and White Pine Counties Groundwater Development Project. The SNWA proposes a groundwater development project that would transport approximately 122,755 ac-ft/yr (151 million m^3/yr) of groundwater under existing water rights and applications from several hydrographic basins in eastern Nevada and western Utah. The proposed facilities include production wells, 306 mi (490 km) of buried water pipelines, 5 pumping stations, 6 regulating tanks, 3 pressure reducing stations, a buried storage reservoir, a water treatment facility, and about 323 mi (517 km) of 230 kV overhead power lines, 2 primary and 5 secondary substations. A portion of the project will be located in the Delamar Valley SEZ. The project would develop groundwater in the following amounts in two hydraulically connected valleys that would supply groundwater to the Delamar Valley SEZ: Dry Lake Valley (11,584 ac-ft/yr [14.3 million m^3/yr]) and Delamar Valley (2,493 ac-ft/yr [3.1 million m^3/yr]). In addition, an undetermined amount of water could be developed and transferred from Coyote Spring Valley, which is south of the SEZ and down-gradient of the other two basins (SNWA 2010).

Lincoln County Land Act (LCLA) Groundwater Development and Utility ROW. This project involves the construction of the infrastructure required to pump and convey groundwater resources in the Clover Valley and Tule Desert hydrographic areas. The project includes 75 mi (122 km) of collection and transmission pipeline, 30 wells, 5 storage tanks, water pipeline booster stations, transmission lines and substations, and a natural gas pipeline. A total of 240 acres (0.97 km^2) will be permanently disturbed, and 1,878 acres (7.6 km^2) temporarily disturbed. The closest approach to the SEZ is about 35 mi (58 km) east (USFWS 2009b).

Coyote Springs Investment (CSI) Development Project. CSI intends to develop a new town in southern Lincoln County at the junction of U.S. 93 and State Route 168. The town would be a master planned community on 21,454 acres (86.8 km^2) and would include residential, commercial and industrial land uses. Plans call for more than 111,000 residential dwelling units at a density of 5 units per acre. Also included in the community would be public buildings, hotels, resorts, casinos, commercial and light industrial areas, roads, bridges and a heliport. Utilities and other infrastructure would be developed to serve the town, including power facilities, sanitary sewer and wastewater treatment facilities, stormwater facilities, solid waste disposal transfer stations, and telecommunications facilities. Water supply treatment facilities, monitoring wells, production wells, storage facilities, and transmission and distribution facilities would also be built. Approximately 70,000 acre ft/yr (86 million m^3/yr) of water would be needed for the community at full build-out, which may occur over a period of about 40 years. Currently, CSI and its affiliates hold approximately 36,000 acre ft/yr (44.0 million m^3/yr) in certificated groundwater rights in various basins within Lincoln County. CSI currently owns the 21,454-acre development area and holds leases on an additional 7,548 acres (30.6 km^2) of BLM land in Lincoln County and 6,219 acres (25.2 km^2) of BLM land in Clark County within or next to the privately held land. These adjacent areas would be managed by BLM for the protection of federally-listed threatened or endangered species; activities would be limited to non-motorized recreation or scientific research. The north end of the development would lie about 20 mi (32 km) south of the SEZ (USFWS 2008).

Kane Springs Groundwater Development Project. The Lincoln County Water District (LCWD) proposes to construct infrastructure to pump and convey groundwater from the Kane Springs Valley Hydrographic Basin to its Service Territory in the Coyote Spring Valley in southern Lincoln County. Facilities would be located along or near the Kane Springs Road ROW, within a 2,640-foot wide utility corridor. A production well and monitoring well were constructed in 2005. Up to six additional production wells would be placed along an approximately 9.4-mi (15-km) long collection pipeline. Other infrastructure would include a 3.8-mi (6-km) long transmission pipeline and two water storage tanks. A 3-mi (5-km) long 138-kV electrical transmission line, 14 mi (22 km) of lower voltage lines, and a new substation would be built to supply power to the project. The Nevada State Engineer has appropriated 1,000 ac-ft/yr (1.2 million m3/yr) for the project, while full development would be dependent upon water demand and future water rights and could draw up to 5,000 ac-ft/yr (6 million m^3/yr) from the Kane Springs Valley Hydrographic Basin. The project would lie about 20 mi (32 km south of the SEZ (BLM 2008e).

Alamo Industrial Park and Community Expansion. The BLM is planning to transfer 4 parcels, consisting of 855 acres (3.46 km^2) to Lincoln County. Parcel A, consisting of approximately 217 acres (0.88 km^2) is intended to be used for light industrial use. It is assumed that the industrial park structures would require 117 acres (0.47 km^2) with parking, roads and support infrastructure on another 100 acres (0.40 km^2). The remaining parcels would be used for community expansion, and would be developed primarily for residential purposes. Housing units limited to about 3 units per acre (0.004 km^2) would be built over a 20-year period. The site, about 0.1 mi (0.16 km) southeast of the Town of Alamo along U.S. 93, is about 9 mi (14 km) west of the SEZ (Agra Infrastructure 2000) (BLM 2007f) (USFWS 2010d).

Meadow Valley Industrial Park. The BLM is planning to transfer a 103 acre (0.42 km^2) parcel to the City of Caliente, Nevada for the construction of the Meadow Valley Industrial Park. The site is located on a previously disturbed area used for agriculture and recreation at the intersection of U.S. 93 and State Route 317, about 20 mi (32 km) northeast of the SEZ. Improvements to the site would include construction of a rail spur, access roads, and water and sewer extensions (USFWS 2010d).

NV Energy Microwave and Mobile Radio Project. NV Energy is proposing to install a new microwave and radio communications network at thirteen sites. Two sites are located about 40 mi (64 km) north of the SEZ and one is located about 10 mi (16 km) south of the SEZ. The closest site is 0.6 acre (0.0024 km^2) but requires disturbance of 57 acres (0.23 km^2) of land for access and power line ROW. Each site would include a communication shelter, two or three propane tanks, and a generator. Two of the three sites closest to the SEZ would have an 80-ft (25-m) self-supporting lattice tower, and the other would have a 200-ft (60-m) tower (BLM 2010b).

U.S. Highway 93 Corridor Wild Horse Gather. The BLM Schell Field Office plans to gather and remove about 50 excess wild horses residing outside the wild horse herd management areas, which pose a safety hazard on U.S. 93 (BLM 2009g).

Silver King Herd Management Area Wild Horse Gather. The BLM Schell and Caliente Field Offices propose to gather and remove 445 excess wild horses from within and outside the Silver King Herd Management Area (HMA). The Silver King HMA is 606,000 acres (2,452 km^2) in size and is located 16 mi (26 km) north of Caliente, Nevada (BLM 2010e).

Eagle Herd Management Area Wild Horse Gather. The BLM Schell Field Office proposes to gather and remove 545 excess wild horses from within and outside the Eagle HMA. The Eagle HMA is 670,000 acres (2,710 km^2) in size and is located 20 mi (32 km) northeast of Caliente, Nevada (BLM 2009h).

Ash Canyon Sagebrush Restoration and Fuels Reduction Project. The BLM Caliente Field Office is proposing to conduct a sagebrush improvement and fuels reduction project adjacent to Ash Canyon, about 5 mi (8 km) southeast of Caliente, Nevada, and about 22 mi (35 km) northeast of the SEZ. The size of the project area is 870 acres (3.5 km^2). The goal is to reduce pinyon and juniper in order to achieve a desired state where sagebrush is present along with an understory of perennial species; to reduce risk of wild fires by reducing fuel loading; to restore the historic disturbance regime; and to improve the available habitat for resident wildlife (BLM 2010f).

Pioche/Caselton Wildland Urban Interface Project. The BLM is proposing to conduct a wildland urban interface project near Pioche and Caselton, Nevada about 35 mi (57 km) northeast of the SEZ. About 3,246 to 4,711 acres (13.1 to 19.1 km^2) is planned for treatment. The goal is to reduce the threat of wild fire to Pioche and Caselton through implementation of fuel reduction treatments; to reduce the risk of large, uncontrolled wild fires by reducing fuel loading; and to restore the historic disturbance regime within the project area. The treatment would include reduction of canopy cover and fuel continuity of single-leaf pinyon, Utah juniper, and shrub species to prevent crown fire potential (BLM 2010g).

Grazing

Grazing is a common use of lands in the vicinity of the proposed Delamar Valley SEZ. The management authority for grazing allotments on these lands rests with BLM's Caliente Field Office. While many factors could influence the level of authorized use, including livestock market conditions, natural drought cycles, increasing nonagricultural land development, and long-term climate change, it is anticipated that the current level of use will continue in the near term. A long-term reduction in federal authorized grazing use would affect the value of the private grazing lands.

Mining

The only active mining in the Ely District is at Bald Mountain Mine and Mooney Basin Mine more than 100 mi (162 km) from the SEZ. The proposed Meadow Valley Gypsum Project is discussed above in this section.

11.2.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change for the proposed Delamar Valley SEZ are presented in this section. Table 11.2.22.3-1 lists the relevant impacting factors for the trends.

TABLE 11.2.22.3-1 General Trends Relevant to the Proposed SEZs in Nevada

General Trend	Impacting Factors
Population growth	Urbanization Increased use of roads and traffic Land use modification Employment Education and training Increased resource use (e.g., water and energy) Tax revenue
Energy demand	Increased resource use Energy development (including alternative energy sources) Energy transmission and distribution
Water availability	Drought conditions and water loss Conservation practices Changes in water distribution
Climate change	Water cycle changes Increased wildland fires Habitat changes Changes in farming production and costs

11.2.22.3.1 Population Growth

Over the period 2000 to 2008, the population grew by 1.4% in Lincoln County, by 4.0% in Clark County, and by 3.4% in Iron County, Utah, the ROI for the Delamar Valley SEZ (see Section 11.2.19.1.5). The population of the ROI in 2008 was 1,927,930. The growth rate for the state of Nevada as a whole was 3.4% and for Utah 2.5%.

11.2.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in seven SEZ areas in Nevada between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5, 0.4, and 0.1% each year, respectively (EIA 2009).

11.2.22.3.3 Water Availability

As described in Section 11.2.9.1, the perennial yield of the Delamar Valley groundwater basin is set at 2,550 ac-ft/yr (3.1 million m^3/yr) representing one-half of the natural recharge estimate used by the State Engineer in Ruling 5875 (NDWR 2008). Of the available 2,550 ac-ft/yr (3.1 million m^3/yr) in water rights, 7 ac-ft/yr (8,600 m^3/yr) is allocated for stock water and 2,493 ac-ft/yr (3.1 million m^3/yr) is allocated for municipal use (NDWR 2010a). The municipal water right allocation was granted to the SNWA by the State Engineer through Ruling 5875, with the remaining 50 ac-ft/yr (61,700 m^3/yr) of unallocated water rights in Delamar Valley being set aside for future water development (NDWR 2008).

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), 11% of which came from surface waters and 89% from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million m^3/yr), with livestock and mining water uses on the order of 230 ac-ft/yr (280,000 m^3/yr) and 450 ac-ft/yr (560,000 m^3/yr), respectively (Kenny et al. 2009). However, within Delamar Valley there has been very little groundwater development, with less than 100 ac-ft/yr (123,000 m^3/yr) withdrawn for stock ponds (Eakin 1963).

11.2.22.3.4 Climate Change

Governor Jim Gibbons' Nevada Climate Change Advisory committee (NCCAC) conducted a study of climate change and its effects on Nevada (NCCAC 2008). The report summarized the present scientific understanding of climate change and its potential impacts on Nevada. A report on global climate change in the United States prepared by the U.S. Global Change Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from these reports indicate:

- Decreased precipitation will occur, with a greater percentage of that precipitation coming from rain, which will result in a greater likelihood of winter and spring flooding, and decreased stream flow in the summer.

- The average temperature in the Southwest has already increased by about 1.5ºF (0.8ºC) compared to a 1960 to 1979 baseline, and by the end of the century, the average annual temperature is projected to rise 4º to 10ºF (2.2º to 5.5ºC).

- Warming climate and related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires.

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end.

- Much of the Southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region.

- As temperatures rise, landscape will be altered as species shift their ranges northward and upward to cooler climates.

- Temperature increases, when combined with urban heat island effects for major cities such as Las Vegas, present significant stress to health, electricity and water supply.

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

11.2.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Delamar Valley SEZ on the basis of the following assumptions: (1) because of the moderate size of the proposed SEZ (10,000 to 30,000 acres [40.5 to 121 km^2]), up to two projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 13,242 acres (53.6 km^2)

(80% of the entire proposed SEZ). For purposes of analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. Since an existing 69-kV transmission line runs along and inside the southeastern boundary of the SEZ, no analysis of impacts has been conducted for the construction of a new transmission line outside of the SEZ that might be needed to connect solar facilities to the regional grid (see Section 11.2.1.2). Regarding site access, the nearest major road is U.S. 93, which lies about 8 mi (13 km) to both the north and west of the SEZ. It is assumed that an access road would be constructed to this road to support solar development in the SEZ.

Cumulative impacts that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section in each resource area are discussed below. At this stage of development, because of the uncertain nature of the future projects in terms of size, number, location within the proposed SEZ, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

11.2.22.4.1 Lands and Realty

The area covered by the proposed Delamar Valley SEZ is largely isolated and undeveloped. In general, the areas surrounding the SEZ are rural in nature. Existing dirt roads from separate access points on U.S. 93 provide access to the northern and southern portions of the SEZ. Numerous dirt/ranch roads provide access throughout the SEZ (Section 11.2.2.1).

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. Utility-scale solar energy development would be a new and discordant land use in the area.

As shown in Table 11.2.22.2-2 and Figure 11.2.22.2-1, there are two pending solar development applications and one pending wind site testing application within a 50-mi (80-km) radius of the proposed Delamar Valley SEZ. There are currently no solar applications within the SEZ. One solar application lies about 5 mi (8 km) northwest of the SEZ and the other lies about 50 mi (80 km) to the southeast, as does the lone wind application. In addition, the proposed Dry Lake Valley North SEZ is about 20 mi (32 km) to the north, but contains no solar applications. The small number of applications indicates only modest interest in renewable energy development within 50 mi (80 km) of the proposed SEZ, while no foreseeable renewable energy projects have been identified.

Several foreseeable projects of other types are of note within this distance, however, including proposed groundwater development and associated utility projects and proposed transmission line projects that would lie on or near the SEZ, and a planned community development on 43,000 acres (174 km^2) that would lie about 20 mi (32 km) south of the SEZ. Proposed projects are described in Section 11.2.22.2.2.

The development of utility-scale solar projects in the proposed Delamar Valley SEZ in combination with other ongoing, foreseeable and potential actions within the geographic extent of effects, nominally 50 mi (80 km), could have cumulative effects on land use in the vicinity of the proposed SEZ. While ongoing and foreseeable actions on or near the SEZ would permanently disturb relatively small amounts of land and the planned community development lies at a distance that would add little to impacts from the SEZ, identified actions could result in small cumulative impacts on land use through impacts on, for example, groundwater and visual resources, especially if the SEZ is fully developed with solar projects.

11.2.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

There are 15 specially designated areas within 25 mi (40 km) of the proposed Delamar Valley SEZ in Nevada (Section 11.2.3.1). The potential exists for cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and the construction of transmission lines outside the SEZ. The exact nature of cumulative visual impacts on the users of these areas would depend on the specific solar technologies employed in the SEZ and the locations selected within the SEZ for solar facilities and outside the SEZ for transmission lines. Currently proposed solar and wind projects lie far enough away from the SEZ that sensitive areas would not likely be cumulatively affected by energy facilities within the geographic extent of effects. However, SEZ facilities and associated roads and transmission lines would add to the visual clutter of the area, including that from several proposed transmission lines and a proposed water pipeline project.

11.2.22.4.3 Rangeland Resources

The proposed Delamar Valley SEZ contains portions of two perennial grazing allotments (Section 11.2.4.1.1). If utility-scale solar facilities are constructed on the SEZ, those areas occupied by the solar projects would be excluded from grazing. The effects of other renewable energy projects within the geographic extent of effects, including pending solar and wind applications within 50 mi (80 km) of the SEZ that are ultimately developed, would not likely result in cumulative impacts on grazing due to the small number and distance of the proposed facilities from Delamar Valley. However, a number of groundwater development projects in the Delamar Valley basin and connected basins, described in Section 11.2.22.2.2, along with groundwater use by solar facilities in the SEZ, could result in a cumulative effect on the availability of groundwater for grazing. Other foreseeable projects that might affect these allotments, mainly proposed transmission lines and a water pipeline, would have minimal long-term effects on grazing.

A number of BLM HMAs and HAs occur within the 50-mi (80-km) SEZ region for the proposed Delamar Valley SEZ (Section 11.2.4.2.1), including one within the 5-mi (8-km) area of indirect effects. While such areas near the proposed SEZ contain wild horses, potential indirect impacts from development within the SEZ would be mitigated. Since foreseeable projects within this distance would have minimal effects on wild horses and burros, cumulative impacts are unlikely to could occur.

11.2.22.4.4 Recreation

Limited outdoor recreation (e.g., backcountry driving, OHV use, and some camping and hunting) occurs on or in the immediate vicinity of the SEZ. While there are no current solar applications within the proposed SEZ, construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. Road closures and access restrictions within the proposed SEZ would affect OHV use in particular. Foreseeable and potential actions, primarily transmission lines and a water pipeline, would also affect areas of low recreational use and would have minimal effects on current recreational activities. Thus, cumulative impacts on recreation within the geographic extent of effects are not expected.

11.2.22.4.5 Military and Civilian Aviation

The southwest portion of the proposed Delamar Valley SEZ is crossed by one MTR with a 100-ft (30-m) AGL operating limit, while the area is completely included within the NTTR. The military has expressed serious concern over possible solar energy facilities within the SEZ. Nellis Air Force Base has indicated that any facilities higher than 100 ft (30 m) may be incompatible with low-level aircraft use of the MTR, and the NTTR has indicated that structures higher than 50 ft (15 m) AGL may present unacceptable electromagnetic compatibility concerns for its test mission (Section 11.2.6.2). Potential solar facilities, proposed communication towers, and proposed new transmission lines outside the SEZ could present additional concerns for military aviation, depending on the eventual location of such facilities with respect to training routes, and thus, could result in cumulative impacts on military aviation. The closest civilian airports located in Alamo, Nevada, and Lincoln County, Nevada, 13 mi (21 km) northwest and 32 mi (51 km) northeast, respectively, are unlikely to be affected by facilities in the SEZ.

11.2.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from construction of other potential renewable energy facilities, proposed transmission lines, proposed water lines, and recreational uses. Overall, the cumulative impacts on soil resources would be small, however, because of the small number of currently foreseeable projects within the geographic extent of effects. The small number of pending solar and wind applications in this area suggests that future impacts from renewable energy projects would increase minimally over that from any development in the SEZ.

Landscaping of solar energy facility areas in the SEZ could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that from other foreseeable projects and other activities (e.g., OHV use, outside the SEZ). However, with the expected programmatic design features in place, cumulative impacts would be small.

11.2.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 11.2.8, there are currently no active oil and gas leases within the proposed Delamar Valley SEZ, while there are no mining claims or proposals for geothermal energy development pending. Because of the generally low level of mineral production in the proposed SEZ and surrounding area and the expected low impact on mineral accessibility of other foreseeable actions within the geographic extent of effects, no cumulative impacts on mineral resources are expected.

11.2.22.4.8 Water Resources

Section 11.2.9.2 describes the water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities. The amount of water needed during the peak construction year for all evaluated solar technologies would be 1,964 to 2,814 ac-ft (2.4 million to 3.5 million m^3). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for all evaluated solar technologies would range from 76 to 39,762 ac-ft/yr (94,000 to 49 million m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. As discussed in Section 11.2.22.2.3, water withdrawals in 2005 from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Therefore, cumulatively the additional water resources needed for solar facilities in the SEZ during operations would constitute from a relatively small (0.1%) to a very large (70%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Lincoln County), depending on the solar technology used (PV technology at the low end and the wet-cooled parabolic trough technology at the high end). However, as discussed in Section 11.2.9.1.3, very little water is currently withdrawn from the Delamar Valley basin, roughly 100 ac-ft/yr. The annual yield of the basin is determined to be 2,550 ac-ft/yr (3.1 million m^3/yr), all but 50 ac-ft/yr (61,700 m^3/yr) of which is currently allocated,, with the vast majority allocated to the SNWA for municipal use. Thus, solar facilities on the SEZ would have the capacity to far exceed the available groundwater in the basin and even within in Lincoln County using wet cooling, while full development with dry-cooled solar trough technologies could exceed estimated basin yields (Section 11.2.9.2.2).

While solar development of the proposed SEZ with water-intensive technologies would likely be infeasible due to impacts on groundwater supplies and restrictions on water rights, excessive groundwater withdrawals could disrupt the existing groundwater flow pattern to the Pahranagat Valley and Coyote Springs Valley basins, which could adversely affect groundwater flow in the White River Groundwater Flow System, as well as the springs and wetlands within the Pahranagat NWR that support critical wildlife habitat (Section 11.2.9.2.4). Thus, a significant increase in withdrawals from development within the proposed SEZ could result in a major impact on groundwater and supported habitats in the Delamar Valley, while further cumulative impacts could occur when combined with other future uses in the region and from potential solar facilities in both the proposed Delamar Valley and in the proposed Dry Lake Valley North SEZ, located 20 mi (32 km) to the north. Other foreseeable, actions with groundwater demands within in the central portion of the White River groundwater flow system are described in Section 11.2.22.2.2 and include: (1) the proposed Coyote Springs Investment Development Project, a planned community located about 20 to 33 mi (32 to 53 km) south of the SEZ, which, at full build-out in approximately 40 years, would require an estimated 70,000 ac-ft/yr (86 million m^3/yr) of water, mainly from groundwater; (2) the Kane Springs Groundwater Development project, which could eventually draw 5,000 ac-ft/yr (6 million m^3/yr); (3) the Clark, Lincoln and White Pine Counties Groundwater Development Project, which could withdraw 14,000 ac-ft/yr (17.3 million m^3/yr) from the Dry Lake and Delamar Valley groundwater basins, and (4) the dry-cooled BrightSource Energy Solar Project, which would be located within the Coyote Springs Development Project and which currently has unknown groundwater needs.

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 19 to 148 ac-ft (23 to 183 thousand m^3) during the peak construction year and would range from less than 2 up to 37 ac-ft/yr (up to 46,000 m^3/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to put undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet-cooling systems, there would also be from 418 to 752 ac-ft/yr (0.52 to 0.93 million m^3) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

11.2.22.4.9 Vegetation

The proposed Delamar Valley SEZ is located within the Tonopah Basin ecoregion, which primarily supports a sparse shadscale communities. The SEZ is located in a transition zone between the Great Basin and Mojave deserts, with Mojave desert-scrub communities and endemic species in the SEZ and adjacent areas. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the SEZ over 80% of its area would result in moderate to large impacts on certain cover types

(Section 11.2.10.2.1). Wetlands associated with the Delamar Lake playa could be affected by project development, while intermittently flooded areas downgradient from solar projects or access roads could be affected by ground-disturbing activities. Alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Wetland and riparian habitats outside of the SEZ that are supported by groundwater discharge, including the Pahranagat NWR, could be affected by hydrologic changes resulting from project activities. The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other construction, agriculture, recreation, and transportation. The cumulative dust loading could result in reduced productivity or changes in plant community composition. Similarly, surface runoff from project areas after heavy rains could increase sedimentation and siltation in areas downstream. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats. While most of the cover types within the SEZ are relatively common in the greater SEZ region, several cover types are relatively uncommon, representing 1% or less of the land area within the region. Thus, other ongoing and reasonably foreseeable future actions would have a cumulative effect on them. Such effects could be moderate with full build-out of the SEZ, but would likely fall to small for foreseeable development due to the abundance of the primary species and the relatively small number of foreseeable actions within the geographic extent of effects. However, the proposed Coyote Springs Investment Development project, a proposed community development covering 43,000 acres (174 km^2) and located about 20 mi (32 km) south of the proposed SEZ (Section 11.2.22.2.2), could contribute to cumulative effects on some rare cover types if they are present in the development area. Nearer the SEZ, cumulative effects on wetland species could occur from water use, drainage modifications, and stream sedimentation from development in the region. The magnitude of such effects is difficult to predict at the current time.

11.2.22.4.10 Wildlife and Aquatic Biota

Wildlife species that could potentially be affected by the development of utility-scale solar energy facilities in the proposed SEZ include amphibians, reptiles, birds, and mammals. The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, and wildlife injury or mortality. In general, impacted species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These design features would include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats.

As noted in Section 11.2.22.2, other ongoing, reasonably foreseeable and potential future actions within 50 mi (80 km), of the proposed SEZ include a groundwater transfer project, two pending solar applications, and one pending wind application (Figure 11.2.22.2-1). While impacts from full build-out over 80% of the proposed SEZ would result in small to moderate impacts on some amphibian, reptile, bird, and mammal species (Section 11.2.11), impacts from foreseeable development within the 50-mi (80-km) geographic extent of effects would be small.

Many of the wildlife species present within the proposed SEZ that could be affected by other actions have extensive available habitat within the region, while no foreseeable solar or wind projects have been firmly identified within the geographic extent of effects. The pending solar and wind applications in the region could contribute to small cumulative effects, however, as would the foreseeable groundwater transfer and transmission line projects. In addition, the proposed Coyote Springs Investment Development project located about 20 mi (32 km) south of the proposed SEZ could contribute to cumulative effects on some species due to its large size.

There are no surface waterbodies or perennial streams within the proposed Delamar Valley SEZ or within the 5-mi (8-km) area of indirect effects, while washes are typically dry and flow only after precipitation, and Delamar Lake and associated wetlands rarely contain water. Thus, no standing aquatic communities are likely to be present in the proposed SEZ. However, aquatic communities do exist within the 50-mi (80-km) geographic extent of effects, including Ash Spring and the Pahranagat NWR, which contain stream and wetland habitat critical for aquatic biota, including several protected endemic fish species (Section 11.2.11.2). However, potential contributions to cumulative impacts on aquatic biota and habitats resulting from groundwater drawdown or soil transport to surface streams from solar facilities within the SEZ and within the geographic extent of effects are difficult to quantify, but are expected to be low. There is little foreseeable development within the geographic extent of effects that would affect the same aquatic habitats potentially affected by the proposed SEZ, while available groundwater is already fully appropriated. The magnitude of any cumulative impacts on aquatic species that might occur will depend on the extent of eventual solar and other development in the region and on cooling technologies employed by solar facilities.

11.2.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

On the basis of recorded occurrences or suitable habitat, as many as 49 special status species could occur within the Delamar Valley SEZ or could be affected by groundwater use there. Of these species only the desert tortoise is known to occur within the affected area of the SEZ. The nearest recorded occurrences of desert tortoise are 5 mi (8 km) west of the SEZ, while designated critical habitat occurs approximately 9 mi (14 km) south of the SEZ. In addition, there are 16 groundwater-dependent species or species with habitats that may be affected in the White River Valley regional groundwater system from withdrawals in the Delamar Valley. Numerous additional species that occur on or in the vicinity of the SEZ are listed as threatened or endangered by the state of Nevada or Utah or listed as a sensitive species by the BLM (Section 11.2.12.1). Design Features to be used to reduce or eliminate the potential for effects on these species from the construction and operation of utility-scale solar energy facilities in the SEZs and related projects (e.g., access roads and transmission line connections) outside the SEZ include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. Ongoing effects on special status species include those from roads, transmission lines, and recreational activities in the area. However, the amount of foreseeable development within the geographic extent of effects is low, including mainly one potential solar and one potential wind project, a groundwater transfer pipeline, and several transmission line projects. Cumulative impacts on protected species, including the desert tortoise, are possible but are expected to be relatively low. Actual impacts would depend on the number, location, and cooling technologies of projects that are actually built. Projects would employ mitigation measures to limit effects.

11.2.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other nearby projects outside the proposed SEZ or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. The dust generation from the construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment.

Because the area proposed for the SEZ is rural and undeveloped land, there are no significant industrial sources of air emissions in the area. The only type of air pollutant of concern is dust generated by winds. Because the number of other foreseeable and potential actions that could produce fugitive dust emissions is small, while such projects are unlikely to overlap in both time and affected area, cumulative air quality effects due to dust emissions during any overlapping construction periods would be small.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as coal, oil, and natural gas. As discussed in Section 11.2.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the Delamar Valley SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 12% of all emissions from the current electric power systems in Nevada.

11.2.22.4.13 Visual Resources

The proposed Delamar Valley SEZ is located in the central portion of the broad and flat Delamar Valley. The valley is bounded by mountain ranges to the east, southeast and west, with open views to the north. (Section 11.2.14.1). The area is sparsely inhabited, remote, and rural in character.

The VRI values for the SEZ and immediate surroundings are VRI Class IV, indicating low relative visual values. Currently, there is a low level of cultural disturbance, including from unpaved roads, transmission lines, fences, and corrals. Delamar Lake is used for various recreational uses, including OHV driving and racing. Grazing occurs outside of the dry lake bed.

Construction of utility-scale solar facilities on the SEZ and associated transmission lines outside the SEZ would significantly alter the natural scenic quality of the area. Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Other potential solar and wind projects and related roads and transmission lines outside the proposed SEZ would cumulatively affect the visual resources in the area.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area. There is currently only one solar facility ROW application nearby, about 5 mi (8 km) northwest of the SEZ, and one other solar and one wind site testing application, each about 50 mi (80 km) southeast of the SEZ on public lands (Figure 11.2.22.2-1). In addition, several new transmission projects and a groundwater transfer pipeline project represent foreseeable development that would pass through or near the proposed SEZ as discussed in Section 11.2.22.2. While the contribution to cumulative impacts in the area of these potential projects would depend on the location of facilities that are actually built, it may be concluded that the general visual character of the landscape within this distance could be altered from what is currently rural desert by the presence of solar facilities, transmission lines, and other new infrastructure. Because of the topography of the region, such developments, located in basin flats, would be visible at great distances from surrounding mountains, which include sensitive viewsheds. Given the small number of current proposals, it is unlikely that two or more facilities would be viewable from a single location. However, facilities would be located near major roads and thus would be viewable by motorists, who would also be viewing transmission lines, towns, and other infrastructure, as well as the road system itself.

As facilities are added, several projects might become visible from one location, or in succession, as viewers move through the landscape, as by driving on local roads. In general, the new projects would not be expected to be consistent in terms of their appearance and, depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Considering the above in light of the fact that only potential solar and wind projects have been identified, small cumulative visual impacts could occur within the geographic extent of effects from future solar, wind, and other existing and future developments.

11.2.22.4.14 Acoustic Environment

The areas around the proposed Delamar Valley SEZ are relatively quiet. The existing noise sources around the SEZ include road traffic, aircraft flyover, and cattle grazing. Other noise sources are associated with current land use around the SEZ, including outdoor recreation and OHV use. The construction of solar energy facilities could increase the noise levels periodically for up to 3 years per facility, but there would be little or no noise during operation of solar facilities, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES, which could also minimally affect nearby residences due to considerable separation distances.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZs are described in Section 11.2.22.2. Because proposed projects and nearest residents are relatively far from the SEZ with respect to noise impacts and the area is sparsely populated, cumulative noise effects during the construction or operation of solar facilities are unlikely.

11.2.22.4.15 Paleontological Resources

The proposed Delamar Valley SEZ has low potential for the occurrence of significant fossil material in 73% of its area, mainly alluvial deposits, and unknown potential in about 27% of its area, mainly playa deposits (Section 11.2.16.1). While impacts on significant paleontological resources are unlikely to occur in most of the SEZ, the specific sites selected for future projects would be investigated to determine whether a paleontological survey is needed. Any paleontological resources encountered would be mitigated to the extent possible. No significant cumulative impacts on paleontological resources are expected.

11.2.22.4.16 Cultural Resources

The Delamar Valley is rich in cultural history, and the area covered by the proposed Delamar Valley SEZ has the potential to contain significant cultural resources. At least 9 surveys have been conducted within the boundaries of the SEZ, and 17 additional surveys have been conducted within 5 mi (8 km) of the SEZ, resulting in the recording of 8 sites within SEZ and at least 47 sites located within 5 mi (8 km) of the SEZ (Section 11.2.17.1). Areas with potential for significant sites within the proposed SEZ include areas around the dry lake, at the south end of the SEZ, as well as in alluvial fans located on the outer portions of the SEZ and within a 5-mi (8-km) radius. It is possible that the development of utility-scale solar energy projects in the SEZ, when added to other potential projects likely to occur in the area, could contribute cumulatively to cultural resource impacts occurring in the region. However, the amount of potential and foreseeable development is low, including one potential solar project, a proposed groundwater transfer pipeline, and several proposed transmission line projects within the 25-mi (40-km) geographic extent of effects (Section 11.2.22.2). While any future solar projects would disturb large areas, the specific sites selected for future projects would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Nevada SHPO and appropriate Native American governments, it is likely that most adverse effects on significant resources in the region could be mitigated to some degree. It is unlikely that any sites recorded in the SEZ would be of such individual significance that, if properly mitigated, development would cumulatively cause an irretrievable loss of information about a significant resource type, but this would depend on the results of the future surveys and evaluations. An increase in vandalism on cultural sites could result from additional development in the area, however, particularly if there are multiple solar projects on the SEZ.

11.2.22.4.17 Native American Concerns

Major Native American concerns in arid portions of the Great Basin include water, culturally important plant and animal resources, and culturally important landscapes. The development of utility-scale solar energy facilities within the SEZ in combination with the foreseeable development in the surrounding area could cumulatively contribute to effects on these resources. Development of the SEZ would result in the removal of plant species from the footprint of the facility during construction. This would include some plants of cultural importance. However, the primary species that would be affected are abundant in the region, thus the cumulative effect would likely be small. Likewise, habitat for important species, such as the black-tailed jackrabbit, would be reduced; however, extensive habitat is available in the area, reducing the cumulative effect. The cultural importance of the mountains surrounding the SEZ is as yet undetermined. If culturally important, the view from these features can be an important part of their cultural integrity. The degree of impact on these resources of development at specific locations must be determined in consultation with the Native American Tribes whose traditional use area includes the proposed SEZ. In general, Tribes prefer that development occur on previously disturbed land and this SEZ is largely undeveloped.

Government-to-government consultation is under way with federally recognized Native American Tribes with possible traditional ties to the Delamar Valley area. All federally recognized Tribes with Southern Paiute or Western Shoshone roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. To date, no specific concerns have been raised to the BLM regarding the proposed Delamar Valley SEZ. However, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. When commenting on past projects in the Delamar Valley, the Southern Paiute have expressed concern over adverse effects of energy projects on a wide range of resources (Section 11.2.18.2). Continued discussion with the area Tribes through government-to-government consultation is necessary to determine the extent to which cumulative effects of solar energy development in the Delamar Valley can be addressed.

11.2.22.4.18 Socioeconomics

Solar energy development projects in the proposed Delamar Valley SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health-care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services in combination with temporary workers involved in other new projects in the area, including other renewable energy development. The number of workers involved in the construction of solar projects in the peak construction year (including the transmission lines) could range from about 260 to 3,500 depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 460 (solar PV) to as high as 6,000 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-year or more solar development period.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-year duration, and could combine with those from other new projects in the area, including the proposed groundwater transfer pipeline, and several proposed transmission line projects. The number of workers needed at the solar facilities would be in the range of 30 to 600 with approximately 40 to 900 total jobs created in the region, assuming full build-out of the SEZ (Section 11.2.19.2.2). Population increases would contribute to general upward trends in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

11.2.22.4.19 Environmental Justice

Any impacts from solar development could have cumulative impacts on minority and low-income populations within 50 mi (80 km) of the proposed SEZ in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual impacts, noise, and exposure to fugitive dust. Actual impacts would depend on where low-income populations are located relative to solar and other proposed facilities and on the geographic range of effects. Overall, effects from facilities within the SEZ are expected to be small, while other foreseeable and potential actions would not likely combine with effects from the SEZ on minority and low-income populations. If needed, mitigation measures can be employed to reduce the impacts on these populations in the vicinity of the SEZ. Thus, it is not expected that the proposed Delamar Valley SEZ would contribute to cumulative impacts on minority and low-income populations.

11.2.22.4.20 Transportation

U.S. 93 lies about 8 mi (13 km) to the west and a equal distance to the north of the proposed Delamar Valley SEZ. The closest commercial airport is Lincoln County Airport at Panaca, about 35 mi (56 km) to the northeast of the SEZ. The Union Pacific railroad serves the region. During construction of utility-scale solar energy facilities, there could be up to 1,000 workers commuting to the construction site at the SEZ, which could increase the AADT on these roads by 2,000 vehicle trips for each facility under construction. With as many as two facilities assumed under construction at the same time, traffic on U.S. 93 could experience slowdowns in the area of the SEZ (Section 11.2.21.2). This increase in highway traffic from construction workers could likewise have moderate cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area, including from construction in the proposed Dry Lake Valley North SEZ located 20 mi (32 km) to the north, should construction schedules overlap. Local road improvements may be necessary on portions of U.S. 93 near the proposed Delamar Valley SEZ. Any impacts during construction activities would be temporary. The impacts can also be mitigated to some degree by staggered work schedules and ride-sharing programs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate the solar facilities and would have little contribution to cumulative impacts.

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11.2.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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11.3 DRY LAKE

11.3.1 Background and Summary of Impacts

11.3.1.1 General Information

The proposed Dry Lake SEZ is located in Clark County in southern Nevada (Figure 11.3.1.1-1). The SEZ has a total area of 15,649 acres (63 km^2). In 2008, the county population was 1,879,093. The towns of Moapa Town and Overton are as close as 18 mi (29 km) northeast and 23 mi (37 km) east of the SEZ, respectively. The Nellis Air Force Base is located approximately 13 mi (21 km) southwest of the SEZ.

The nearest major roads accessing the proposed Dry Lake SEZ are I-15, which passes through the southeastern portion of the SEZ, and U.S. 93, which runs from northwest to southeast along part of the southwest border of the SEZ. The UP Railroad runs north to south along a portion of the eastern SEZ boundary, with the nearest stop in Las Vegas. The nearest public airport is the North Las Vegas Airport, a regional airport about 21 mi (34 km) to the southwest of the SEZ that does not have scheduled commercial passenger service. McCarran International Airport is farther south, in Las Vegas, and is served by all major U.S. airlines.

Three designated transmission corridors that are heavily developed with numerous natural gas, petroleum product, and electric transmission lines (including a 500-kV transmission line) pass through the proposed SEZ. It is assumed that the existing 500-kV transmission line, or any of the other existing transmission lines, could potentially provide access from the SEZ to the transmission grid (see Section 11.3.1.2).

There are four foreseeable and 16 pending solar development applications and one foreseeable and nine pending wind site testing applications within a 50-mi (80-km) radius of the proposed Dry Lake SEZ. Five of the 16 pending solar applications are either within or adjacent to the SEZ, as is one of the wind site testing applications. These applications are discussed in Section 11.3.22.2.1.

The proposed Dry Lake SEZ is in an undeveloped rural area. The SEZ is located in Dry Lake Valley and is bounded on the west by the Arrow Canyon Range and on the southeast by the Dry Lake Range. Land within the SEZ is undeveloped scrubland, characteristic of a semiarid basin.

The proposed Dry Lake SEZ and other relevant information are shown in Figure 11.3.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar energy development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions).

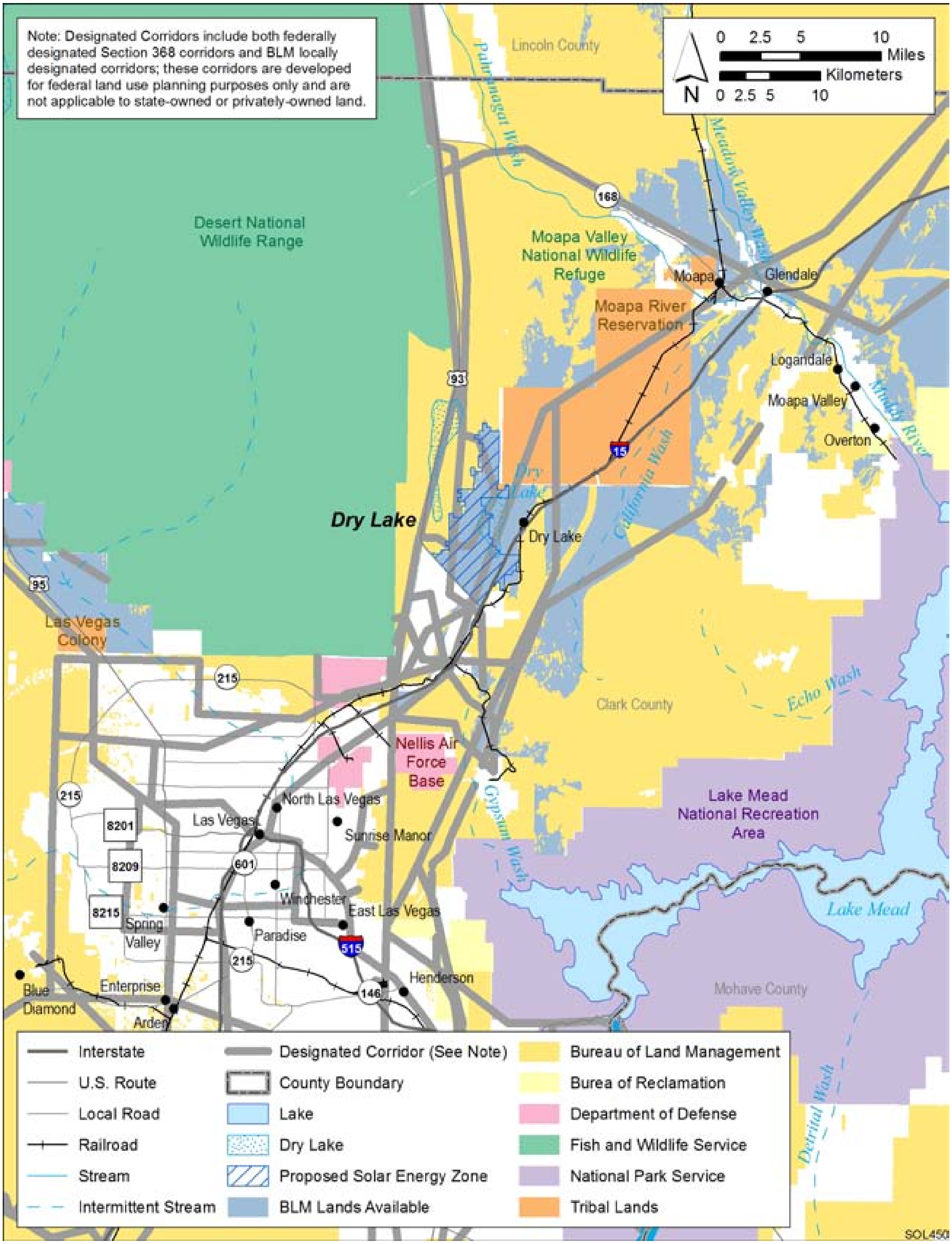

FIGURE 11.3.1.1-1 Proposed Dry Lake SEZ

Although these classes of restricted lands were excluded from the proposed Dry Lake SEZ, other restrictions might be appropriate. The analyses in the following sections evaluate the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Dry Lake SEZ encompassed 16,516 acres (67 km^2). Subsequent to the study area scoping period, the boundaries of the proposed Dry Lake SEZ were altered somewhat to facilitate the BLM's administration of the SEZ area. Borders with irregularly shaped boundaries were adjusted to match the section boundaries of the Public Lands Survey System (PLSS) (BLM and USFS 2010c).The revised SEZ is approximately 867 acres (3.5 km^2) smaller than the original SEZ area as published in June 2009.

11.3.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the Dry Lake SEZ is assumed to be 80% of the SEZ area over a period of 20 years; a maximum of 12,519 acres (51 km^2). These values are shown in Table 11.3.1.2-1, along with other development assumptions. Full development of the Dry Lake SEZ would allow development of facilities with an estimated total of 1,391 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 2,504 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. Several existing transmission lines, including a 500-kV line, run through the SEZ. It is possible that an existing line could be used to provide access from the SEZ to the transmission grid, but a 500-kV capacity line would be inadequate for 1,391 to 2,504 MW of new capacity (note: a 500-kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, new transmission and/or upgrades of existing transmission lines may be required to bring electricity from the proposed Dry Lake SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in the PEIS, it was assumed that the existing 500-kV transmission line which runs through the proposed SEZ could provide initial access to the transmission grid, and thus, no additional acreage for transmission line access was assessed. Access to the existing transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different off-site grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

TABLE 11.3.1.2-1 Proposed Dry Lake SEZ—Assumed Development Acreages, Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line and Road ROWs	Distance to Nearest Designated Corridor[d]
15,649 acres and 12,519 acres[a]	1,391 MW[b] and 2,504 MW[c]	I-15 0 mi[d]	0 mi and 500 kV	0 acres and 0 acres	0 mi

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

Existing road access to the proposed Dry Lake SEZ should be adequate to support construction and operation of solar facilities, because a portion of I-15 runs through the SEZ and because U.S. 93 is adjacent to the SEZ. Thus, no additional road construction outside of the SEZ was assumed to be required to support solar development.

11.3.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 11.3.2 through 11.3.21 for the proposed Dry Lake SEZ are summarized in tabular form. Table 11.3.1.3-1 is a comprehensive list of impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 11.3.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Dry Lake SEZ are included in Sections 11.3.2 through 11.3.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 11.3.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Dry Lake SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the proposed Dry Lake SEZ could disturb up to 12,519 acres (51 km^2). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity.	None.
	The three designated transmission corridors located within the SEZ could limit future solar development within the corridor. Alternatively, solar development could also constrain future development within these corridors.	None.
	Solar development could sever existing roads that cross the SEZ, making it difficult to access public lands within the SEZ that are not developed or those that are outside of the SEZ.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	Wilderness characteristics in up to 3% of the Arrow Canyon and 13% of the Muddy Mountains WAs could be adversely affected.	Design features for visual resources should be applied to minimize adverse visual impacts.
Rangeland Resources: Livestock Grazing	The grazing allotments within the SEZ have been closed, therefore there are no impacts to grazing.	None.
Rangeland Resources: Wild Horses and Burros	None.	None.
Recreation	Recreational use would be eliminated from portions of the SEZ that would be developed for solar energy production.	None.

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Recreation *(Cont.)*	Because the SEZ sits astride numerous roads and trails, construction of solar energy facilities could sever access to undeveloped public lands.	None.
Military and Civilian Aviation	Nellis Air Force Base has expressed concern for solar energy facilities that might affect approach and departure from runways on the base. The military is also concerned with the potential impact on the test and training mission at the NTTR.	None.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase. Impacts would include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation).	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.
Water Resources	Ground-disturbance activities (affecting 38% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 3,480 ac-ft (4.3 million m^3) of water during the peak construction year. Construction activities would generate as high as 148 ac-ft (180,000 m^3) of sanitary wastewater.	Wet-cooling and dry-cooling options would not be feasible unless further hydrologic study of the basin reveals that more water is available; other technologies should incorporate water conservation measures. Land-disturbance activities should avoid impacts to the extent possible in the vicinity of the ephemeral washes and the dry lake present on the site.

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	Assuming full development of the SEZ, operations would use the following amounts of water: • For parabolic trough facilities (2,504-MW capacity), 1,788 to 3,791 ac-ft/yr (2.2 million to 4.7 million m^3/yr) for dry-cooled systems; 12,554 to 37,593 ac-ft/yr (15 million to 46 million m^3/yr) for wet-cooled systems. • For power tower facilities (1,391-MW capacity), 989 to 2,102 ac-ft/yr (1.2 million to 2.6 million m^3/yr) for dry-cooled systems; 6,971 to 20,881 ac-ft/yr (8.6 million to 26 million m^3/yr) for wet-cooled systems. • For dish engine facilities (1,391-MW capacity), 711 ac-ft/yr (880,000 m^3/yr). • For PV facilities (1,391-MW capacity), 71 ac-ft/yr (86,000 m^3/yr). • Assuming full development of the SEZ, operations would generate up to 35 ac-ft/yr (43,000 m^3/yr) of sanitary wastewater and up to 711 ac-ft/yr (877,000 m3/yr) of blowdown water.	Siting of solar facilities and construction activities should avoid areas identified as being within a 100-year floodplain, which totals 1,569 acres [6.3 km^2] of the proposed SEZ. Groundwater rights must be obtained from the NDWR. Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection. Groundwater monitoring and production wells should be constructed in accordance with state standards. Water for potable uses would have to meet or be treated to meet water quality standards in accordance with the *Nevada Administrative Code* (445A.453-445A.455).
Vegetation[b]	Up to 80% (12,519 acres [50.7 km^2]) of the SEZ would be cleared of vegetation; re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of desert scrub and other affected habitats, and to minimize the potential for the spread of invasive species such as salt cedar or

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*	The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Vegetation communities associated with Dry Lake playa habitats or other intermittently flooded areas within or downgradient from solar projects could be affected by ground-disturbing activities. The use of groundwater within the proposed Dry Lake SEZ for technologies with high water requirements, such as wet-cooling systems, could disrupt the groundwater flow pattern and adversely affect mesquite communities on or near the SEZ or springs in the vicinity of the SEZ.	Mediterranean grass. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. All dry wash, dry wash woodland, chenopod scrub, and playa communities within the SEZ should be avoided to the extent practicable, and any impacts minimized and mitigated. Any yucca, cacti, or succulent plant species that cannot be avoided should be salvaged. A buffer area should be maintained around dry wash, dry wash woodland, playa, and wetland habitats to reduce the potential for impacts. Appropriate engineering controls should be used to minimize impacts on dry wash, dry wash woodland, wetland, and playa habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition. Appropriate buffers and engineering controls would be determined through agency consultation. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on groundwater-dependent communities, such as mesquite communities. Potential impacts on springs should be determined through hydrological studies.
Wildlife: Amphibians and Reptiles[b]	Direct impacts on representative amphibian and reptile species from SEZ development would be small (i.e., loss of ≤1% of potentially suitable habitats). With implementation of proposed design features, indirect impacts would be expected to be negligible.	Dry Lake and wash habitats should be avoided.

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Wildlife: Birds[b]	Direct impacts on all representative bird species from SEZ development would be small (i.e., loss of ≤1% of potentially suitable habitats). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These indirect impacts are expected to be negligible with implementation of design features.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act. Dry lake and wash habitats should be avoided.
Wildlife: Mammals[b]	Direct impacts on all representative mammal species would be small (i.e., loss of ≤1% of potentially suitable habitats). In addition to habitat loss, other direct impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences). Indirect impacts on mammals could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with the implementation of design features.	The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. Dry Lake and wash habitats should be avoided.
Wildlife: Aquatic Biota[b]	The dry lake and the washes and wetlands present in the SEZ are typically dry and are not connected to any permanent surface water features; therefore, impacts on aquatic habitat and communities are not likely. California Wash and Gypsum Wash are intermittent streams in the area of indirect effects that flow into perennial surface waters. Thus fugitive dust entering these streams could potentially affect aquatic habitat and biota.	Appropriate engineering controls should be implemented to minimize the amount of runoff and fugitive dust that reaches California Wash and Gypsum Wash.

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Wildlife: Aquatic Biota[b] *(Cont.)*	Groundwater withdrawals for solar energy needs could affect surface water levels, habitat conditions, and aquatic biota in the Colorado River and the springs located in the vicinity of the SEZ. Contaminants are not likely to affect aquatic habitat and biota given the relatively large distance and lack of hydrologic connection of the SEZ to any perennial surface water.	Minimize or eliminate the impact of groundwater withdrawals on streams near the SEZ such as the Muddy River, and springs such as those along the north shore of Lake Meade and within Desert NWR and Moapa NWR
Special Status Species[b]	Potentially suitable habitat for 62 special status species occurs in the affected area of the Dry Lake SEZ. For all of these special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects. There are 13 groundwater dependent species that occur outside of the areas of direct and indirect effects. Potential impacts on these species could range from small to large depending on the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals.	Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible for some species, translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Consultation with the USFWS and NDOW should be conducted to address the potential for impacts on the following four species currently listed as threatened or endangered under the ESA: Moapa dace, Pahrump poolfish, desert tortoise, and southwestern willow flycatcher. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate,

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Coordination with the USFWS and NDOW should be conducted to address the potential for impacts on the following seven species under review for listing under the ESA that may be affected by solar energy development on the SEZ: Las Vegas buckwheat, grated tryonia, Moapa pebblesnail, Moapa Valley pebblesnail, Moapa Warm Spring riffle beetle, Moapa speckled dace, and Moapa White River springfish. Coordination would identify an appropriate survey protocol, and mitigation requirements, which may include avoidance, minimization, translocation, or compensation. Avoiding or minimizing disturbance to desert wash, playa, and desert pavement habitats on the SEZ could reduce or eliminate impacts on 14 special status species. Avoidance or minimization of groundwater withdrawals to serve solar energy development on the SEZ could reduce or eliminate impacts on 13 special status species. In particular, impacts on aquatic and riparian habitat in the Corn Creek Spring, Moapa Warm Springs and Muddy River should be avoided.

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. These concentrations would decrease quickly with distance. Modeling indicates that emissions from construction activities are anticipated to be somewhat higher than Class I PSD PM_{10} increments at the nearest federal Class I area (Grand Canyon NP, Arizona). In addition, construction emissions from the engine exhaust of heavy equipment and vehicles could affect AQRVs (e.g., visibility and acid deposition) at nearby federal Class I areas. *Operations*: Positive impact due to avoided emissions of air pollutants from combustion-related power generation: 6.4 to 12% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada avoided (up to 6,189 tons/yr SO_2, 5,308 tons/yr NO_x, 0.035 ton/yr Hg, and 3,407,000 tons/yr CO_2).	None.
Visual Resources	The SEZ is in an area of low scenic quality, and major cultural disturbances are already present in SEZ and surrounding areas. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads.	None.

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape. The SEZ is located 2.3 mi (3.7 km) from Desert National Wildlife Range. Because of the close proximity of the NWR to the SEZ, and the elevated viewpoints in the NWR, strong visual contrasts could be observed by NWR visitors. The SEZ is located 2.4 mi (3.9 km) from a high-potential segment of the Old Spanish National Historic Trail. Because of the close proximity of the NHT to the SEZ, and the elevated viewpoints in the WA, strong visual contrasts could be observed by NHT users. The SEZ is located 2.5 mi (4.0 km) from Arrow Canyon WA. Because of the close proximity of the WA to the SEZ, and the elevated viewpoints in the WA, strong visual contrasts could be observed by WA visitors. The SEZ is located 6.6 mi (10.6 km) from Muddy Mountains WA. Because of the elevated viewpoints in the WA, moderate visual contrasts could be observed by WA visitors. The SEZ is located 4.5 mi (7.2 km) from Muddy Mountains SRMA. Because of the elevated viewpoints in the SRMA, moderate visual contrasts could be observed by SRMA visitors. The SEZ is located 4.3 mi (6.9 km) from Nellis Dunes SRMA. Because of the elevated viewpoints in the SRMA, moderate visual contrasts could be observed by SRMA visitors.	

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	Almost 38 mi (61.2 km) of I-15 are within the Dry Lake SEZ viewshed, and almost 4 mi (6.4 km) of I-15 pass along and through the SEZ's southeasternmost portion. Because of the close proximity of the I-15 to the SEZ, strong visual contrasts could be observed by travelers on I-15. Almost 13 mi (21 km) of U.S. 93 are within the SEZ viewshed, and about 4.5 mi (7.2 km) of U.S. 93 pass along the SEZ's southwestern boundary. Because of the close proximity of the U.S. 93 to the SEZ, strong visual contrasts could be observed by travelers on U.S. 93.	
Acoustic Environment	*Construction:* For construction of a solar facility located near the southern SEZ boundary, estimated noise levels at the nearest residences located about 12 mi (19 km) from the SEZ boundary would be about 14 dBA, which is well below the typical daytime mean rural background level of 40 dBA. In addition, an estimated 40 dBA L_{dn} at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas. *Operations:* For operation of a parabolic trough or power tower facility located near the southern SEZ boundary, the predicted noise level would be about 20 dBA at the nearest residences, which is well below the typical daytime mean rural background level of 40 dBA. If the operation were limited to daytime, 12 hours only, a noise level of about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated for the nearest residences, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. However, in the case of 6-hour TES, the estimated noise level at the nearest residences would be 30 dBA, which is equivalent to the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is still well below the EPA guideline of 55 dBA L_{dn} for residential areas.	None.

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Acoustic Environment *(Cont.)*	If 80% of the SEZ were developed with dish engine facilities, the estimated noise level at the nearest residences would be about 32 dBA, which is below the typical daytime mean rural background level of 40 dBA. On the basis of 12-hour daytime operation, the estimated 40 dBA L_{dn} at these residences (i.e., no contributions from dish engines) would be well below the EPA guideline of 55 dBA L_{dn} for residential areas.	
Paleontological Resources	Few, if any, impacts on significant paleontological resources are likely to occur in 90% of the proposed Dry Lake SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. The potential for impacts on significant paleontological resources in the remaining 10% of the SEZ is unknown. A paleontological survey will likely be needed.	The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations.
Cultural Resources	Direct impacts on significant cultural resources could occur in the proposed Dry Lake SEZ; however, further investigation is needed. Consistent with findings at other SEZs, dune areas continue to have potential to contain significant sites within the valley floors suitable for solar development. A cultural resource survey of the entire area of potential effects, including consultation with affected Native American Tribes, would need to be conducted first to identify archaeological sites, historic structures and features, and traditional cultural properties, and then an evaluation would follow to determine whether any are eligible for listing in the NRHP as historic properties. Direct impacts are possible to the Old Spanish Trail/Mormon Road site within the SEZ, which is listed in the NRHP as a district. Visual impacts are also possible to a high-potential segment of the congressionally designated Old Spanish National Historic Trail located near the SEZ to the east.	Coordination with the Trail Administration for the Old Spanish Trail and Old Spanish Trail Association is recommended for identifying potential mitigation strategies for avoiding or minimizing potential impacts on the congressionally designated Old Spanish National Historic Trail, and also to any remnants of the NRHP-listed site associated with the Old Spanish Trail/Mormon Road that may be located within the SEZ. Avoidance of the Old Spanish Trail NRHP-listed site within the southeastern portion of the proposed SEZ is recommended. Other SEZ-specific design features would be determined through consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Native American Concerns	The proposed Dry Lake SEZ is directly adjacent to Moapa Valley, a traditional center of Southern Paiute culture. It is likely that plant and animal species of cultural importance to the Southern Paiute are present within the proposed SEZ. With 80% of the SEZ developed, it is likely that important traditional plants and animal habitat will be destroyed. The cultural importance of this loss must be determined through consultation with the Tribes. The culturally important Salt Song Trail approaches or passes through the SEZ and could experience visual and noise impacts by the development of utility-scale solar energy facilities within the proposed SEZ.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.
Socioeconomics	*Construction:* A total of 441 to 5,842 jobs would be added; ROI income would increase by \$27.3 million to \$361.5 million. *Operations:* A total of 36 to 822 annual jobs would be added; ROI income would increase by \$1.3 million to \$31.1 million.	None.
Environmental Justice	There are both minority and low income populations, as defined by CEQ guidelines, within the 50-mi (80-km) radius around the boundary of the SEZ. Therefore, any adverse impacts of solar projects, although likely to be small, could disproportionately affect both minority and low-income populations.	None.

TABLE 11.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake SEZ	SEZ-Specific Design Features
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. I-15 provides a regional traffic corridor that would experience small impacts for single projects that may have up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum), or possibly 4,000 vehicle trips per day if two larger projects were to be developed at the same time. Such an increase would range from 10 to 20% of the current traffic volume. If all project traffic were routed through U.S. 93, the traffic levels would represent a 100 to 200% increase of the traffic level experienced on U.S. 93 north of its junction with I-15.	

Abbreviations: AAQS = ambient air quality standards; AQRV = air quality–related value; BLM = Bureau of Land Management; BMP = best management practice; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; dBA = A-weighted decibel; DoD = U.S. Department of Defense; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; L_{dn} = day-night average sound level; MTR = military training route; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NNHP = Nevada Natural Heritage Program; NO_x = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; NTTR = Nevada Test and Training Range; PEIS = programmatic environmental impact statement; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 µm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 µm or less; PSD = prevention of significant deterioration; PV= photovoltaic; ROI = region of influence; ROW = right-of-way; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; SRMA = Special Recreation Management Area; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service.

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Dry Lake SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 11.3.10 through 11.3.12.

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11.3.2 Lands and Realty

11.3.2.1 Affected Environment

The proposed Dry Lake SEZ is a moderately sized and well-blocked area of BLM-administered land. The character of much the land in the SEZ, especially the southern portion, is highly developed with many types of energy, water, and transportation infrastructure facilities present. Three designated transmission corridors pass through the area, including a 368 corridor (of the Energy Policy Act of 2005), that contain numerous electric transmission lines, natural gas and refined petroleum product lines, and water lines (see Figure 11.3.1.1-1). A new power generating station is being constructed within the area of the SEZ, and two existing natural gas power plants are located just southwest of the SEZ on private land. A minerals processing plant is located in the southeastern corner of the area.

The area is bordered on the southwest by U.S. 93, and I-15 passes through the southeastern portion of the SEZ. A railroad closely follows the southeastern border of the SEZ, and there is an undeveloped railroad ROW located in the portion of the SEZ east of I-15. With the exception of the 368 corridor, the area in the northern portion of the SEZ is relatively undeveloped. Several informal dirt roads provide access into the area, in addition to roads that provide access to along the various transmission lines.

As of February 2010, there were five ROW applications for solar energy facilities either within or adjacent to the SEZ.

11.3.2.2 Impacts

11.3.2.2.1 Construction and Operations

Full development of the proposed Dry Lake SEZ could disturb up to 12,519 acres (51 km^2) (Table 11.3.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude other potential uses of the land, perhaps in perpetuity. Numerous energy-related activities occur within the SEZ; solar energy development, however, with its high density of visible facilities, would become a dominating visual presence in the area.

Existing ROW authorizations on the SEZ would not be affected by solar energy development since they are prior rights. Should the proposed SEZ be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development.

The existing electrical transmission and pipelines in the three designated transmission corridors, and the existing pipeline pumping, mineral processing, and power plant construction sites, occupy a large area within the SEZ that would not be available for solar energy development. The railroad ROW may also not be available. To avoid technical or operational interference between transmission and pipeline facilities and solar energy facilities, solar facilities cannot be constructed under transmission lines or over pipelines. A consideration that could affect future solar development is the need for future corridor capacity within the three designated corridors. As presently proposed, capacity for future electrical transmission lines or pipelines would be restricted by solar energy development. This is an administrative conflict that can be addressed by the BLM through its planning process, but there would be implications either for the amount of potential solar energy development that could be accommodated within the SEZ, or the amount of additional corridor capacity available for future development.

Existing dirt roads located in the SEZ would be closed wherever solar development facilities are developed, and access to public lands not developed for solar energy could be affected. This could adversely affect public land users wishing to access any areas isolated by solar development unless provision of alternate access is retained or provided.

11.3.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 500-kV transmission line runs through the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

Road access to the SEZ is readily available from U.S. 93 and I-15, so it is anticipated there would be no additional land disturbance outside the SEZ associated with road construction to provide access to the SEZ.

Roads and power lines would be constructed within the SEZ as part of the development of solar energy facilities.

11.3.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

There are no SEZ specific design features proposed to protect lands and realty resources. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide some mitigation for some identified impacts. The exceptions may be the development of the SEZ would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity.

11.3.3 Specially Designated Areas and Lands with Wilderness Characteristics

11.3.3.1 Affected Environment

There are 9 specially designated areas within 25 mi (40 km) of the proposed Dry Lake SEZ that potentially could be affected by solar energy development within the SEZ, principally from impacts on scenic, recreation, and/or wilderness resources. It is not anticipated that any of these areas would experience increased visitation impacts associated with SEZ development. The Meadow Valley Range and Mormon Mountains WAs and the Lake Mead NRA are not considered further because of the small amount of acreage with visibility of the SEZ, the long distance from the SEZ, and the percentage of the total acreage of the areas with visibility of the SEZ is less than 1%. The ACECs included in the list below have scenic values as one of the components supporting the designation. The Hidden Valley, Coyote Springs, Arrow Canyon, Mormon Mesa, and Kane Springs ACECs that are within 25 mi (40 km) of the SEZ are not being analyzed because they were designated to protect either critical desert tortoise habitat, or paleontological, cultural, or geologic resources that would not be affected by solar development within the SEZ. The specially designated areas that could be affected from solar development within the SEZ include the following (see Figure 11.3.3.1-1):

- Wilderness Areas
  - Arrow Canyon
  - Muddy Mountains

- Areas of Critical Environmental Concern
  - Rainbow Gardens
  - River Mountains

- National Wildlife Refuges
  - Desert National Wildlife Range
  - Moapa Valley

- National Trail
  - Old Spanish Trail

- Scenic Byway
  - Bitter Springs Backcountry Byway

- State Park
  - Valley of Fire

No lands within 25 mi (40 km) of the SEZ and outside of designated wilderness areas have been identified by the BLM to be managed to protect wilderness characteristics.

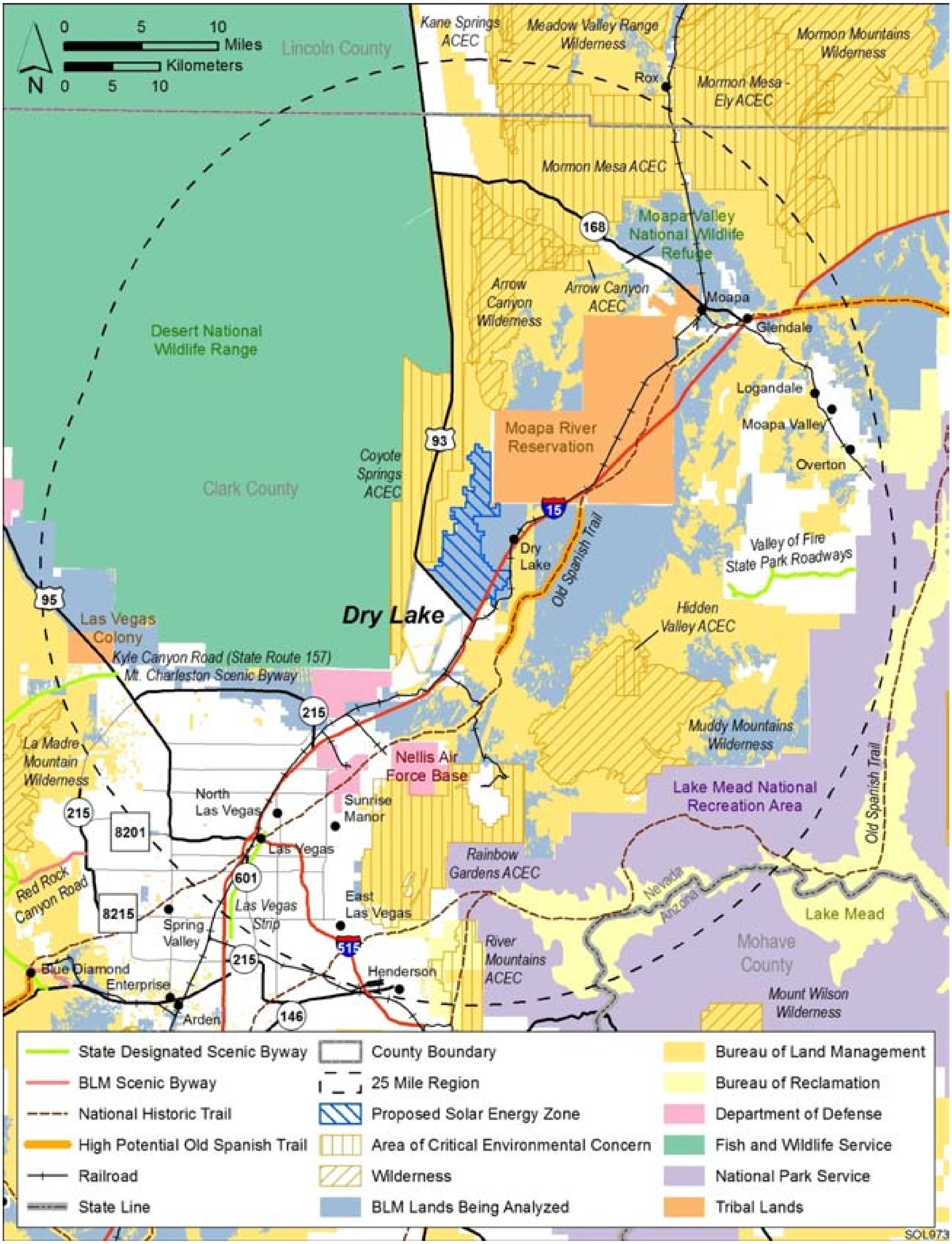

FIGURE 11.3.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Dry Lake SEZ

11.3.3.2 Impacts

11.3.3.2.1 Construction and Operations

The primary potential impact on the remaining specially designated areas near the SEZ would be from visual impacts of solar energy development that could affect scenic, recreational, or wilderness characteristics of the areas. The visual impact on specially designated areas is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be a factor in the viewshed from portions of these specially designated areas, as summarized in Table 11.3.3.2-1. The data provided in the table assume the use of 198-m (650-ft) power tower solar energy technology, which because of the potential height of these facilities, could be visible from the largest amount of land of the technologies being considered in the PEIS. Viewshed analysis for this SEZ has shown that the visual impacts of shorter solar energy facilities would be slightly less than for power tower technology that is used for the analysis (see Section 11.3.14 for more detail on all viewshed analysis discussed in this section). Assessment of the visual impact of solar energy projects must be conducted on a site-specific and technology-specific basis to accurately identify impacts.

In general, the closer a viewer is to solar development, the greater the impact on an individual's perception. From a visual analysis perspective, the most sensitive viewing distances generally are from 0 to 5 mi (0 to 8 km). The viewing height above a solar energy development area, the size of the solar development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness or scenic experience within these areas could be expected to be more adversely affected than those simply traveling along a highway with another destination in mind. In the case of the Dry Lake SEZ, the low-lying location of the SEZ in relation to some of the surrounding specially designated areas, especially the Muddy Mountains and Arrow Canyon WAs, would highlight the industrial-like development in the SEZ.

The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas that were used to assess potential impacts on specially designated areas do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

Wilderness Areas

Arrow Canyon. The southernmost portion of the Arrow Canyon WA is less than 2.5 mi (4 km) north of the northernmost portion of the SEZ. About 1,500 acres (6.1 km^2), or about 5%, of the WA within about 9 mi (14 km) are within the SEZ viewshed. Mountains of the Arrow Canyon Range just south of the WA screen views of the SEZ from all but the highest elevations of the southern peaks in the WA. From a few of these peaks, nearly open views of the SEZ exist,

TABLE 11.3.3.2-1 Potentially Affected Specially Designated Areas within a 25-mi (40-km) Viewshed of the Proposed Dry Lake SEZ, Assuming Power Tower Solar Technology and a Target Height of 650 ft (198.1 ha)

		Feature Area or Highway Length		
			Visible within	
Feature Type	Feature Name (Total Acreage/Linear Distance)[a]	Visible within 5 mi	5 mi and 15 mi	15 mi and 25 mi
WAs	Arrow Canyon (27,521 acres)	764 acres (2.8%)[b]	1,485 acres (5.4%)	1,485 acres (5.4%)
	Muddy Mountains (44,522 acres)	0 acres	5,764 acres (13%)	5,764 acres (13%)
ACECs	Rainbow Gardens (38,777 acres)	0 acres	680 acres (1.8%)	844 acres (2.2%)
	River Mountains (10,950 acres)	0 acres	0 acres	1,962 acres (18%)
Wildlife Refuges	Desert (1,626,903 acres)	12,098 acres (0.7%)	45,730 acres (2.8%)	51,276 acres (3.2%)
	Moapa Valley (117 acres)	0 acres	0 acres	0 acres
National Trail	Old Spanish Trail (high-potential segment)	11 mi	0 mi	1 mi
Scenic Highway	Bitter Springs (28 mi)	0 mi	9.5 mi	0 mi
State Park	Valley of Fire (36,000 acres)	0 acres	727 acres (2%)	0 acres

[a] To convert acres to km^2, multiply by 0.004047; to convert mi to km, multiply by 1.609.

[b] Percentage of total feature acreage or road length viewable.

looking down the narrow north–south axis of the SEZ; from those viewpoints, solar facilities would cause moderate to strong contrast levels with the surrounding terrain. It is anticipated that in the portions of the WA with views of the SEZ within 5 mi (8 km) of the SEZ, wilderness characteristics would likely be adversely affected. These effects would be restricted to less than 3% of the WA. It is possible that areas visible out to 9 mi (14 km) could be adversely affected, but because of the visual orientation along the narrow axis of the SEZ, it is not clear this would be the case.

Muddy Mountains. The Muddy Mountains WA is located about 7 mi (11 km) southeast of the SEZ at the point of closest approach. Within the WA, solar facilities within the SEZ could be visible from an area of about 5,800 acres (23.5 km^2) scattered throughout the peaks of much of the western half of the WA out to a distance of about 12 mi (19 km) from the SEZ. The Dry Valley Range provides at least partial screening of the SEZ for views within the WA. However, for some of the higher peaks closer to the SEZ, a substantial portion of the SEZ would be in view over the mountains of the Dry Lake Range, and for some viewpoints within the WA, the SEZ would stretch across most of the horizontal field of view, and strong visual contrast would be expected as a result. Because of the anticipated strong contrast and a clear view into the largest portion of the SEZ, it is anticipated that wilderness characteristics in the portions of the WA closest to the SEZ would be adversely affected. The presence of existing development within the SEZ, especially the new power plant under construction, and the presence of the freeway and existing power line development within the SEZ that are visible from the WA may moderate the impact of solar development.

Areas of Critical Environmental Concern

Rainbow Gardens. The Rainbow Gardens ACEC, which was designated to protect geological, scientific, cultural, sensitive plants, and scenic resources is located 9 mi (24.5 km) south of the SEZ. Within the ACEC, solar facilities within the SEZ could be visible from about 2.2% of the area, and this visibility is scattered through several areas of the northwestern portion of the area, generally at the summits and on north-facing slopes of Sunrise and Frenchman Mountains, and neighboring peaks and ridges. From these high-elevation viewpoints, views of the SEZ are over the tops of mountains in the Dry Lake Range and hills more directly south of the SEZ. Although the viewpoints are 1,000 to 2,000 ft (305 to 610 m) above the elevation of the SEZ, the vertical angle of view is low, and the SEZ is partially screened by intervening topography. In addition, the views are along the SEZs' relatively narrow north–south axis, so that the SEZ occupies only a small portion of the horizontal field of view; consequently, only weak visual contrast is expected from solar facilities within the SEZ. On the basis of this assessment, it is anticipated that there would be no effect on this ACEC from solar construction within the SEZ.

River Mountains. The River Mountains ACEC is located about 20 mi (32 km) south of the SEZ. The ACEC was designated to protect the scenic viewshed for Henderson and Boulder City located south of the ACEC and to protect bighorn sheep habitat. From within the ACEC, solar facilities within the SEZ could be distantly visible from an area of about 2,000 acres (8.1 km^2) scattered among the peaks and ridge tops within the area. Because of the long distance to the SEZ and screening of much of the SEZ by intervening topography, minimal levels of visual contrast would be expected for viewpoints in the ACEC, and it is anticipated that there would be no effect within the ACEC from construction within the SEZ; the reasons for which the area was designated would also not be affected.

Wildlife Refuges

Desert Wildlife Refuge. The refuge was established to protect and perpetuate the desert bighorn sheep and its habitat. The refuge contains habitat for many species, and there also are many recreational opportunities available. The refuge is located a little more than 2 mi (3 km) west of the SEZ at the point of closest approach, beyond the Arrow Canyon Range, and extends beyond the 25-mi (40-km) viewshed of the SEZ. Within the refuge, areas with visibility of solar facilities within the SEZ would include the eastern slopes of mountains and ridges of the Las Vegas Range on the east side of the refuge, primarily within 10 mi (16 km) of the SEZ, but extending in a few areas to beyond 20 mi (32 km) into the refuge. Public access to the refuge is restricted to the eastern third of the area, and strong visual contrast would be expected for some viewpoints that look into the SEZ. Lower elevation viewpoints would be more subject to screening by the mountains of the Arrow Canyon Range, and lower contrast levels would therefore be expected. While the major purpose of the refuge would not be disrupted by the presence of solar facilities in the SEZ, it is possible that some of the areas closest to the SEZ could become less attractive to recreational visitors who currently access these areas. It is not anticipated that this would result in a significant impact on recreational use of the refuge nor would there be any effect on the major purpose of the refuge.

Moapa Valley. This is a very small refuge that was established for the protection of the Moapa dace, a small endangered fish. The refuge is located about 15 mi (24 km) northeast of the SEZ. The principle concern for the refuge is the maintenance of adequate water flows to sustain the dace and to protect its habitat. Groundwater withdrawals within the SEZ to support solar operations could create concern over the long-term impacts on maintenance of the refuge. Water withdrawals in the basin are currently controlled and monitored by the Nevada State Engineer. See Section 11.3.12 for more detailed information on ecological issues associated with the maintenance of adequate groundwater flows within the region surrounding the SEZ. The implementation of design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system would reduce impacts on the Moapa dace and other special status species residing in thermal springs of the Moapa Valley.

National Trail

Old Spanish National Historic Trail. About 30 mi (48 km) of the Old Spanish National Historic Trail are within the SEZ viewshed to the east and northeast of the SEZ. Much of this segment of the trail has been identified as having high potential for future management for protection and interpretation of the trail. For all but 5 mi (8 km), visibility of solar facilities within the SEZ would be limited to the upper portions of power towers, and expected visual contrast levels in these portions of the trail would likely be minimal or very weak. The SEZ would be visible from the trail in a number of places, but the segment with full visibility of solar facilities within the SEZ is a 5-mi (8 km) stretch roughly paralleling the SEZ's eastern boundary, and 3 to 5 mi (5 to 8 km) east of the SEZ. For much of this segment, views of the SEZ would be partially screened by the Dry Lake Range, but some portions of the SEZ would be visible through gaps in the range and beyond the northern end of the range. Visual contrast levels are expected to be minimal to weak, but a site-specific analysis would be required prior to any solar project construction. Potential impacts on the historical setting of the trail and future management of the trail are unknown at this time.

Scenic Byway

Bitter Springs Backcountry Byway. This BLM 28-mi (45-km) designated byway is located about 7 mi (11 km) east from the nearest boundary of the SEZ. About 9.5 mi (15.3 km) of the byway is within the viewshed of the SEZ before it enters the Muddy Mountains. Views of solar development within the SEZ from the byway would be generally very low angle. No impact on the use of the byway from construction of solar facilities within the SEZ is anticipated.

Nevada State Park

Valley of Fire. This is Nevada's oldest and largest state park and it includes about 36,000 acres (146 km^2). The western boundary of the park is about 14 mi (23 km) from the SEZ. Visual analysis indicates that the southwestern corner of the state park could have some limited visibility of taller solar power towers constructed in the SEZ on about 727 acres (3 km^2), or 2% of the park. Overall contrast levels associated with solar facilities would be low, and it is not anticipated that there would be an adverse impact on the use of the park.

11.3.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and road access to the SEZ, no additional construction of transmission or road facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts to specially designated areas. See Section 11.3.1.2 for the development assumptions underlying this analysis.

11.3.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide some mitigation for some identified impacts. The exceptions may be the adverse impacts on wilderness characteristics in up to 3% of the Arrow Canyon and 13% of the Muddy Mountains WAs that would not be completely mitigated.

A proposed design feature specific to the Dry Lake SEZ is as follows:

- Design features for visual resources as described in Section 11.3.14 should be applied to minimize adverse visual impacts.

11.3.4 Rangeland Resources

Rangeland resources managed by the BLM on BLM-administered lands include livestock grazing and habitat for wild horses and burros. These resources and possible impacts on them from solar development within the proposed Dry Lake SEZ are discussed in Sections 11.3.4.1 and 11.3.4.2.

11.3.4.1 Livestock and Grazing

11.3.4.1.1 Affected Environment

Three grazing allotments overlapped the proposed SEZ, but they were closed to grazing in the 1998 ROD for the Las Vegas Resource Management Plan (BLM 1998).

11.3.4.1.2 Impacts

Because the Dry Lake SEZ does not contain any active grazing allotments, solar energy development within the SEZ would have no impact on livestock and grazing.

11.3.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary to protect or minimize impacts on livestock and grazing.

11.3.4.2 Wild Horses and Burros

11.3.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nearly 100 wild horse and burro herd management areas (HMAs) occur within Nevada (BLM 2009f). Five HMAs in Nevada are located wholly or partially within the 50-mi (80-km) SEZ region for the proposed Dry Lake SEZ; while one HMA in Arizona also occurs partially within the SEZ region (BLM 2010a) (Figure 11.3.4.2-1). None of the HMAs occur within the SEZ or within the area of indirect effects. The Muddy Mountains HMA is the closest HMA. It occurs about 8 mi (13 km) east of the Dry Lake SEZ (Figure 11.3.4.2-1).

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to the proposed Dry Lake SEZ is the Spring Mountain Territory, located within a portion of the

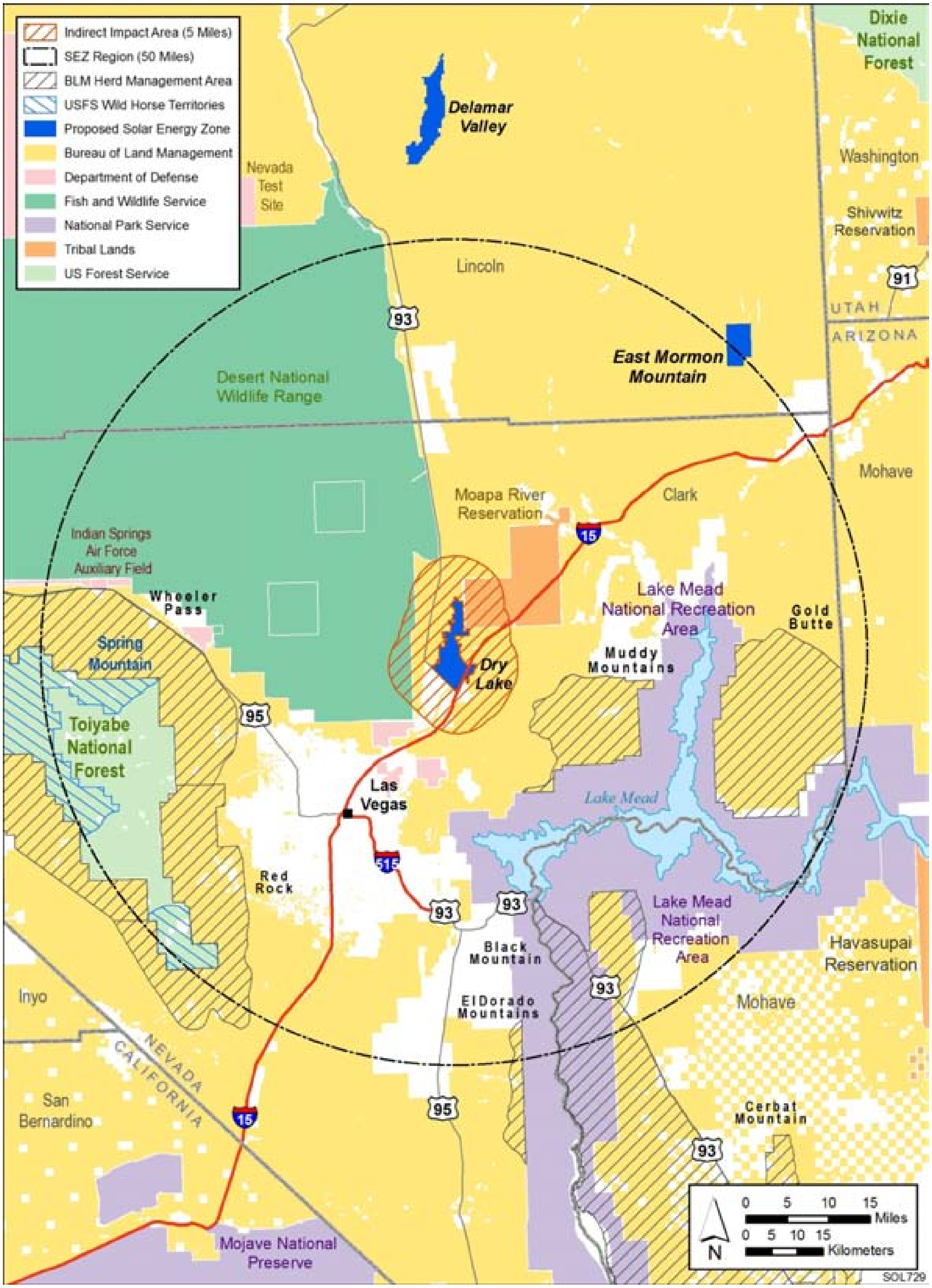

FIGURE 11.3.4.2-1 Wild Horse and Burro Herd Management Areas and Territories within the Analysis Area for the Proposed Dry Lake SEZ (Sources: BLM 2009f; USFS 2007)

Toiyabe National Forest. The closest portion of this territory is located about 33 mi (53 km) west of the proposed Dry Lake SEZ (Figure 11.3.4.2-1).

11.3.4.2.2 Impacts

Because the proposed Dry Lake SEZ is about 8 mi (13 km) or more from any wild horse and burro HMA managed by the BLM and more than about 33 mi (53 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly or indirectly affect wild horses and burros that are managed by these agencies.

11.3.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features for solar development within the proposed Dry Lake SEZ would be necessary to protect or minimize impacts on wild horses and burros.

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11.3.5 Recreation

11.3.5.1 Affected Environment

The site of the proposed Dry Lake SEZ is an easily accessible area, close to Las Vegas, that is flat with numerous roads and trails that provide access into the area. Although there are no recreation data available, the area appears to offer limited opportunities for recreation, although backcountry driving, OHV use of the roads and trails, and recreational shooting are evident in the area. The area may also support some limited camping and hunting opportunities. OHV use in the SEZ and surrounding area has been designated as "Limited to existing roads, trails, and dry washes" (BLM 2010b).

11.3.5.2 Impacts

Construction and Operations

Recreational use would be eliminated from portions of the SEZ developed for solar energy production, and existing recreational users would be displaced. Although there are no recreational use figures for the area, the area is not a major recreation destination, and it is not anticipated that the loss of recreational opportunities would be significant. The area contains numerous roads and trails that access areas in and around the SEZ, and the potential exists for many of these roads and trails to be closed. This could adversely affect access to undeveloped areas within the SEZ and areas outside the SEZ. Whether recreational visitors would continue to use any remaining undeveloped portions of the SEZ, or how the use of areas surrounding the SEZ would change, is unknown.

Because of the presence of solar development within the SEZ, it is possible that some of the specially designated areas closest to the SEZ could become less attractive to recreational visitors who currently access these areas. It is not anticipated that this would result in a significant impact on recreational use.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If open OHV routes within the SEZ were identified during project-specific analyses, they would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and road access to the SEZ, no additional construction of transmission or road facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts to specially designated areas. See Section 11.3.1.2 for the development assumptions underlying this analysis.

11.3.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features to protect recreation resources would be required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions may be that recreational use of the area developed for solar energy production would be lost and would not be mitigated.

11.3.6 Military and Civilian Aviation

11.3.6.1 Affected Environment

The proposed Dry Lake SEZ is not located under any military airspace, nor is it identified as a DoD Consultation Area in BLM land records. It is located about 13.5 mi (22 km) northeast of Nellis Air Force Base, which is one of the largest fighter bases in the world. While not located under designated military airspace, the area is close to airspace that is used for military aircraft approaches and departures from Nellis.

The nearest public airport is the North Las Vegas Airport, a regional airport about a 21-mi (34-km) drive to the southwest of the SEZ. The airport does not have scheduled commercial passenger service but caters to smaller private and business aircraft (Clark County Department of Aviation 2010a). Farther to the south in Las Vegas, McCarran International Airport is served by all major U.S. airlines and is the major airport in the area.

11.3.6.2 Impacts

The Command at Nellis Air Force Base has commented that approaches/departures from runways at Nellis may be affected by solar towers or other tall structures that could be located in the SEZ. In addition, because of the nature of testing at the NTTR located to the west and north of the SEZ, the military has indicated that solar technologies requiring structures higher than 50 ft (15 m) AGL may present unacceptable electromagnetic compatibility concerns for its test mission. The NTTR has commented that a pristine testing environment is required for the unique national security missions conducted on the NTTR.

The North Las Vegas and McCarran International airports are located far enough away from the facility that there would be no effect on their operations.

11.3.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features are required to protect either military airspace or civilian aviation operations. The programmatic design features described in Appendix A, Section A.2.2, would require early coordination with the DoD to identify and mitigate, if possible, potential impacts on the use of MTRs.

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11.3.7 Geologic Setting and Soil Resources

11.3.7.1 Affected Environment

11.3.7.1.1 Geologic Setting

Regional Setting

The proposed Dry Lake SEZ is located in Dry Lake Valley, a northeast-trending closed basin within the Basin and Range physiographic province in southern Nevada. The valley is bounded on the west by the Arrow Canyon Range and on the southeast by the Dry Lake Range (Figure 11.3.7.1-1). Dry Lake Valley is one of many structural basins (grabens) typical of the Basin and Range province.

Exposed sediments in Dry Lake Valley consist mainly of modern alluvial and eolian deposits (Qa) (Figure 11.3.7.1-2). Playa lake sediments at Dry Lake (Qp) occur in the valley's center. The surrounding mountains are composed predominantly of Paleozoic carbonates (limestone and dolomite) and Tertiary volcaniclastic sedimentary rocks. The oldest rocks in the region are the Late Proterozoic to Cambrian metamorphic rocks (CZq) exposed along ridges within the Las Vegas Range to the west (Longwell et al. 1965).

Topography

Dry Lake Valley is an elongated basin covering an area of about 102,400 ac (414 km^2). Elevations along the valley axis range from about 2,200 ft (670 m) at its northern end and along the range fronts to about 1,970 ft (600 m) at its southern end near Dry Lake. Alluvial fan deposits occur along the valley margins and coalesce toward the valley center. The valley is drained by several unnamed ephemeral streams that terminate at the Alkali Flat and Dry Lake, a playa in the southern part of the valley.

The proposed Dry Lake SEZ is located in the southern part of Dry Lake Valley, between the Arrow Canyon Range to the west and the Dry Lake Range to the east (Figure 11.3.7.1-1). The terrain of the proposed SEZ site is relatively flat. Elevations range from about 2,556 ft (779 m) along the northwest-facing boundary to 1,985 ft (600 m) along the western edge of Dry Lake near the center of the SEZ (Figure 11.3.7.1-3).

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Dry Lake SEZ. Solar project developers

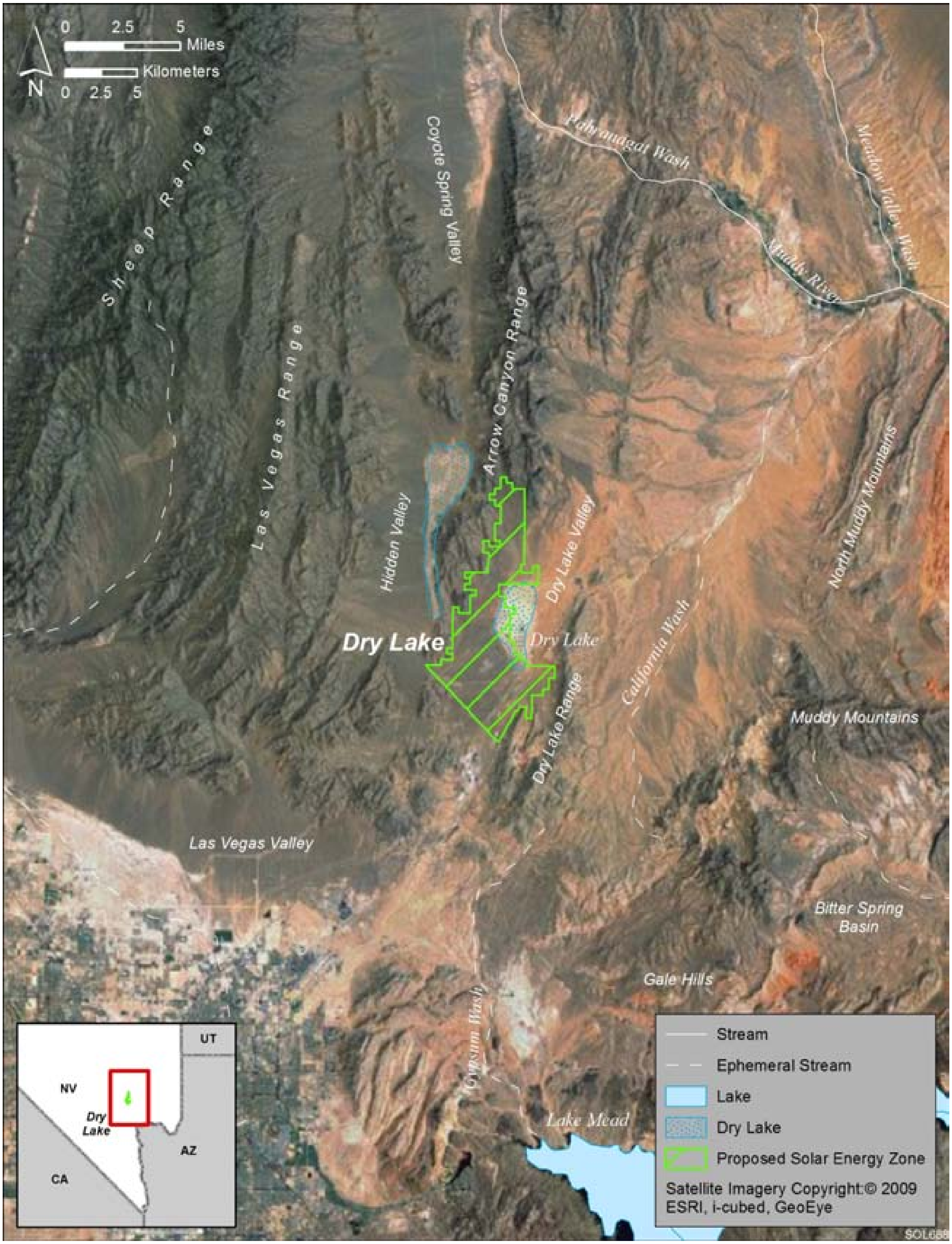

FIGURE 11.3.7.1-1 Physiographic Features of the Dry Lake Valley Region

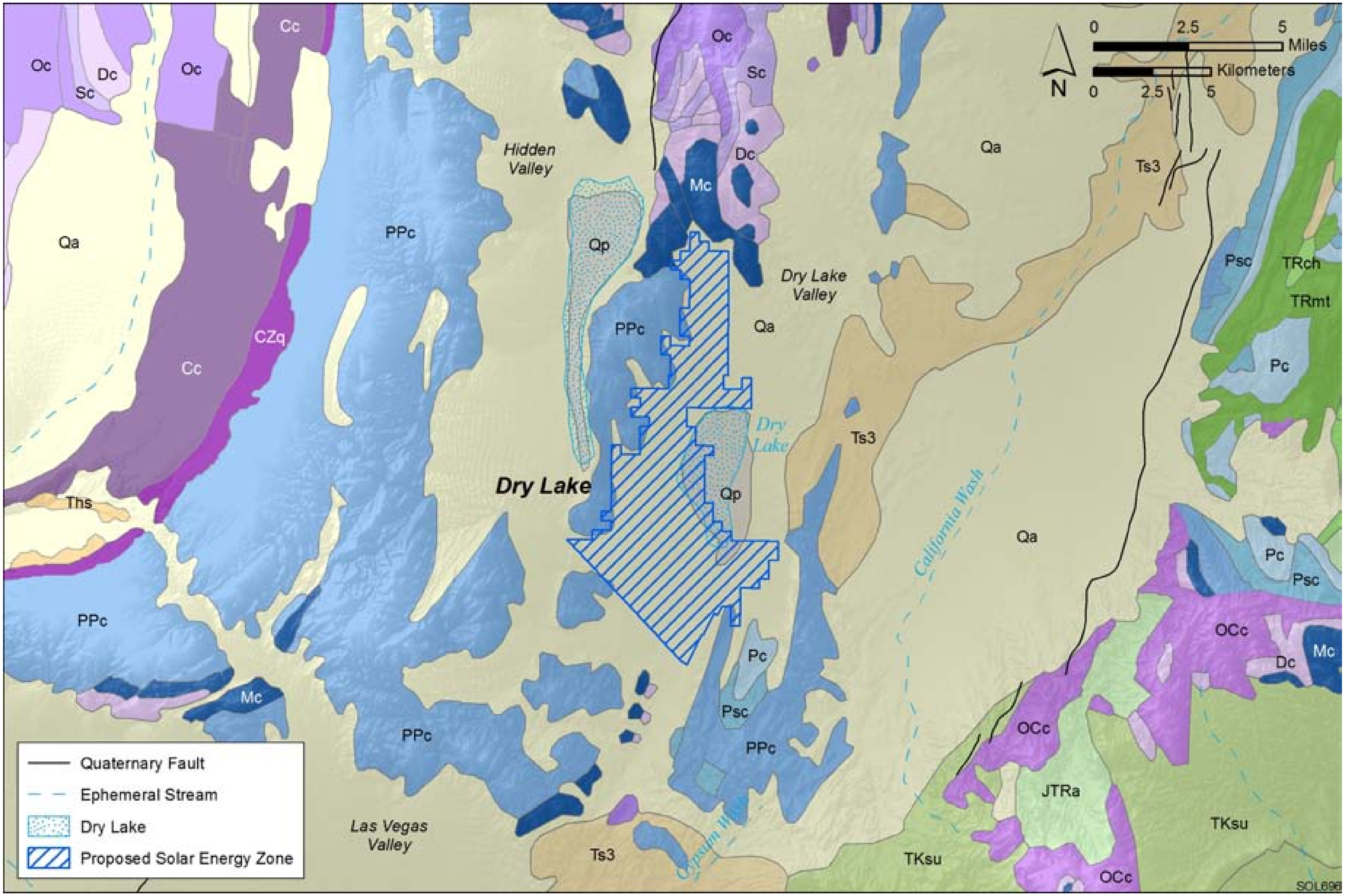

FIGURE 11.3.7.1-2 Geologic Map of the Dry Lake Valley Region (Sources: Ludington et al. 2007; Stewart and Carlson 1978)

Cenozoic (Quaternary, Tertiary)

- Qa — Alluvial deposits; locally includes beach and sand dune deposits
- Qp — Playa, marsh, and alluvial-flat deposits, locally eroded
- Ts3 — Tuffaceous sedimentary rocks; minor tuff
- Ths — Horse Spring Formation (tuffaceous sedimentary rocks)
- TKsu — Continental sedimentary rocks

Mesozoic

- JTRa — Aztec Sandstone (Triassic - Jurassic)
- TRch — Chinle Formation (bentonitic claystone, siltstone, and clayey sandstone; ledge-forming sandstone; and red siltstone)
- TRmt — Moenkopi and Thaynes Formations (marine deposits of siltstone, limestone and sparse conglomerate)

Paleozoic

- Pc — Cherty limestone and sparse dolomite, shale and sandstone
- Psc — Siltstone, sandstone, limestone, dolomite and gypsum
- PPc — Limestone and sparse dolomite, siltstone and sandstone (Permian - Pennsylvanian)
- Mc — Limestone and minor amounts of dolomite and shale
- Dc — Dolomite, limestone and minor amounts of sandstone and quartzite
- Sc — Dolomite
- Oc — Limestone, dolomite, shale and quartzite
- OCc — Dolomite and limestone, undivided (Cambrian - Ordovician)
- Cc — Limestone and dolomite; locally thick sequences of shale and siltstone
- CZq — Quartzite and minor amounts of conglomerate, phyllitic siltstone, limestone and dolomite (Proterozoic - Cambrian)

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FIGURE 11.3.7.1-2 (Cont.)

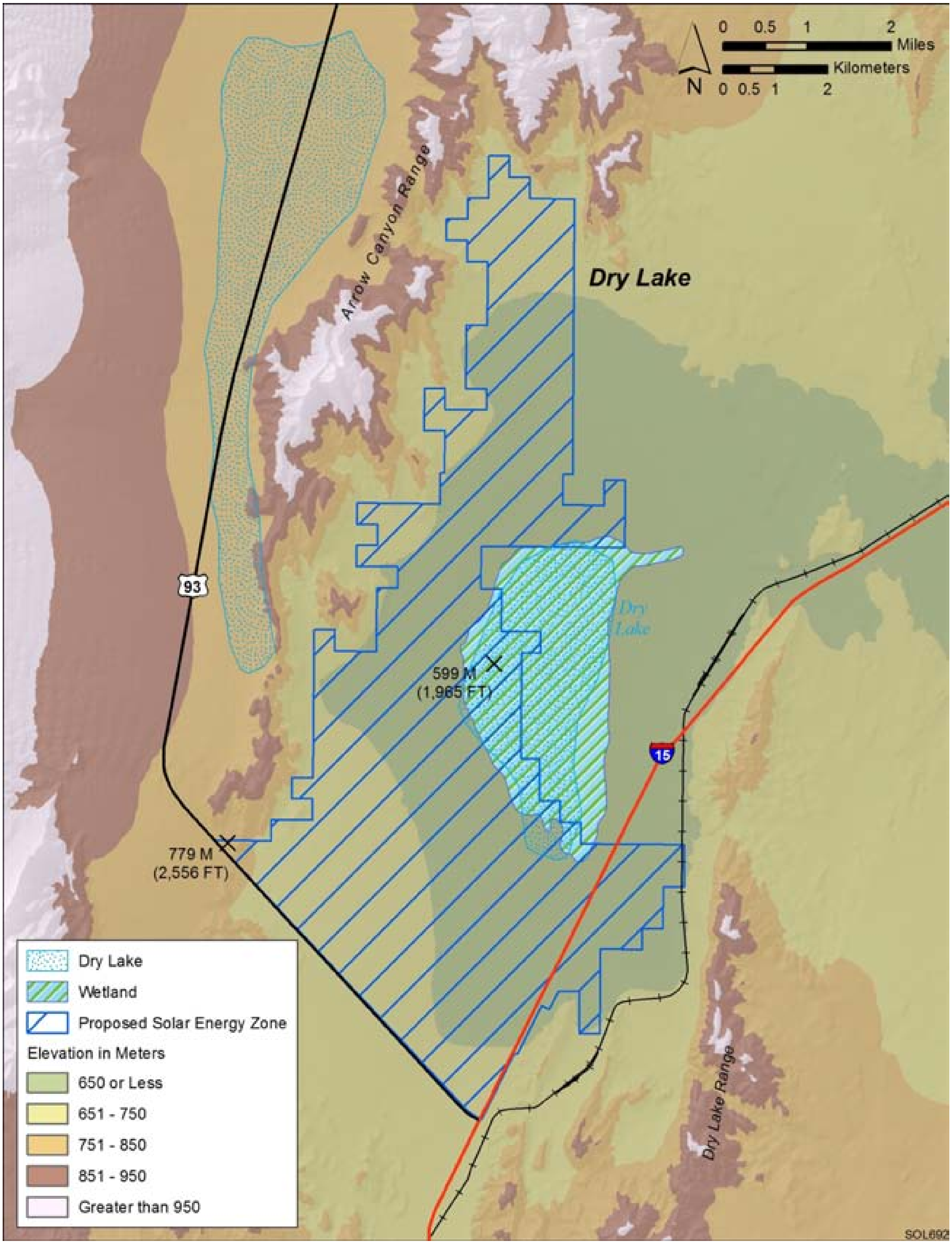

FIGURE 11.3.7.1-3 General Terrain of the Proposed Dry Lake SEZ

may need to conduct a geotechnical investigation to identify and assess geologic hazards locally to better identify facility design criteria and site-specific design features to minimize their risk.

Seismicity. Clark County is south of the Southern Nevada Seismic Belt (also called the Pahranagat Shear Zone), a south-southwest trending zone of seismic activity characterized mainly by background earthquakes (i.e., earthquakes not associated with surface expression) (DePolo and DePolo 1999). Although the region is seismically active, no Quaternary faults occur within or immediately adjacent to the proposed Dry Lake SEZ. The nearest Quaternary fault is the Arrow Canyon Range fault, a north-striking fault along the western edge of the Arrow Canyon Range a few miles north of the SEZ (Figure 11.3.7.1-4).

The Arrow Canyon Range fault is a major basin and range normal fault that forms an abrupt boundary between the down-dropped block (Hidden Valley) to the west and the east-tilting block of the Arrow Canyon Range to the east. Its trace is well defined, and fault-line scarps have been mapped at the 1:100,000 scale. The northern part of the fault cuts older alluvium of middle to early Pleistocene age and is covered by alluvial fan deposits of middle to late Pleistocene age, placing the age of most recent movement at less than 1.6 million years. Slip rates along the fault are estimated to be less than 0.2 mm/yr (Anderson 1998).

From June 1, 2000, to May 31, 2010, 51 earthquakes were recorded within a 61-mi (100-km) radius from the proposed Dry Lake SEZ (USGS 2010a). The largest earthquake during that period occurred on May 16, 2004. It was located about 50 mi (80 km) north of the SEZ in the Gregerson Basin (near the Delamar Mountains) and registered a Richter magnitude[1] (ML) of 4.5 (Figure 11.3.7.1-4). During this period, 24 (47%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0; none were greater than 4.5 (USGS 2010a).

Liquefaction. The proposed Dry Lake SEZ is within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.09 and 0.10 g. Shaking associated with this level of acceleration is generally perceived as moderate to strong; however, the potential damage to structures is very light to light (USGS 2008).Given the very low intensity of ground shaking estimated for the area and the low incidence of historical seismicity in the region, the potential for liquefaction in sediments within and around the SEZ is also likely to be low.

Volcanic Hazards. Dry Lake Valley is located about 60 mi (100 km) southeast of the southwestern Nevada volcanic field, which consists of volcanic rocks (tuffs and lavas) of the Timber Mountain-Oasis Valley caldera complex and Silent Canyon and Black Mountain calderas

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[1] Richter scale magnitude (ML) was the original magnitude defined by Richter and Gutenberg for local earthquakes in 1935. It was based on the maximum amplitude recorded on a Wood-Anderson torsion seismograph but is currently calculated for earthquakes with magnitudes ranging from 2 to 6, using modern instruments with adjustments (USGS 2010b).

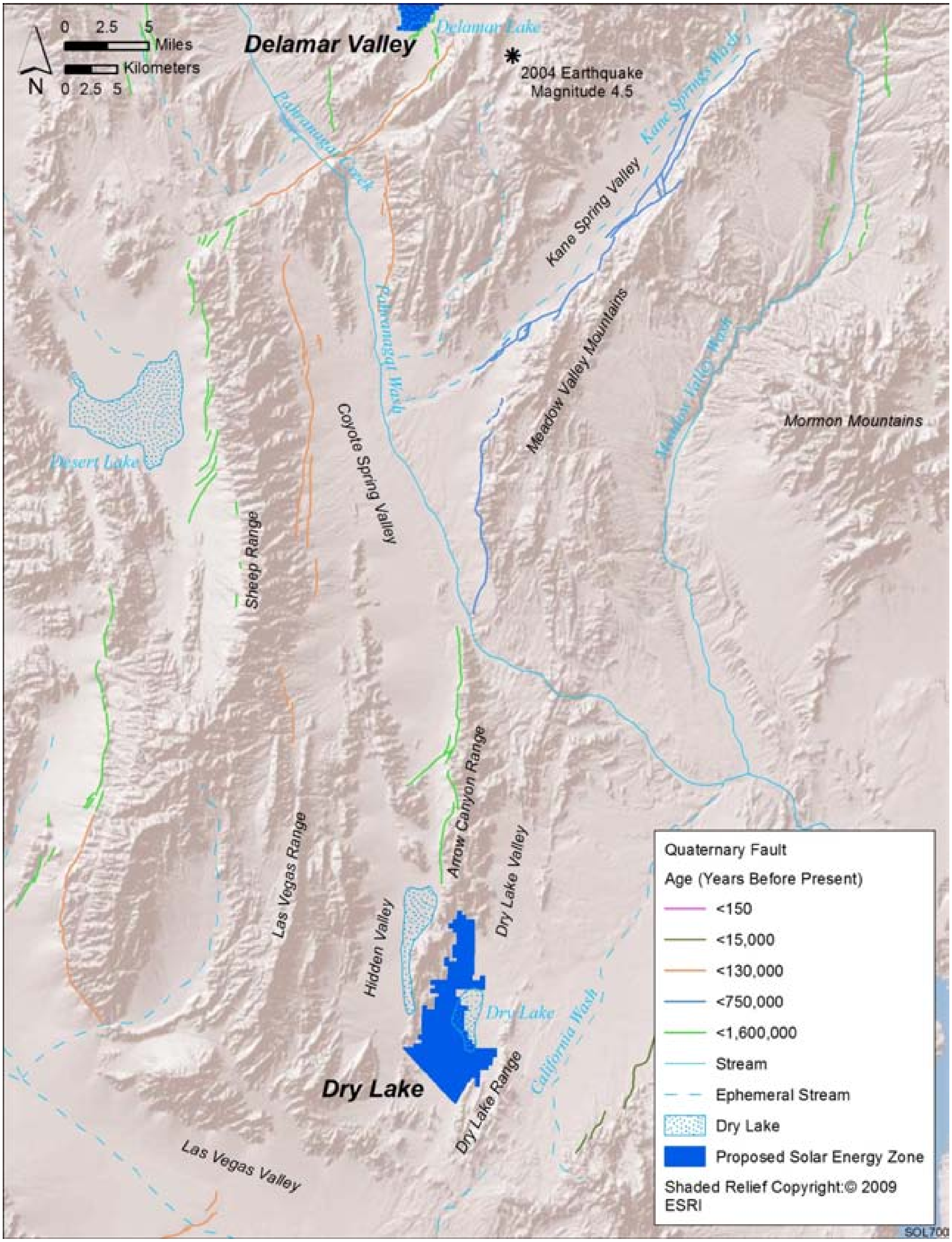

FIGURE 11.3.7.1-4 Quaternary Faults in the Dry Lake Valley Region (USGS and NBMG 2010; USGS 2010a)

(Figure 11.3.7.1-4). The area has been studied extensively because of its proximity to the NTS and Yucca Mountain repository. Two types of fields are present in the region: (1) large-volume, long-lived fields with a range of basalt types associated with more silicic volcanic rocks produced by melting of the lower crust, and (2) small-volume fields formed by scattered basaltic scoria cones during brief cycles of activity, called rift basalts because of their association with extensional structural features. The basalts of the region typically belong to the second group; examples include the basalts of Silent Canyon and Sleeping Butte (Byers et al. 1989; Crowe et al. 1983).

The oldest basalts in the region were erupted during the waning stages of silicic volcanism in the southern Great Basin in the Late Miocene and are associated with silicic volcanic centers like Dome Mountain (the first group). Rates of basaltic volcanic activity in the region have been relatively constant but generally low. Basaltic eruptions occurred from 1.7 million to 700,000 years ago, creating the cinder cones within Crater Flat (Stuckless and O'Leary 2007). The most recent episode of basaltic eruptions occurred at the Lathrop Wells Cone complex about 80,000 years ago, a few miles east of the proposed Amargosa SEZ (Stuckless and O'Leary 2007). There has been no silicic volcanism in the region in the past 5 million years. Current silicic volcanic activity occurs entirely along the margins of the Great Basin (Crowe et al. 1983).

Crowe et al. (1983) determined that the annual probability of a volcanic event for the region is very low (3.3×10^{-10} to 4.7×10^{-8}), similar to the probability of 1.7×10^{-8} calculated for the proposed Yucca Mountain repository (Cline et al. 2005). The volcanic risk in the region is associated only with basaltic eruptions; the risk of more explosive silicic volcanism is negligible. Perry (2002) cites new hypotheses and geologic data that point to a possible increase in the recurrence rate (and thus the probability of disruption) of volcanism in the region. These include hypotheses of anomalously high strain rate episodes in the region and the presence of a regional mantle hot spot; and new aeromagnetic data that suggest as many as twelve previously unrecognized volcanoes may be buried in the alluvial-filled basins in the region.

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts. Such events can present a hazard to facilities on the relatively flat terrain of valley floors, such as Dry Lake Valley, if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

No land subsidence monitoring has taken place in Dry Lake Valley to date; however, earth fissures have been documented in the Las Vegas Valley around Las Vegas, about17 mi (27 km) southwest of the proposed Dry Lake SEZ. The fissures are likely the result of land subsidence caused by compaction of unconsolidated alluvial sediments due to groundwater withdrawal. Spatial distribution of fissures in the valley suggests that fissures are preferentially located near and along Quaternary faults, with 80% of fissures within 1,150 ft (350 m) of a known fault. The maximum subsidence measured for the period between 1963 and 1987 was about 5 ft (1.5 m). Since then, subsidence rates have declined by as much as 50 to 80%. The reduction in subsidence rates has been attributed to the effects of the artificial recharge program

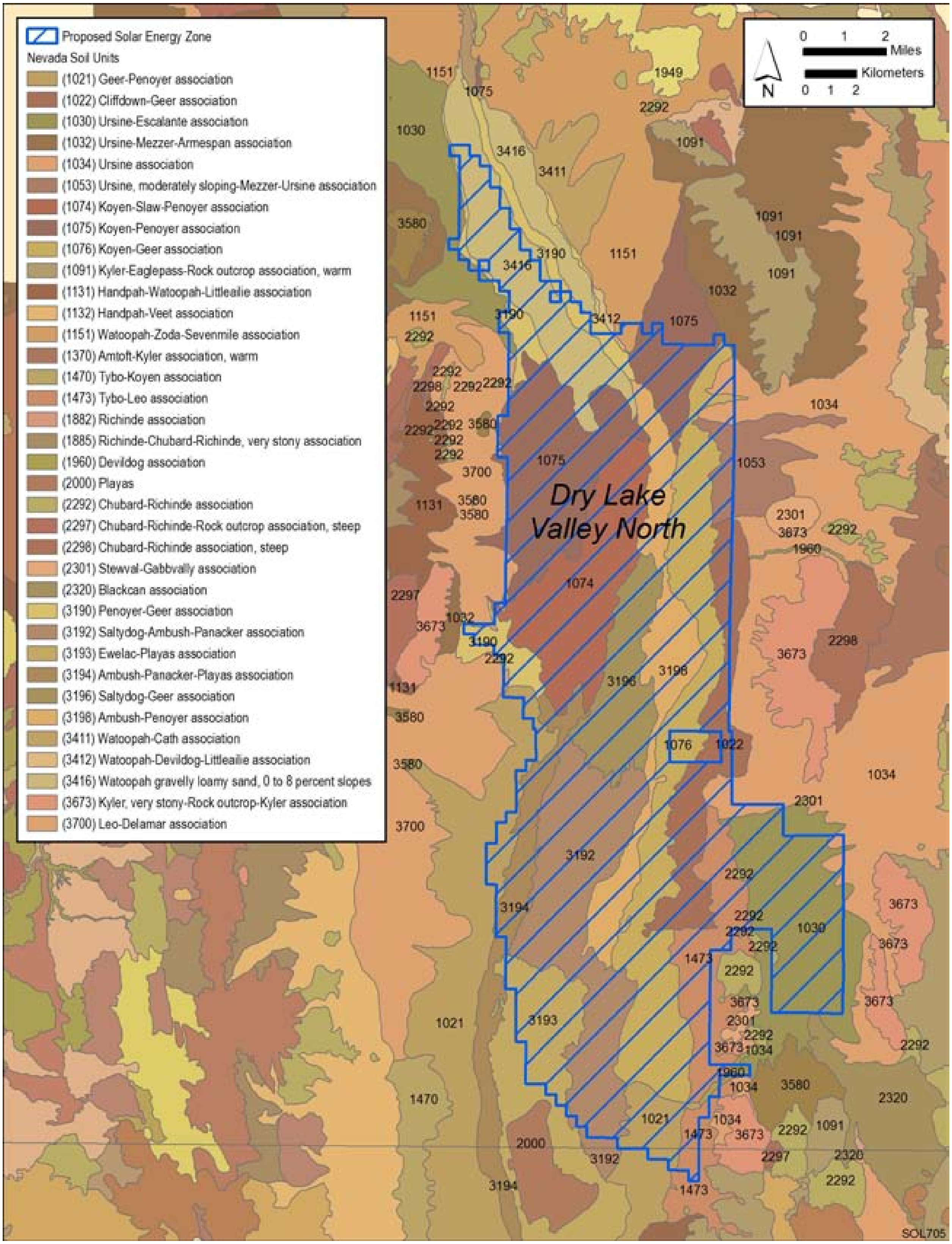

FIGURE 11.3.7.1-5 Soil Map for the Proposed Dry Lake SEZ (NRCS 2008)

(using water from Lake Mead) started in the 1990s, which has generally increased water levels in the region (Bell et al. 2002; Burbey 2002; Galloway et al. 1999).

Other Hazards. Other potential hazards at the proposed Dry Lake SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Disturbance of soil crusts and desert pavement on soil surfaces may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those found in Dry Lake Valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow fans) will depend on the specific morphology of the fan (NRC 1996). Section 11.3.9.1.1 provides further discussion of flood risks within the proposed Dry Lake SEZ.

11.3.7.1.2 Soil Resources

Soils within the proposed Dry Lake SEZ are predominantly very gravelly and stony loams of the Colorock-Tonopah and Bard-Tonopah associations, which together make up about 68% of the soil coverage at the site (Figure 11.3.7.1-5). Soil map units within the proposed Dry Lake SEZ are described in Table 11.3.7.1-1. These gently to moderately sloping soils are derived alluvium from sedimentary rocks (mainly carbonates); some soils (particularly those of the Colorock series) have well developed pavements. They are characterized as deep and well to excessively drained. Most of the soils on the site have a high surface runoff potential and moderate permeability. The water erosion potential is low for all soils at the site except those within the playa (covering about 1% of the site). The susceptibility to wind erosion is moderate for most soils, with as much as 86 tons (78 metric tons) of soil eroded by wind per acre each year (NRCS 2010). Biological soil crusts and desert pavement have not been documented in the SEZ, but may be present.

None of the soils within the proposed Dry Lake SEZ is rated as hydric.[2] Except for the Ireteba loam, which covers about 851 acres (3.4 km^2) and has a frequent flooding rating (with a 50% chance in any year), flooding is rare for soils at the site but possible under unusual weather conditions (with a 1 to 5% chance in any year). None of the soils is classified as prime or unique farmland (NRCS 2010).

11.3.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind,

2 A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding (NRCS 2010).

TABLE 11.3.7.1-1 Summary of Soil Map Units within the Proposed Dry Lake SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (percent of SEZ)
469360	Colorock-Tonopah association, moderately sloping (2 to 8% slopes)	Low (0.24)	Moderate (WEG 6)[d]	Consists of about 55% Colorock very gravelly clay loam and 40% Tonopah gravelly sandy loam. Nearly level to gently sloping soils on fan remnants. Parent material is calcareous alluvium derived from sedimentary rock. Deep and well to excessively drained, with high surface runoff potential (very slow infiltration rate) and moderate permeability. Available water capacity is low. Moderate rutting hazard. Colorock soils have well developed pavements. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	8,777 (56)
469349	Bard-Tonopah association, gently sloping	Low (0.28)	Moderate (WEG 5)	Consists of about 60% Bard gravelly fine sandy loam and 30% Tonopah gravelly sandy loam. Gently sloping soils on fan remnants. Parent material is alluvium derived from limestone and dolomite. Shallow and deep, well to excessively drained, with high surface runoff potential (very slow infiltration rate) and moderate permeability. Available water capacity is very low. Moderate rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	1,814 (12)
469355	Bard very stony loam (2 to 4% slopes)	Low (0.28)	Moderate (WEG 5)	Nearly level to gently sloping soils on fan remnants. Parent material consists of alluvium derived from limestone and dolomite. Moderately deep and well drained, with high surface runoff potential (very slow infiltration rate) and high permeability. Available water capacity is very low. Moderate rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	1,546 (10)
469353	Bard gravelly fine sandy loam (2 to 8% slopes)	Low (0.20)	Moderate (WEG 4)	Nearly level to gently sloping soils on fan remnants. Parent material consists of alluvium derived from limestone and dolomite. Moderately deep and well drained, with high surface runoff potential (very slow infiltration rate) and high permeability. Available water capacity is very low. Moderate rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	1,189 (8)

TABLE 11.3.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
369381	Ireteba loam, overflow	Low (0.28)	Moderate (WEG 4)	Nearly level soils formed on floodplains. Parent material consists of alluvium derived from mixed sources. Moderately deep and well drained, with moderate surface runoff potential and moderate permeability Low resistance to compaction. Available water capacity is high. Severe rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	851 (5)
369380	Ireteba loam	Low (0.28)	Moderate (WEG 4)	Nearly level soils on fan remnants. Parent material consists of alluvium from mixed sources. Moderately deep and well drained, with moderate surface runoff potential and moderate permeability. Available water capacity is high. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	516 (3)
369379	Grapevine loam	Moderate (0.43)	Moderate (WEG 4)	Level to nearly level soils on fan piedmonts and alluvial flats. Very deep and well drained, with moderate surface runoff potential and moderate permeability. Parent material consists of mixed alluvium with some gypsum. Available water capacity is moderate. Used mainly as wildlife habitat and rangeland; unsuitable for cultivation.	415 (1)
369399	Rock land-St. Thomas association, very steep	Not rated	Not rated	Consists of about 60% rockland and 30% St. Thomas. Steeply sloping soils on mountain slopes. Parent material is colluvium derived from limestone and dolomite over residuum weathered from limestone and dolomite. Shrink-swell potential is low. Available water capacity is very low. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	226 (1)
369395	Playas	Moderate (0.37)	Moderate (WEG 4)	Moderately to strongly saline, very poorly drained silty clay loam (0 to 6 in.[e]) to silty clay (6 to 60 in.) formed on playas. Used mainly for wildlife habitat, watershed, and recreational and esthetic purposes.	195 (1)

TABLE 11.3.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
369354	Bard very gravelly fine sandy loam (2 to 15% slopes)	Low (0.10)	Moderate (WEG 6)	Moderately sloping soils formed on fan remnants. Parent material consists of alluvium derived from limestone and dolomite. Shallow to moderately deep and well drained, with high surface runoff potential (very slow infiltration rate) and high permeability. Available water capacity is very low. Slight rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	116 (<1)

[a] Water erosion potential rates based on soil erosion factor K, which indicates the susceptibility of soil to sheet and rill erosion by water. Values range from 0.02 to 0.69 and are provided in parentheses under the general rating; a higher value indicates a higher susceptibility to erosion. Estimates based on the percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8 low (see footnote d for further explanation).

[c] To convert from acres to km^2, multiply by 0.004047.

[d] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEG 4, 86 tons (78 metric tons) per acre (4,000 m^2) per year; WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year; and WEG 6, 48 tons (44 metric tons) per acre (4,000 m^2) per year.

[e] To convert from in. to cm, multiply by 2.54.

Source: NRCS (2010).

soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy developments in varying degrees and are described in more detail for the four phases of development in Section 5.7.1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility since some components would involve greater disturbance and would take place over a longer timeframe.

11.3.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Dry Lake SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2., as required under BLM's Solar Energy Program, would reduce the potential for soil impacts during all project phases.

11.3.8 Minerals (Fluids, Solids, and Geothermal Resources)

11.3.8.1 Affected Environment

As of September 17, 2010, there were a number of active mining claims, both lode and placer located, in Sections 13 and 14, Township 18S, Range 63E, in the very southern tip of the proposed Dry Lake SEZ (BLM and USFS 2010a). There also is a mineral processing plant located in Section 13. The public land within the SEZ was closed to additional locatable mineral entry in June 2009, pending the outcome of this solar energy PEIS. There are no active oil and gas leases in the area, but all but a small portion of the area has been leased in the past (BLM and USFS 2010b). The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals, and for disposal of salable minerals. There is no active or historical geothermal leasing or development in or near the SEZ (BLM and USFS 2010b).

11.3.8.2 Impacts

The existing mining claims in the southern portion of the SEZ represent prior existing rights and would likely make development of the encumbered parcels within the two sections unlikely. In addition, this same area already has numerous existing ROWs present, so it is not likely to be utilized for solar development.

If the area were identified as a solar energy zone, it would continue to be closed to all incompatible forms of mineral development. For the purpose of this analysis, it is assumed that future development of oil and gas resources would continue to be possible, since such development could occur with directional drilling from outside the SEZ. Since the remainder of the SEZ does not contain existing mining claims, it is also assumed that there would be no future loss of locatable mineral production. The production of common minerals, such as sand and gravel and mineral materials used for road construction or other purposes, might take place in areas not directly developed for solar energy production.

Since the SEZ has no history of leasing or development of geothermal resources, it is not anticipated that solar development would adversely affect development of geothermal resources.

11.3.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required to protect mineral resources. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate protection mineral resources.

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11.3.9 Water Resources

11.3.9.1 Affected Environment

The proposed Dry Lake SEZ is located within the Lower Colorado-Lake Mead subbasin of the Lower Colorado River Basin hydrologic region (USGS 2010c) and the Basin and Range physiographic province, which is characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed SEZ has surface elevations ranging between 1,970 and 2,560 ft (600 and 780 m). The Dry Lake SEZ is located within Garnet Valley Hydrographic Area (also referred to as Dry Lake Valley), a closed basin that is internally drained and underlain by alluvial deposits that fill the valley (Figure 11.3.9.1-1). The climate of Garnet Valley is arid; average annual precipitation is about 5 in. (13 cm) in the basin (WRCC 2010a). Evaporation rates are estimated to be 99 in. (251 cm) in the basin (Cowherd et al. 1988; WRCC 2010b).

11.3.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

The Dry Lake SEZ is located within the Garnet Valley Hydrographic Area, a closed basin that has an area of approximately 99,800 acres (404 km^2) and is not hydraulically connected to the Colorado River Basin (NDWR 1972). Surface water features within the proposed Dry Lake SEZ include three unnamed washes that lead to the remnants of a Pleistocene era dry lake (Figure 11.3.9.1-1) (NDWR 1972). Annual runoff from the mountains within the Garnet Valley is estimated to be 300 ac-ft/yr (370,000 m^3/yr) (Rush 1968). The basin is closed, so any water that runs off the mountains of the Garnet Valley Basin evaporates or infiltrates into the ground. The area of the dry lake is approximately 2,700 acres (11 km^2). To the east, in the adjacent California Wash Basin, the California Wash drains east to Muddy River, a tributary to the Colorado River.

Flood hazards within the SEZ include areas within the 100-year floodplain (Zone A) and areas outside the 500-year floodplain (Zone X) (FEMA 2009). Areas of the SEZ within the 100-year floodplain total 1,569 acres (6.3 km^2) and include the Pleistocene era dry lake and two washes that extend southwest from the dry lake. Flooding in parts of these areas occurs with an annual probability greater than or equal to 1%. In these areas, intermittent flooding may occur with temporary ponding and erosion. The rest of the proposed SEZ is estimated to be outside the 500-year floodplain, and has an annual probability of flooding of less than 0.2%.

A 3,310-acre (13-km^2) wetland area has been identified by the NWI in the vicinity of the dry lake, and approximately 1,022 acres (4.1 km^2) of the SEZ are part of the wetland area (USFWS 2009a). Further information regarding the wetlands near the SEZ is described in Section 11.3.10.1.

11.3.9.1.2 Groundwater

The proposed Dry Lake SEZ is located within the Garnet Valley groundwater basin (NDWR 2010a). The basin-fill aquifer in Garnet Valley consists of unconfined Quaternary-age

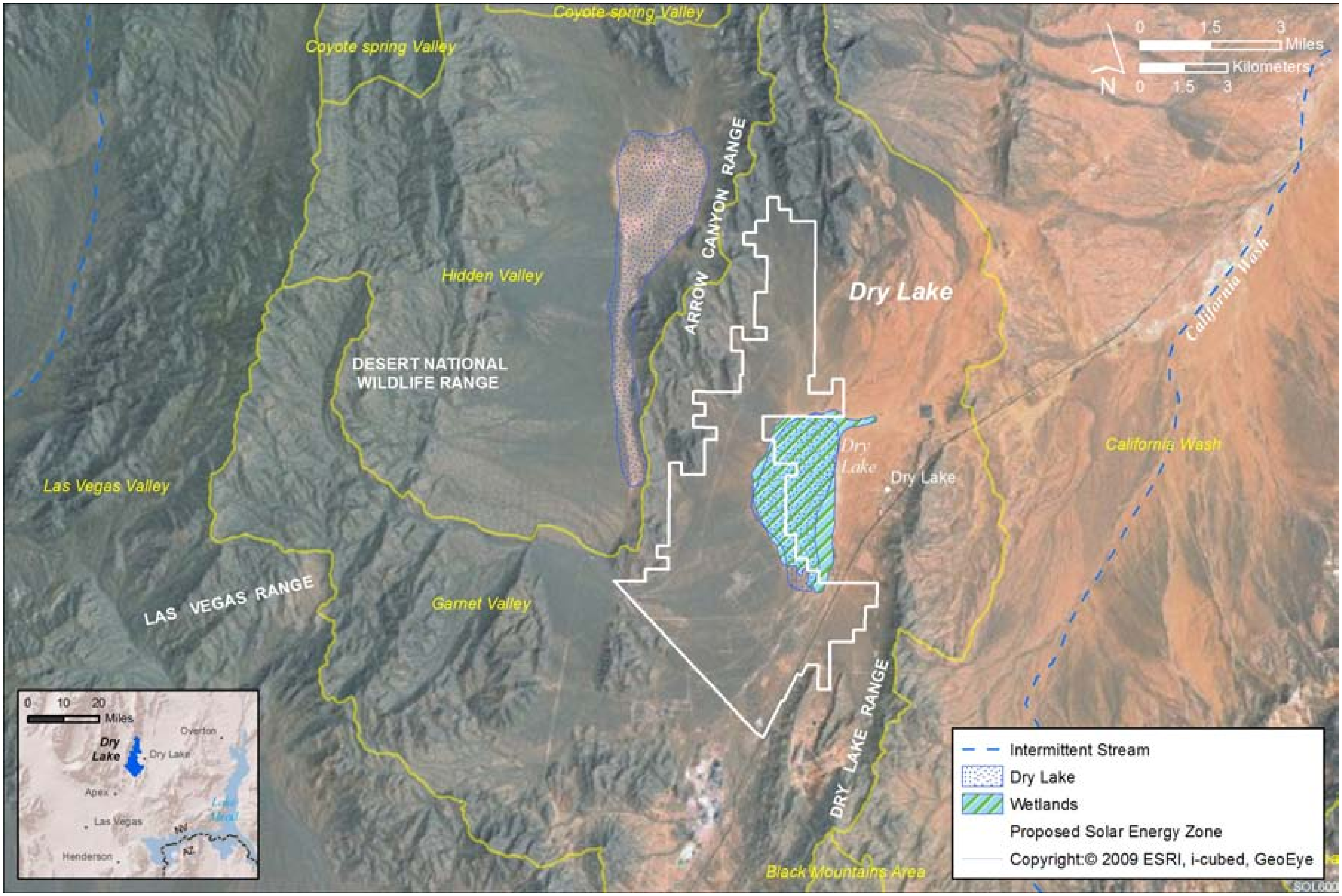

FIGURE 11.3.9.1-1 Surface Water Features near the Proposed Dry Lake SEZ

alluvium and lacustrine deposits of moderately well-sorted sand, silt, and clay. The younger alluvium is underlain by the Muddy Creek Formation consisting of gypsum and Pleistocene-age poorly sorted, semi-consolidated alluvium (Rush 1968). Alluvium thickness has been found to be between 900 and 1,500 ft (274 and 457 m) in the center of the basin, but likely averages around 600 ft (183 m) (Rush 1968). Thickness of suitable aquifer basin-fill materials was found to be between 50 and 200 ft (15 and 61 m) in the basin (Rush 1968). Transmissivity values have not been reported for the alluvium in the basin, but are estimated to be low, in general, with areas of coarser and more well-sorted materials being more conductive (Rush 1968).

Paleozoic carbonate rocks underlie the alluvium in the Garnet Valley basin and are present in the mountain ranges on the basin margins (Rush 1968; Burbey 1997). The Paleozoic carbonate rocks that underlay Garnet Valley basin are thought to be a part of the White River Groundwater Flow System, a regional-scale carbonate-rock aquifer that flows generally toward the south and terminates at Muddy River Springs and the Virgin River. The White River Groundwater Flow System is a part of a large carbonate-rock province that occurs within approximately one-third of Nevada, a large portion of Utah, and parts of Arizona and California (Harrill and Prudic 1998). Connectivity of the carbonate-rock aquifer system in Nevada is difficult to assess, due to the complex geologic history of compression and extensional forces that the rocks were subjected to long after they were deposited (Burbey 1997). Garnet Valley and the Hidden Valley basin to the north are studied together because of their similar properties and connectivity. Approximately 17,000 ft (5,200 m) of carbonate rocks were measured during exploratory drilling of the Arrow Canyon mountain range, which is thought to be one of the thickest sequences of carbonate rocks in southern Nevada (Burbey 1997). Connectivity of the carbonate rock systems in the Garnet Valley (and the adjacent Hidden Valley) basin with the rest of White River Groundwater Flow System is unclear. Fault systems to the east and west may impede groundwater flow between Garnet Valley and Las Vegas Valley to the west and California Wash basin to the east. However, the Garnet Valley/Hidden Valley groundwater system is thought to be connected to the Coyote Spring Valley basin to the north, as the isotopic characteristics of the water in Garnet Valley are similar to those of the White River Groundwater Flow System (Burbey 1997).

Groundwater discharge through evapotranspiration was estimated to be nonexistent in the Garnet Valley aquifer system (DeMeo et al. 2008). Groundwater recharge from precipitation on the valley floor and the surrounding mountains was estimated to be 400 ac-ft/yr (490,000 m^3/yr) (Rush 1968). Groundwater inflows from neighboring basins were estimated at 400 ac-ft/yr (490,000 m^3/yr) from the Hidden Valley groundwater basin, adjacent to the north/west (Rush 1968). Groundwater is estimated to discharge from the basin to the west into the California Wash groundwater basin at a rate of 800 ac-ft/yr (990,000 m^3/yr) (Rush 1968). Estimates of interbasin flows were estimated based on the amount of recharge received in the upstream basin, Hidden Valley, and in Garnet Valley to formulate the numbers presented in the report by Rush (1968).

Groundwater flows through the basin from the west to the east, through fractured carbonate rocks; however, the groundwater gradient is very flat (Rush 1968; Burbey 1997). Groundwater elevations were approximately 1,810 to 1,815 ft (552 to 553 m) in the year 2000, and were recorded at between 230 and 760 ft (70 and 230 m) below ground surface

(USGS 2010d). Water depths in some areas of the basin declined approximately 20 ft (6 m) between the 1950s and 1980s.

Groundwater quality in the Garnet Valley basin has been measured (one sample in each of four wells) and reported to the NWIS database (USGS 2010d). Concentrations of total dissolved solids (TDS) have been measured at between 950 and 1,010 mg/L, which is above the secondary MCL of 500 mg/L recommended by the EPA (2009d). Sulfate concentrations have been measured at between 330 to 370 mg/L, which is higher than secondary MCL. Iron, fluoride, and manganese concentrations also exceeded secondary MCLs in one well. The only well sampled for Radon-222 had a concentration of 530 pCi/L, which exceeds the primary MCL for alpha-emitting radioactive constituents of 15 pCi/L.

11.3.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Clark County were 680,000 ac-ft/yr (839 million m^3/yr), of which 83% came from surface waters and 17% came from groundwater. The largest water use category was public supply, at 526,000 ac-ft/yr (649 million m^3/yr). Thermoelectric water use accounted for 28,000 ac-ft/yr (34 million m^3/yr), with irrigation water use on the order of 17,000 ac-ft/yr (21 million m^3/yr) (Kenny et al. 2009). Municipal water use for the Las Vegas Valley Water District is listed as the primary water use (64%); other uses include industrial (20%), mining and milling (8%), quasi-municipal (5%), domestic (1%), and commercial (<1%) (NDWR 2010a; SNWA 2009).

All waters in Nevada are the property of the public in the State of Nevada and subject to the laws described in Nevada Revised Statutes, Chapters 532 through 538 (available at http://leg.state.nv.us/nrs). The NDWR, led by the State Engineer, is the agency responsible for managing both surface water and groundwater resources, which includes overseeing water right applications, appropriations, and interbasin transfers (NDWR 2010c). The two principle ideas behind water rights in Nevada are the prior appropriations doctrine and the concept of beneficial use. A water right establishes an appropriation amount and date such that more senior water rights have priority over newer water rights. In addition, water rights are treated as both real and personal property, such that water rights can be transferred without affecting the land ownership (NDWR 2010c). Water rights applications (new or transfer of existing) are approved if the water is available to be appropriated, if existing water rights will not be affected, and if the proposed use is not deemed to be harmful to the public interest. If these conditions are satisfied according to the State Engineer, proof of beneficial use of the approved water must be provided within a certain time period, and following that a certificate of appropriation is issued (BLM 2001).

The NDWR has the authority to designate preferred uses of groundwater in a basin, overriding the prior appropriation doctrine (BLM 2001). The NDWR generally does not grant water rights in a basin that is over-appropriated. However, in basins that may have alternative sources of water, groundwater rights can be temporarily granted in excess of the estimated recharge of the basin. For example, basins that may have access to Colorado River water in the future may be temporarily granted use of groundwater. Those permits may then be revoked at a later date when water becomes available from the Colorado River (BLM 2001). Interbasin transfers of water are possible within Nevada and are regulated by the NDWR (NDWR 2010c).

The proposed Dry Lake SEZ is located in the Garnett Valley groundwater basin (NDWR 2010a). The NDWR estimates the perennial yield for each groundwater basin as the amount of water that can be economically withdrawn for an indefinite period without depleting the source (NDWR 1999). The perennial yield for Garnett Valley was estimated to be 400 ac-ft/yr (490,000 m^3/yr) according to the study by Rush (1968) (NDWR 2010a). The Garnett Valley groundwater basin is over-appropriated with up to approximately 3,400 ac-ft/yr (4.2 million m^3/yr) committed for beneficial uses in Garnet Valley. However, groundwater withdrawals ranged from 797 to 1,558 ac-ft/yr (980,000 to 1.9 million m^3/yr) between 2001 and 2009, primarily for mining and industrial uses (NDWR 2010a,b). The Southern Nevada Water Authority (SNWA 2009) stated that the Las Vegas Valley Water District has leased the majority of their 2,200 ac-ft/yr (2.7 million m^3/yr) of groundwater rights in Garnet Valley to dry-cooled power plants in the area.

In 1990, Garnet Valley was designated as a groundwater basin by the State Engineer, and the preferred uses of groundwater were specified to exclude irrigation and to include the following uses: municipal, quasi-municipal, industrial, commercial, mining, stockwater, and wildlife purposes (NDWR 1990). In 2002, the State Engineer issued Order 1169 stating that new applications for water in the carbonate-rock aquifer systems within Garnet Valley would be suspended to allow further study of the system (NDWR 2002). An additional 44,500 ac-ft/yr (55 million m^3/yr) of water rights have been applied for within the basin and are under consideration by the NDWR (NDWR 2010b). These water rights applications are currently being held in abeyance per NDWR Order 1169 (NDWR 2002).

11.3.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, and off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water–wetland–groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by the excessive withdrawal from aquifers).

11.3.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy developments, which are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. Land disturbance activities should be avoided to the extent possible in the vicinity of the dry lake, 100-year flood plain, and ephemeral wash areas within the SEZ. The area of the 100-year floodplain totals 1,569 acres (6.3 km^2) of the proposed Dry Lake SEZ. Alterations to these systems could enhance erosion processes, disrupt groundwater recharge, and negatively affect plant and animal habitats associated with the ephemeral channels and the dry lake.

11.3.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Dry Lake SEZ include the following:

- On the basis of a total area of 15,649 acres (63 km^2), it is assumed that two solar projects would be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;

- The maximum land disturbance for an individual solar facility during the peak construction year is 3,000 acres (12 km^2);

- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, result in the potential to disturb up to 38% of the SEZ total area during the peak construction year; and

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry cooling (see Section 5.9.2.1).

Site Characterization

During site characterization, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible, since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Because there are no significant surface water bodies on the proposed Dry Lake SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources.

Water requirements for dust suppression and potable water supply during construction are shown in Table 11.3.9.2-1 and could be as high as 3,480 ac-ft (4.3 million m^3) in the peak construction year. The assumptions underlying these estimates for each solar energy technology are described in Appendix M. Groundwater wells would have to yield up to an estimated 2,160 gpm (8,200 L/min) to meet the estimated construction water requirements. These yields are on the order of a large-scale municipal or agricultural well, so multiple wells may be needed in order to obtain the water requirements (Harter 2003). In addition, up to 148 ac-ft (180,000 m^3) of sanitary wastewater generated on-site would need to be either treated on-site or sent to an off-site facility. The availability of groundwater, groundwater rights, and the impacts of groundwater withdrawal would need to be assessed during the site characterization phase of a solar development project. Obtaining water from an offsite source could be necessary for solar development projects.

Groundwater quality in the vicinity of the SEZ is known to have elevated concentrations of TDS and other constituents. If groundwater were to be used for potable supply during construction, it would need to be tested to verify the quality would comply with drinking water standards.

TABLE 11.3.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Dry Lake SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	2,260	3,390	3,390	3,390
Potable supply for workforce (ac-ft)	148	90	37	19
Total water use requirements (ac-ft)	2,408	3,480	3,428	3,409
Wastewater generated				
Sanitary wastewater (ac-ft)	148	90	37	19

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Table M.9-1 (Appendix M).

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 99 in./yr (251 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

[c] To convert ac-ft to m^3, multiply by 1,234.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 11.3.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, hybrid, wet). Further refinements to water requirements for cooling would result from the percentage of time the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 11.3.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

TABLE 11.3.9.2-2 Estimated Water Requirements during Operations at the Proposed Dry Lake SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	2,504	1,391	1,391	1,391
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	1,252	696	697	70
Potable supply for workforce (ac-ft/yr)	35	16	16	1.6
Dry cooling (ac-ft/yr)[e]	501–2,504	278–1,391	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	11,267–36,306	6,260–20,170	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	711	71
Dry-cooled technologies (ac-ft/yr)	1,788–3,791	989–2,102	NA	NA
Wet-cooled technologies (ac-ft/yr)	12,554–37,593	6,971–20,881	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	711	395	NA	NA
Sanitary wastewater (ac-ft/yr)	35	16	16	1.6

[a] Land area for parabolic trough was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

[b] Water needs are linearly related to power. Water usage for any other size project can be estimated by using multipliers provided in Table M.9-2 (Appendix M).

[c] Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

[d] To convert ac-ft to m^3, multiply by 1,234.

[e] Dry-cooling value assumes 0.2 to 1.0 ac-ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac-ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009).

[f] NA = not applicable.

[g] Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 70 to 1,252 ac-ft/yr (86,000 to 1.5 million m^3/yr) and the workforce potable water supply from 1.6 to 35 ac-ft/yr (2,000 to 43,000 m^3/yr). The maximum total water usage during normal operation at full build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 37,593 ac-ft/yr (46 million m^3/yr). Water usage for dry-cooling systems would be as high as 3,791 ac-ft/yr (4.7 million m^3/yr), approximately a factor of 10 times less than the wet-cooling option. Non-cooled technologies, dish engine and PV systems, require substantially less water at full build-out capacity, up to 711 ac-ft/yr (880,000 m^3/yr) for dish engine systems and 71 ac-ft/yr (86,000 m^3/yr) for PV systems (Table 11.3.9.2-2). Operations would produce up to 35 ac-ft/yr (43,000 m^3/yr) of sanitary wastewater; in addition, for wet-cooled technologies, 395 to 711 ac-ft/yr (490,000 to 880,000 m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds were effectively lined in order to prevent any groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed Dry Lake SEZ. However, obtaining water from an off-site source could be necessary for solar development projects. At the level of full build-out, parabolic trough technologies that use wet cooling would use 32 to 94 times the amount of water of the estimated perennial yield of the Garnett Valley groundwater basin. Water use for technologies that use dry cooling would also exceed the perennial yield of the basin. If groundwater withdrawals exceeded the sustainable yield of the basin, then groundwater levels would decline in the basin, potentially leading to permanent loss of groundwater storage, land surface subsidence, and reduced inflows to the California Wash basin, which is within the Colorado River Basin watershed. Groundwater level declines could also affect flow in the White River Groundwater Flow System and impact groundwater discharge to the Muddy River Springs or the Virgin River. Groundwater may be available within the carbonate aquifer, but further study is needed to determine the connectivity of the system within Nevada and the potential impacts from large-scale groundwater withdrawals. Further, both new and current applications for groundwater rights are being held in abeyance per NDWR Order 1169. Also, 44,500 ac-ft/yr (55 million m^3/yr) of water rights that have been applied for within the basin and would be considered by the NDWR first before any applications for new water rights or transfer of existing water rights would be considered. Based on the information presented here, wet cooling and dry cooling for the full build-out scenario is not deemed feasible for the Dry Lake SEZ. To the extent possible, solar development projects should implement water conservation practices to limit water needs.

Groundwater quality in the vicinity of the SEZ is known to have elevated concentrations of TDS and other constituents. If groundwater were to be used for potable supply during construction, it would need to be tested to verify the quality would comply with drinking water standards.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its pre-construction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and may also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because quantities of water needed during the decommissioning/reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

11.3.9.2.3 Off-Site Impacts: Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. The extent of the impacts on water resources would be proportional to the amount and location of land disturbance needed to connect the proposed SEZ to major roads and existing transmission lines. The proposed Dry Lake SEZ is located adjacent to existing roads and transmission lines as described in Section 11.3.1.2, so it is assumed that impacts would be negligible.

11.3.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy at the proposed Dry Lake SEZ are associated with land disturbance effects on the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation issues, as well as altering groundwater recharge and discharge processes. Land disturbance activities should be avoided to the extent possible in the vicinity of the dry lake, 100-year flood plain, and ephemeral wash areas within the SEZ. Alterations to these systems could enhance erosion processes, disrupt groundwater recharge, and negatively affect plant and animal habitats associated with the ephemeral channels and the dry lake.

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater is the primary water resource available to solar energy facilities in the proposed Dry Lake SEZ; however, aquifer characteristics and the basin’s sustainable yield are not fully quantified. The estimates of groundwater recharge, discharge, underflow from adjacent basins, and historical data on groundwater extractions and groundwater surface elevations suggest that there may not be groundwater available to support the water-intensive technologies, such as those using wet or dry cooling. The basin's perennial yield is listed as 400 ac-ft/yr (490,000 m^3/yr), and current withdrawals from the basin are almost four times that estimated perennial yield (NDWR 2010a; NDWR 2010b). The estimate of basin's perennial yield for Garnet Valley is based on a report done in 1968, and does not include the yield of the carbonate aquifer beneath the basin fill in Garnet Valley. The quantity of water potentially available within the carbonate-rock aquifer is not well understood, and is currently being studied.

Currently, all applications for new water rights are on hold pending studies on the carbonate-rock aquifer system, per NDWR Order 1169. Water rights currently allocated by the

NDWR within the basin are over 8 times the estimated perennial yield of the basin-fill aquifer (NDWR 2010a). In addition, water rights applications are pending for another 44,500 ac-ft/yr (55 million m^3/yr) in water allocations from the basin. Obtaining new water rights or transfer of existing water rights within the Garnet Valley basin could present challenges for solar development. Given the information presented here, wet cooling and dry cooling for the full build-out scenario is not deemed feasible for the Dry Lake SEZ. To the extent possible, solar development projects should implement water conservation practices to limit water needs.

Groundwater quality in the vicinity of the SEZ is known to have elevated concentrations of TDS and other constituents. If groundwater were to be used for potable supply during construction, it would need to be tested to verify the quality would comply with drinking water standards.

11.3.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, will mitigate some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Proposed design features specific to the Dry Lake SEZ include the following:

- Wet-cooling and dry-cooling options would not be feasible unless further hydrologic study of the basin reveals that more water is available, and other technologies should incorporate water conservation measures;

- Land-disturbance activities should avoid impacts to the extent possible in the vicinity of the ephemeral washes and the dry lake present on the site;

- Siting of solar facilities and construction activities should avoid areas identified as being within a 100-year floodplain, which totals 1,569 acres (6.3 km^2) of the proposed SEZ.

- Groundwater rights must be obtained from the NDWR;

- Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection (NDEP 2010);

- Groundwater monitoring and production wells should be constructed in accordance with state standards (NDWR 2006); and

- Water for potable uses would have to meet or be treated to meet water quality standards in accordance with the *Nevada Administrative Code* (445A.453-445A.455).

11.3.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Dry Lake SEZ. The affected area considered in this assessment includes the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and includes only the SEZ. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects.

Indirect effects considered in the assessment include effects from surface runoff, dust, and accidental spills from the SEZ but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

11.3.10.1 Affected Environment

The proposed Dry Lake SEZ is located primarily within the Creosotebush–Dominated Basins Level IV ecoregion (EPA 2007), which includes stream terraces, floodplains, alluvial fans, and eroded washes, as well as isolated hills, mesas, and buttes (Bryce et al. 2003). Plant communities are characterized by sparse creosotebush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), and big galleta grass (*Pleuraphis rigida*); cacti, yucca (*Yucca* sp.), ephedra (*Ephedra* sp.), and Indian ricegrass (*Achnatherum hymenoides*) are also common, although barren areas occur. In addition, mesquite (*Prosopis* sp.) and acacia (*Acacia* sp.) are present, and blackbrush (*Coleogyne ramosissima*) is common in areas near the Arid Footslopes ecoregion. Riparian habitats include desert willow (*Chilopsis linearis*), coyote willow (*Salix exigua*), and mesquite, with salt cedar (*Tamarix* sp.), a non-native shrub/tree invading riparian areas. Small areas of the northwestern margin of the SEZ are located in the Arid Footslopes Level IV ecoregion. This ecoregion supports a diverse but sparse mixture of Mojave desert forbs, succulents and shrubs, such as creosotebush, white bursage, *Yucca* species, including Joshua tree (*Yucca brevifolia*), winterfat (*Krascheninnikovia lanata*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedra nevadensis*), big galleta, Indian ricegrass, and annual fescue (*Vulpia myuros*) on alluvial fans, basalt flows, hills, and low mountains (Bryce et al. 2003). Cacti, such as silver cholla (*Cylindropuntia echinocarpa*) and beavertail (*Opuntia basilaris*), occur in rocky areas. Annual plants are abundant with sufficient winter precipitation. The east-central portion of the SEZ is located within the Mojave Playas Level IV ecoregion, which includes broad, nearly level alluvial flats, muddy lake plains, low terraces, sand sheets, and sand dunes (Bryce et al. 2003). These playas are intermittently flooded and mostly barren, with sparse, scattered, highly salt-tolerant vegetation on the margins. Velvet ash (*Fraxinus velutina*), mesquite or other trees may occur on some playas with sufficient moisture. Scattered creosotebush occurs in some locations. Areas surrounding the SEZ include the Creosotebush–Dominated Basins and Arid Footslopes ecoregions.

These ecoregions are located within the Mojave Basin and Range Level III ecoregion (see Appendix I). This ecoregion is characterized by broad basins and scattered mountains. Communities of sparse, scattered shrubs and grasses including creosotebush, white bursage, and big galleta grass occur in basins; Joshua tree, other *Yucca* species, and cacti occur on arid footslopes; woodland and shrubland communities occur on mountain slopes, ridges, and hills (Bryce et al. 2003). Creosotebush, all-scale (*Atriplex polycarpa*), brittlebush (*Encelia farinosa*), desert holly (*Atriplex hymenelytra*), white burrobrush (*Hymenoclea salsola*), shadscale (*Atriplex confertifolia*), blackbrush, and Joshua tree are dominant species within the Mojave desertscrub biome (Turner 1994). Precipitation in the Mojave Desert occurs primarily in winter. Many ephemeral species (winter annuals) germinate in response to winter rains (Turner 1994). Annual precipitation in the vicinity of the SEZ is low, averaging about 6.5 in. (16.4 cm) at Valley of Fire State Park (see Section 11.3.13).

Land cover types described and mapped under the SWReGAP (USGS 2005a) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Dry Lake SEZ are shown in Figure 11.3.10.1-1. Table 11.3.10.1-1 lists the surface area of each cover type within the potentially affected area.

Sonora-Mojave Creosote-White Bursage Desert Scrub is the predominant cover type within the proposed Dry Lake SEZ. Additional cover types within the SEZ are given in Table 11.3.10.1-1. During an August 2009 visit to the site, creosotebush and white bursage were the dominant species observed in the desert scrub communities throughout most of the SEZ, with scattered Mojave yucca (*Yucca schidigera*) in some areas. A large dry lake playa in the central area of the SEZ was mostly barren, with saltbush (*Atriplex* sp.) along the perimeter. Thickets of honey mesquite (*Prosopis glandulosa*) occurred in swales near the playa. Cacti observed on the SEZ included teddybear cholla (*Cylindropuntia bigelovii*) and beavertail. Sensitive habitats on the SEZ include desert chenopod scrub/mixed salt desert scrub, desert dry washes, dry wash woodland, wetland, and playa. The area has a history of livestock grazing, and the plant communities on the SEZ have likely been affected by grazing.

The area of indirect effects, including the area within 5 mi (8 km) around the SEZ, includes 12 cover types, which are listed in Table 11.3.10.1-1. The predominant cover type in the area of indirect effects is Sonora-Mojave Creosote-White Bursage Desert Scrub.

One wetland mapped by the NWI is located within the central portion of the SEZ (USFWS 2009a) (Figure 11.3.10.1-2). NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009a). This large sparsely vegetated lacustrine wetland, Dry Lake, is mapped primarily as North American Warm Desert Pavement, with small areas of Sonora-Mojave Creosote-White Bursage Desert Scrub, Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Playa, and North American Warm Desert Wash. Approximately 1,022 acres (4.1 km^2) of this 3,310.5-acre (13.4-km^2) wetland is located within the SEZ. The remaining portion is located entirely within the area of indirect effects. Numerous dry washes occur within the SEZ, terminating in the large playa. These washes do not support wetland habitats, but many support communities of mesquite and

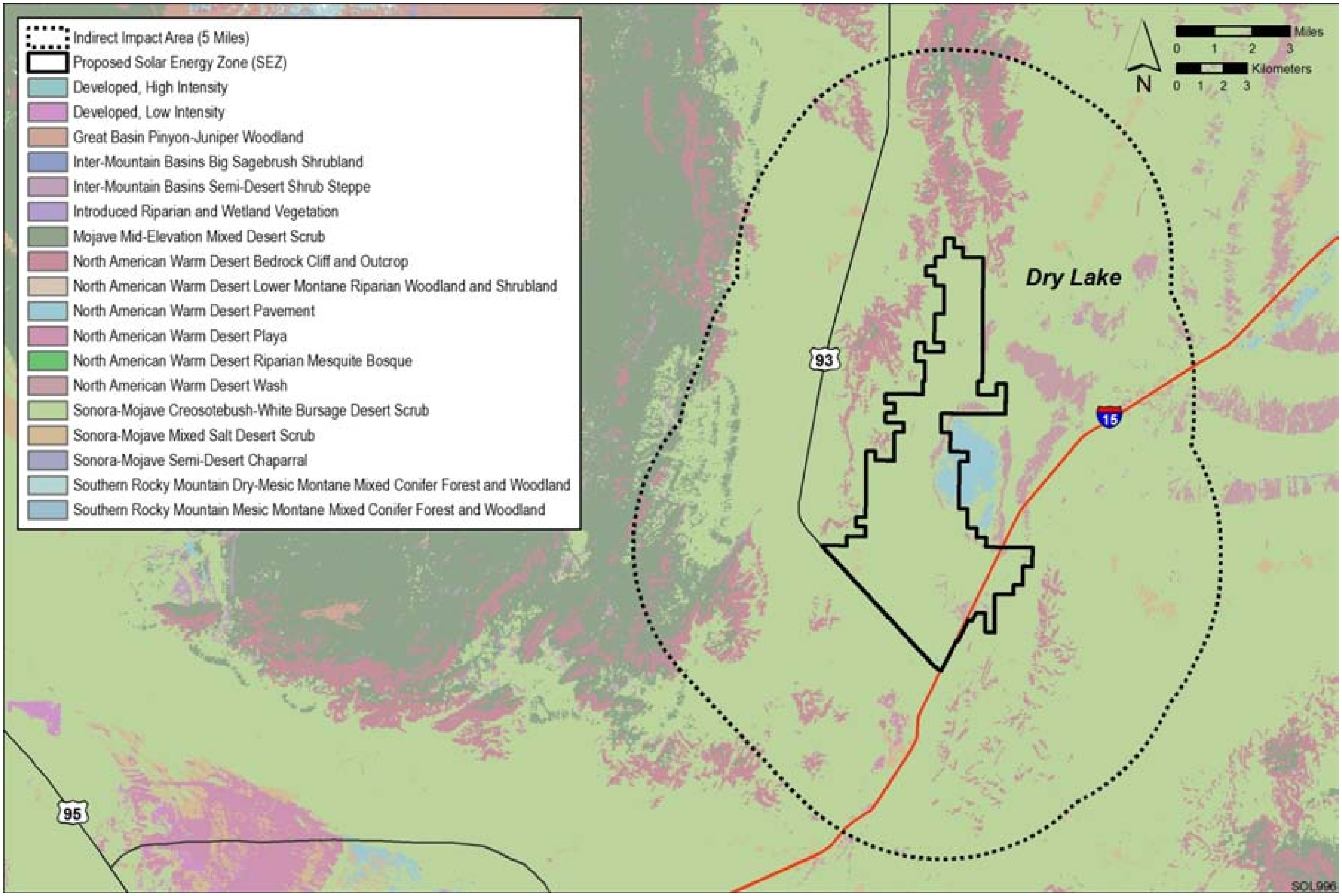

FIGURE 11.3.10.1-1 Land Cover Types within the Proposed Dry Lake SEZ (Source: USGS 2004)

TABLE 11.3.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Dry Lake SEZ and Potential Impacts

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
Sonora-Mojave Creosotebush-White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	14,613 acres[f] (0.5%, 1.0%)	118,001 acres (4.1%)	Small
North American Warm Desert Pavement: Consists of unvegetated to very sparsely vegetated (<2% plant cover) areas, usually in flat basins, with ground surfaces of fine to medium gravel coated with "desert varnish." Desert scrub species are usually present. Herbaceous species may be abundant in response to seasonal precipitation.	430 acres (1.1%, 3.8%)	1,271 acres (3.1%)	Moderate
North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	429 acres (0.7%, 1.0%)	3,419 acres (5.4%)	Small
Developed, Medium-High Intensity: Includes housing and commercial/industrial development. Impervious surfaces compose 50 to 100% of the total land cover.	128 acres (0.7%, 4.3%)	441 acres (2.3%)	Small
Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran Deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even co-dominant. Grasses occur at varying densities.	54 acres (0.1%, 0.3%)	1,064 acres (1.4%)	Small

TABLE 11.3.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b]		Overall Impact Magnitude[e]
	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
North American Warm Desert Playa: Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant.	2 acres (<0.1%, <0.1%)	295 acres (0.5%)	Small
North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, and unstable scree and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	0 acres	11,639 acres (3.5%)	Small
Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs, and grasses and may include *Yucca* spp.	0 acres	6,309 acres (0.7%)	Small
Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	0 acres	239 acres (0.5%)	Small
Introduced Riparian and Wetland Vegetation: Dominated by non-native riparian and wetland plant species.	0 acres	71 acres (0.5%)	Small
North American Warm Desert Riparian Mesquite Bosque: Occurs along perennial and intermittent streams as relatively dense riparian corridors composed of trees and shrubs. Honey mesquite (*Prosopis glandulosa*) and velvet mesquite (*P. velutina*) are the dominant trees. Vegetation is supported by groundwater when surface water is absent.	0 acres	7 acres (0.2%)	Small
Open Water: Plant or soil cover is generally less than 25%.	0 acres	1 acre (<0.1%)	Small

Footnotes on next page.

TABLE 11.3.10.1-1 (Cont.)

[a] Land cover descriptions are from USGS (2005a). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from USGS (2004).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region. The SEZ region intersects portions of Nevada and Arizona. However, the SEZ and area of indirect effects occur only in Nevada.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project facilities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the area of indirect effects and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion ($\leq$1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but $\leq$10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

[f] To convert acres to km^2, multiply by 0.004047.

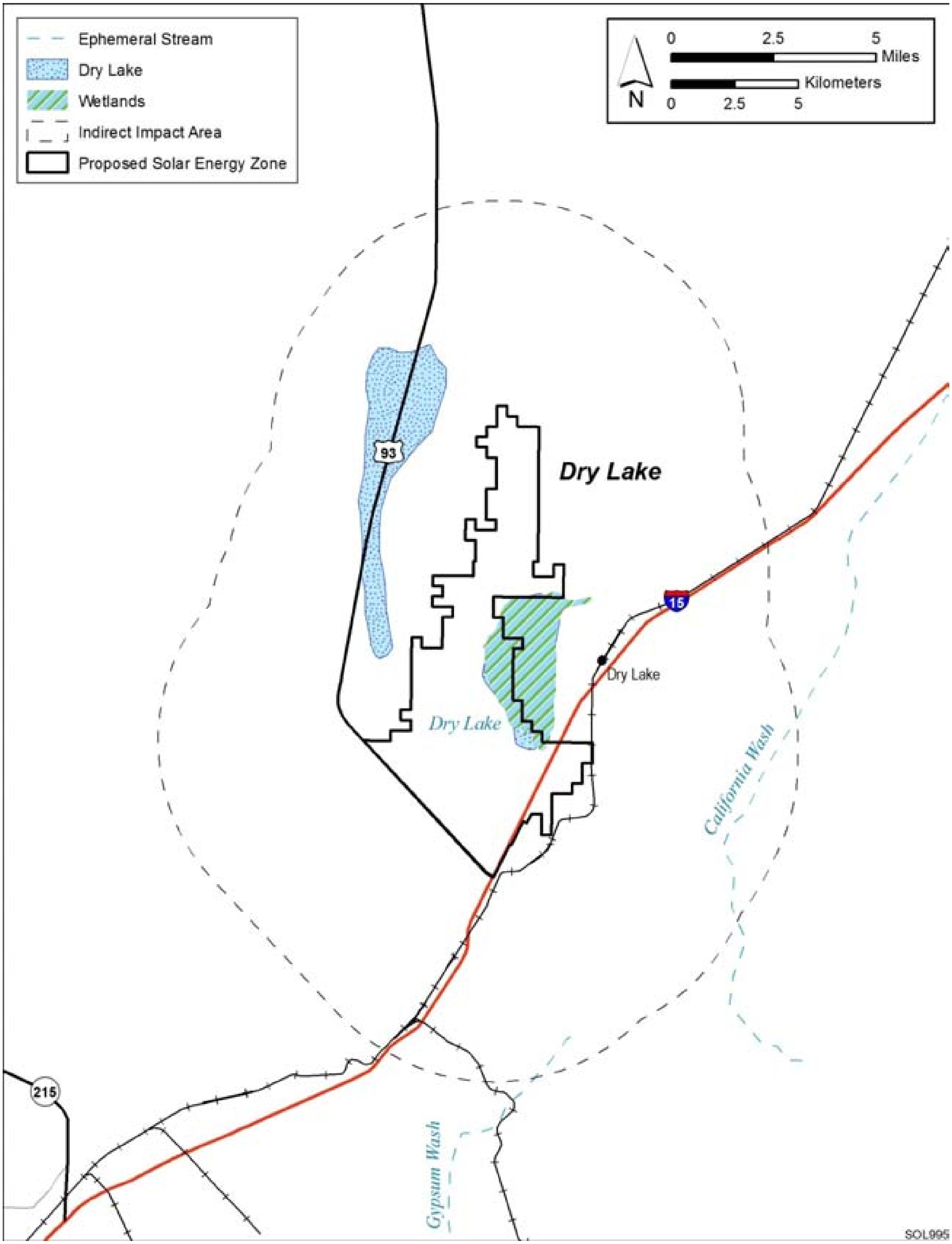

FIGURE 11.3.10.1-2 Wetlands within the Proposed Dry Lake SEZ (Source: USFWS 2009a)

other shrubs. The dry washes and playa typically contain water for short periods during or following precipitation events.

Springs occur in the vicinity of the SEZ, including Moapa Warm Springs, northeast of the SEZ, and Corn Creek Spring, west of the SEZ (see Section 11.3.9). A large playa is located west of the SEZ in Hidden Valley, entirely within the area of indirect effects; this playa is separated from the SEZ by the Arrow Canyon Range.

The State of Nevada maintains an official list of weed species designated as noxious. Table 11.3.10.1-2 provides a summary of the noxious weed species regulated in Nevada that are known to occur in Clark County (USDA 2010; Creech et al. 2010), which includes the proposed Dry Lake SEZ. Salt cedar (*Tamarix* sp.), included in Table 11.3.10.1-2, was observed on the SEZ in August 2009 near the edge of the playa. Mediterranean grass (*Schismus barbatus*), an invasive species observed to occur within much of the SEZ, is not included in this table.

TABLE 11.3.10.1-2 Designated Noxious Weeds of Nevada Occurring in Clark County

Common Name	Scientific Name	Category
African/Sahara mustard[a,b]	*Brassica tournefortii*	B
African rue[a,b]	*Peganum harmala*	A
Camelthorn[a]	*Alhagi maurorum*	A
Canada thistle	*Cirsium arvense*	C
Crimson/Green fountaingrass[a]	*Pennisetum setaceum*	A
Diffuse knapweed[a]	*Centaurea diffusa*	B
Giant reed[a,b]	*Arundo donax*	A
Hoary cress[a]	*Cardaria draba*	C
Johnsongrass[a,b]	*Sorghum halepense*	C
Malta star thistle[a,b]	*Centaurea melitensis*	A
Mediterranean sage[a]	*Salvia aethiopis*	A
Musk thistle	*Carduus nutans*	B
Perennial pepperweed[a]	*Lepidium latifolium*	C
Puncture vine[a,b]	*Tribulus terrestris*	C
Purple loosestrife[a]	*Lythrum salicaria*	A
Russian knapweed[a,b]	*Acroptilon repens*	B
Saltcedar[a,b]	*Tamarix* spp.	C
Scotch thistle[a,b]	*Onopordium acanthium*	B
Spotted knapweed[a]	*Centaurea maculosa/biebersteinii*	A
White horse-nettle/Silverleaf nightshade[a,b]	*Solanum elaeagnifolium*	B

[a] Creech et al. (2010).

[b] USDA (2010).

Source: NDA (2005).

The Nevada Department of Agriculture classifies noxious weeds into one of three categories (NDA 2005):

- "Category A: Weeds not found or limited in distribution throughout the state; actively excluded from the state and actively eradicated wherever found; actively eradicated from nursery stock dealer premises; control required by the state in all infestations."

- "Category B: Weeds established in scattered populations in some counties of the state; actively excluded where possible, actively eradicated from nursery stock dealer premises; control required by the state in areas where populations are not well established or previously unknown to occur."

- "Category C: Weeds currently established and generally widespread in many counties of the state; actively eradicated from nursery stock dealer premises; abatement at the discretion of the state quarantine officer."

11.3.10.2 Impacts

The construction of solar energy facilities within the proposed Dry Lake SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (12,519 acres [50.7 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (e.g., caused by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation within the SEZ are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required design features described in Section A.2.2 of Appendix and from any additional mitigation applied. Section 11.3.10.2.3, below, identifies design features of particular relevance to the proposed Dry Lake SEZ.

11.3.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (≤1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); moderate (>1 but ≤10%) if it could affect an intermediate proportion of a cover type; and large if it could affect greater than 10% of a cover type.

Solar facility construction and operation in the proposed Dry Lake SEZ would primarily affect communities of the Sonora-Mojave Creosote-White Bursage Desert Scrub cover type. Additional cover types that would be affected within the SEZ include North American Warm Desert Pavement, North American Warm Desert Wash, Sonora-Mojave Mixed Salt Desert Scrub, and North American Warm Desert Playa. Although the Developed, Medium-High Intensity cover type occurs within the SEZ, these areas likely support few native plant communities. Table 11.3.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed Dry Lake SEZ. Many of these cover types are relatively common in the SEZ region; however, North American Warm Desert Pavement is relatively uncommon, representing 0.8% of the land area within the SEZ region. Desert chenopod scrub/mixed salt desert scrub, desert dry washes, dry wash woodland, wetland, and playa are important sensitive habitats on the SEZ.

The construction, operation, and decommissioning of solar projects within the proposed Dry Lake SEZ would result in moderate impacts on the North American Warm Desert Pavement cover type. Solar energy development would result in small impacts on all other cover types in the affected area.

Because of the arid conditions, re-establishment of desert scrub communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region and likely occur on the SEZ. Damage to these crusts, by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect impact area identified in Table 11.3.10.1-1.

Communities associated with Dry Lake playa habitats or other intermittently flooded areas within or downgradient from solar projects could be affected by ground-disturbing activities. Surface drainage throughout the SEZ is directed toward Dry Lake playa. Site-clearing and site-grading could disrupt surface water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation; could potentially alter playa plant communities, including occurrences outside of the SEZ; and could affect community function. Increases in surface runoff from a solar energy project site could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect desert dry wash habitats within the SEZ. Some desert dry washes in the SEZ support communities of mesquite or other shrubs. Alteration of surface drainage patterns or hydrology could adversely affect dry wash communities outside the SEZ. Vegetation within these communities could be lost by erosion or desiccation.

Potential impacts on wetlands as a result of solar energy facility development are described in Section 5.6.1. Approximately 1,022 acres (4.1 km^2) of wetland habitat that has been identified within the SEZ, associated with the Dry Lake playa, could be affected by project development. Direct impacts on the wetland would occur if fill material were placed within the playa for solar facility construction. Indirect impacts, as described above, could occur with project construction near or upgradient from Dry Lake playa.

Although the use of groundwater within the Dry Lake SEZ for technologies with high water requirements, such as wet-cooling systems, may be unlikely, groundwater withdrawals for such systems could reduce groundwater elevations. Communities that depend on accessible groundwater, such as mesquite communities, could become degraded or lost as a result of lowered groundwater levels. The potential for impacts on springs in the vicinity of the SEZ, such as Moapa Warm Springs or Corn Creek Springs, would need to be evaluated by project-specific hydrological studies.

11.3.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

On February 8, 1999, the President signed E.O. 13112, “Invasive Species,” which directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Despite required design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Dry Lake SEZ, such that weeds could be transported into areas that were previously relatively weed-free, which could result in reduced restoration success and possible widespread habitat degradation. Invasive species, including salt cedar and Mediterranean grass, occur within the SEZ. Additional species designated as noxious weeds in Nevada and known to occur in Clark County are given in Table 11.3.10.1-2. Approximately 71 acres (0.3 km^2) of Introduced Riparian and Wetland Vegetation occurs within the area of indirect effects.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Existing roads, transmission lines, and recreational OHV use within the SEZ area of potential impact would also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species. Disturbed areas occur within the SEZ and may contribute to the establishment of noxious weeds and invasive species. Approximately 128 acres (0.5 km^2) of Developed, Medium-High Intensity occurs within the SEZ and 441 acres (1.8 km^2) in the area of indirect effects.

11.3.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While specific practices are best established when project details are considered, some SEZ-specific design features can be identified at this time, as follows:

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of desert scrub and other affected habitats, and minimize the potential for the spread of invasive species such as salt cedar or Mediterranean grass. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- All dry wash, dry wash woodland, chenopod scrub, and playa communities within the SEZ should be avoided to the extent practicable, and any impacts minimized and mitigated. Any yucca, cacti, or succulent plant species that cannot be avoided should be salvaged. A buffer area should be maintained around dry wash, dry wash woodland, playa, and wetland habitats to reduce the potential for impacts.

- Appropriate engineering controls should be used to minimize impacts on dry wash, dry wash woodland, wetland, and playa habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on groundwater-dependent communities, such as mesquite communities. Potential impacts on springs should be determined through hydrological studies.

If these SEZ-specific design features are implemented in addition to other programmatic design features, it is anticipated that a high potential for impacts from invasive species and potential impacts on dry wash, dry wash woodland, chenopod scrub, mesquite bosque, riparian, wetland, and playa, communities and springs would be reduced to a minimal potential for impact.

11.3.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Dry Lake SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from SWReGAP (USGS 2007). Land cover types suitable for each species were also determined from SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) within the SEZ. The maximum developed area within the SEZ would be 12,519 acres (50.7 km^2). No areas of direct effect would occur for either a new transmission line or a new access road because existing transmission line and road corridors are adjacent to or run through the SEZ.

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the area of direct effect (e.g., surface runoff, dust, noise, lighting, and accidental spills in the SEZ). Areas of potentially suitable habitat within the SEZ that are greater than the maximum of 12,519 acres (50.7 km^2) of direct effect were also included as part of the area of indirect effects. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. The area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. Areas of direct and indirect effect are defined and the impact assessment approach is described in Appendix M.

The primary land cover habitat type within the affected area is Sonora–Mojave creosotebush–white bursage desert scrub (see Section 11.3.10). Potentially unique habitats in the affected area include washes, playas, and bedrock cliff and rock outcrops (the bedrock and cliff outcrops only occur within the area of indirect effects). A portion of Dry Lake occurs within the SEZ, while the remainder of Dry Lake and an unnamed dry lake occur within the area of indirect effects. Three ephemeral washes also occur within the SEZ (Section 11.3.9.1) Portions of California Wash and Gypsum Wash occur within the area of indirect effects (see Figure 11.3.10.1-2).

11.3.11.1 Amphibians and Reptiles

11.3.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Dry Lake SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Based on species distributions within the area of the SEZ and habitat preferences of the amphibian species, the Great Plains toad (*Bufo cognatus*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). Both toad species would most likely occur in or near the dry lakes within the SEZ.

More than 25 reptile species occur within the area that encompasses the proposed Dry Lake SEZ (USGS 2007; Stebbins 2003). The desert tortoise (*Gopherus agassizii*) is a federal and state listed threatened species. This species is discussed in Section 11.3.12. Lizard species expected to occur within the SEZ include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), side-blotched lizard (*Uta stansburiana*), western fence lizard (Sceloporus occidentalis), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*). Snake species expected to occur within the SEZ are the coachwhip (*Masticophis flagellum*), common kingsnake (*Lampropeltis getula*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), long-nosed snake (*Rhinocheilus lecontei*), and nightsnake (*Hypsiglena torquata*). The Mojave rattlesnake (*Crotalus scutulatus*) and sidewinder (*Crotalus cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 11.3.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Dry Lake SEZ. Special status amphibian and reptile species are addressed in Section 11.3.12.

11.3.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2 and through any additional mitigation applied. Section 11.3.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed Dry Lake SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area, as presented in Section 11.3.11.1.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional

TABLE 11.3.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Dry Lake SEZ

		Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Amphibians				
Great Plains toad (*Bufo cognatus*)	Prairies and deserts. Often breeds in shallow temporary pools or quiet waters of streams, marshes, irrigation ditches, and flooded fields. About 4,005,500 acres[g] of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,529 acres of potentially suitable habitat (3.2% of available suitable habitat)	Small overall impact. Avoid wash and playa habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Red-spotted toad (*Bufo punctatus*)	Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos, desert streams and oases, open grassland, scrubland oaks, and dry woodlands. About 4,116,000 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,529 acres of potentially suitable habitat (3.1% of available suitable habitat)	Small overall impact. Avoid wash and playa habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Lizards				
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. About 4,453,000 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	144,976 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Great Basin collared lizard (*Crotaphytus bicinctores*)	Usually inhabits alluvia, lava flows, mountain slopes, canyons, buttes, rock outcrops, washes, and rocky plains. Limiting factors are presence of large boulders and open/sparse vegetation. About 4,300,700 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	142,979 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semi-desert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 3,834,500 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,283 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Lizards (Cont.)				
Side-blotched lizard (*Uta stansburiana*)	Low to moderate elevations in washes, arroyos, boulder-strewn ravines, rocky cliff bases, and flat shrubby areas in canyon bottoms. Often along sandy washes. Usually in areas with a lot of bare ground. About 4,393,100 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	141,624 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Western fence lizard (*Sceloporus occidentalis*)	Disturbed areas, roadsides, gravel beds, rock quarries, lava flows, outcrops, talus slopes, shrublands, riparian areas, and coniferous woodlands. About 3,641,700 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	132,914 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Western whiptail (*Cnemidophorus tigris*)	Arid and semi-arid habitats with sparse plant cover. About 4,112,700 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	130,252 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Lizards (Cont.)				
Zebra-tailed lizard (*Callisaurus draconoides*)	Open, warm-desert habitats, especially dry washes and canyons with fine gravel and sand. About 4,004,800 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	133,119 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Snakes				
Coachwhip (*Masticophis flagellum*)	Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 3,478,600 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	131,727 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Common kingsnake (*Lampropeltis getula*)	Coniferous forests, woodlands, swampland, coastal marshes, river bottoms, farmlands, prairies, chaparral, and deserts. Uses rock outcrops and rodent burrows for cover. About 4,681,211 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	144,976 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Snakes (Cont.)				
Glossy snake (*Arizona elegans*)	Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 2,981,800 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,955 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semi-desert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 4,335,500 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,994 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Groundsnake (*Sonora semiannulata*)	Arid and semi-arid regions with rocky to sandy soils. River bottoms, desert flats, sand hummocks, and rocky hillsides. About 4,031,800 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	126,413 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Snakes (Cont.)				
Mojave rattlesnake (*Crotalus scutulatus*)	Mostly upland desert and lower mountain slopes. Barren desert, grassland, open juniper woodland, and scrubland; especially common in areas of scattered scrubby growth such as creosote and mesquite. About 5,017,600 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	145,616 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Nightsnake *(Hypsiglena torquata)*	Arid and semi-arid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, seeks refuge underground, in crevices, or under rocks. About 3,471,000 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	131,727 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Sidewinder (*Crotalus cerastes*)	Windblown sand habitats near rodent burrows. Most common in areas of sand hummocks topped with creosote, mesquite, or other desert plants. About 3,749,600 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	126,167 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

[a] Potentially suitable habitat was determined using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

Footnotes continued on next page.

TABLE 11.3.11.1-1 (Cont.)

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 12,519 acres of direct effect within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 12,519 acres of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1% but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[f] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[g] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 11.3.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on representative amphibians and reptiles summarized in Table 11.3.11.1-1, direct impacts on amphibian and reptile species would be small for all species as 0.2 to 0.4% of potentially suitable habitats identified for the species in the SEZ region would be lost. Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 4.2% of available habitat for the glossy snake). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.3.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., washes and playas). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features are best established when considering specific project details, one design feature can be identified at this time:

- Dry lakes and wash habitats should be avoided.

If this SEZ-specific design feature is implemented in addition to the programmatic design features, impacts on amphibian and reptile species could be reduced. However, because potentially suitable habitats for all of the representative amphibian and reptile species occur throughout the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.3.11.2 Birds

11.3.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Dry Lake SEZ. The list of bird species potentially present in the SEZ area was determined from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005)

Twelve bird species that could occur on or in the affected area of the SEZ are considered focal species in the *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), crissal thrasher (*Toxostoma crissale*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), Lucy's warbler (*Vermivora luciae*), phainopepla (*Phainopepla nitens*), and verdin (*Auriparus flaviceps*). Habitats for most of these species are described in Table 11.3.11.2-1. Because of their special species status, the burrowing owl and phainopepla are discussed in Section 11.3.12.1.

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state solar study area. However, within the proposed Dry Lake SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Playa and wash habitats within the SEZ may attract shorebird species, but Lake Mead, Muddy River, and larger named washes and dry lakes within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) is the shorebird species most likely to occur within the SEZ.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state solar energy study area. Species expected to occur within

TABLE 11.3.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Dry Lake SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b] Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Shorebirds				
Killdeer (*Charadrius vociferus*)	Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 302,000 acres[g] of potentially suitable habitat occurs within the SEZ region.	132 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) during construction and operations	733 acres of potentially suitable habitat (0.2% of potentially suitable habitat)	Small overall impact. Avoidance of playa and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Neotropical Migrants				
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 4,143,200 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,129 acres of potentially suitable habitat (3.2% of potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Bewick's wren (*Thryomanes bewickii*)	Generally associated with dense, brushy habitats. Breeding occurs in brushy areas of open woodlands and other open habitats. It is a cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 3,640,500 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	135,644 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-tailed gnatcatcher (*Polioptila melanura*)	Nests in bushes, mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 2,937,100 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,787 acres of potentially suitable habitat (4.2% of potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 4,075,600 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,868 acres of potentially suitable habitat (3.1% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Brewer's sparrow (*Spizella breweri*)	Prefers to nest in sagebrush, but also nests in other shrubs and cactus. During migration and winter, it occurs in low, arid vegetation, desert scrub, sagebrush, and creosotebush. About 3,805,300 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,861 acres of potentially suitable habitat (3.3% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. About 1,311,300 acres of potentially suitable habitat occurs within the SEZ region.	426 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	21,328 acres of potentially suitable habitat (1.6% of potentially suitable habitat)	Small overall impact. Some measure of mitigation also provided by the requirements of the Migratory Bird Treaty Act.
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semi-arid habitats. Nests in open areas on a bare site. About 3,568,200 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	136,443 acres of potentially suitable habitat (3.8% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation also provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Neotropical Migrants (Cont.)				
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 4,319,400 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	128,098 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Costa's hummingbird (*Calypte costae*)	Desert and semi-desert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 3,952,100 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,129 acres of potentially suitable habitat (3.3% of potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Neotropical Migrants (Cont.)				
Crissal thrasher (*Toxostoma crissale*)	Riparian woodlands and shrublands; creosotebush, mixed desert and thorn scrub; juniper woodland and savannah; and pinyon-juniper woodlands. About 83,900 acres of potentially suitable habitat occurs within the SEZ region.	426 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	3,491 acres of potentially suitable habitat (4.2% of potentially suitable habitat)	Small overall impact. Avoid desert wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,628,000 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	143,043 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semi-desert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 3,889,300 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,522 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Ladder-backed woodpecker (*Picoides scalaris*)	Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 4,116,700 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,129 acres of potentially suitable habitat (3.2% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b] Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 3,817,300 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	130,013 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water, including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 4,345,900 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	144,441 acres of potentially suitable habitat (3.3% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Neotropical Migrants (Cont.)				
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally, open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 4,281,400 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,439 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Lucy's warbler (*Vermivora luciae*)	Breeding habitat includes deserts, mesquite along streams, and riparian woodlands. Nests in tree cavities, behind bark and in abandoned woodpecker holes or verdin nests. During migration and winter, it inhabits dry washes, riparian forests, and thorn forests. About 83,200 acres of potentially suitable habitat occurs in the SEZ region.	426 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	3,491 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Northern mockingbird (*Mimus polyglottos*)	Parkland, cultivated lands, second-growth habitats, desert scrub, and riparian areas at low elevations. Forages on ground in short, grassy to nearly barren substrates. About 4,621,700 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	143,555 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Rock wren (*Salpinctes obsoletus*)	Arid and semiarid habitats. It breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices and the nest entrance is paved with small rocks and stones. About 4,687,800 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	143,564 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Sage sparrow (*Amphispiza belli*)	Prefers shrubland, grassland, and desert habitats. The nest, constructed of twigs and grasses, is located either low in a shrub or on the ground. About 486,100 acres of potentially suitable habitat occurs within the SEZ region.	485 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	2,860 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 4,274,000 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	138,901 acres of potentially suitable habitat (3.2% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Verdin (*Auriparus flaviceps*)	Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 3,818,000 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	130,013 acres of potentially suitable habitat (3.4% of potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Western kingbird (*Tyrannus verticalis*)	Occurs in a variety of habitats including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. Migrates to Central America or the southeastern United States for the winter. About 3,941,100 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	126,982 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Birds of Prey				
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 1,817,700 acres of potentially suitable habitat occurs in the SEZ region.	184 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) during construction and operations	19,662 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	Small overall impact.
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 1,810,800 acres of potentially suitable habitat occurs in the SEZ region.	482 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	22,930 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Great horned owl (*Bubo virginianus*)	Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 5,026,500 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	145,051 acres of potentially suitable habitat (2.9% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-eared owl (*Asio otus*)	Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush–bursage flats, desert scrub, grasslands, and agricultural fields). About 4,126,200 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	126,494 acres of potentially suitable habitat (3.1% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Birds of Prey (Cont.)				
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 1,161,900 acres of potentially suitable habitat occurs in the SEZ region.	54 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat) during construction and operations	7,598 acres of potentially suitable habitat (0.7% of available potentially suitable habitat)	Small overall impact.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 4,422,800 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	138,979 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Upland Game Birds				
Chukar (*Alectoris chukar*)	Steep, semi-arid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds during the brooding period found within 0.25 mi (0.4 km) of water. About 4,129,000 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,522 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. Avoid wash and playa habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Upland Game Birds (Cont.)				
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 4,319,900 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	143,057 acres of potentially suitable habitat (3.3% of potentially suitable habitat)	Small overall impact. Avoid wash and playa habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,355,000 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	132,304 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
White-winged dove (*Zenaida asiatica*)	Nests in low to medium height trees with dense foliage and fairly open ground cover. Feeds on wild seeds, grains and fruit. About 3,902,100 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,200 acres of potentially suitable habitat (3.4% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b] Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Upland Game Birds (Cont.)				
Wild turkey (*Meleagris gallopavo*)	Lowland riparian forests, foothill shrubs, pinyon-juniper woodlands, foothill riparian forests, and agricultural areas. About 408,900 acres of potentially suitable habitat occurs within the SEZ region.	426 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) during construction and operations	3,659 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	Small overall impact. Avoid development within desert wash habitat to the extent practicable.

[a] Potentially suitable habitat was determined using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 12,519 acres of direct effect within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 12,519 acres of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1% but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[f] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[g] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

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the proposed Dry Lake SEZ include the ash-throated flycatcher, Bewick's wren (*Thryomanes bewickii*), black-tailed gnatcatcher, black-throated sparrow, Brewer's sparrow (*Spizella breweri*), cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, crissal thrasher, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker, Le Conte's thrasher, lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), Lucy's warbler, northern mockingbird (*Mimus polyglottos*), rock wren (*Salpinctes obsoletus*), sage sparrow (*Amphispiza belli*), Say's phoebe (*Sayornis saya*), verdin, and western kingbird (*Tyrannus verticalis*) (CDFG 2008; NDCNR 2002; USGS 2007).

Birds of Prey

Section 4.10.2.2.4 provided an overview of the birds of prey (raptors, owls, and vultures) within the six-state solar study area. Species that could occur within the proposed Dry Lake SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*) (CDFG 2008; NDCNR 2002; USGS 2007). Several special status birds of prey species are discussed in Section 11.3.12.

Upland Game Birds

Section 4.10.2.2.5 provided an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed Dry Lake SEZ include the chukar (*Alectoris chukar*), Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), white-winged dove (*Zenaida asiatica*), and wild turkey (*Meleagris gallopavo*) (CDFG 2008; NDCNR 2002; USGS 2007).

Table 11.3.11.2-1 provides habitat information for representative bird species that could occur within the proposed Dry Lake SEZ. Special status bird species are discussed in Section 11.3.12.

11.3.11.2.2 Impacts

The types of impacts birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2 and through any additional mitigation applied. Section 11.3.11.2.3, below, identifies design features of particular relevance to the proposed Dry Lake SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 11.3.11.2.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 11.3.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), and from disturbance, injury, or mortality to individual birds. Table 11.3.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed Dry Lake SEZ. Direct impacts on representative bird species would be small, since SEZ development could cause the loss of less than 0.01 to 0.5% of their potentially suitable habitat within the SEZ region. Larger areas of potentially suitable habitat for bird species occur within the area of potential indirect effects (e.g., up to 4.2% of potentially suitable habitat for the black-tailed gnatcatcher, crissal thrasher, and Lucy's warbler). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (for example, impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.3.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds, especially for those species that depend on habitat types that can be avoided (e.g., wash and playa habitats). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important in reducing impacts on birds are best established when considering specific project details, some design features can be identified at this time:

- The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed.

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the

USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act.

- Dry lakes and wash habitats should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on bird species could be reduced. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.3.11.3 Mammals

11.3.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Dry Lake SEZ. The list of mammal species potentially present in the SEZ area was determined from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Over 55 species of mammals have ranges that encompass the area of the proposed Dry Lake SEZ (NDCNR 2002; USGS 2007); however, suitable habitats for a number of these species are limited or nonexistent within the SEZ (USGS 2007). Similarly to the overview of mammals provided for the six-state solar energy study area (Section 4.10.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ; (2) are important to humans (e.g., big game, small game, and furbearer species); and/or (3) are representative of other species that share important habitats.

Big Game

The big game species that could occur within the vicinity of the proposed Dry Lake SEZ include cougar (*Puma concolor*), mule deer (*Odocoileus hemionus*), and Nelson's bighorn sheep (*Ovis canadensis nelsoni*) (CDFG 2008; NDCNR 2002; USGS 2007). Due to its special species status, Nelson's bighorn sheep is addressed in Section 11.3.12. Potentially suitable habitat for the cougar and mule deer occur throughout most of the SEZ. Figure 11.3.11.3-1 shows the location of the SEZ relative to mapped range of mule deer habitat.

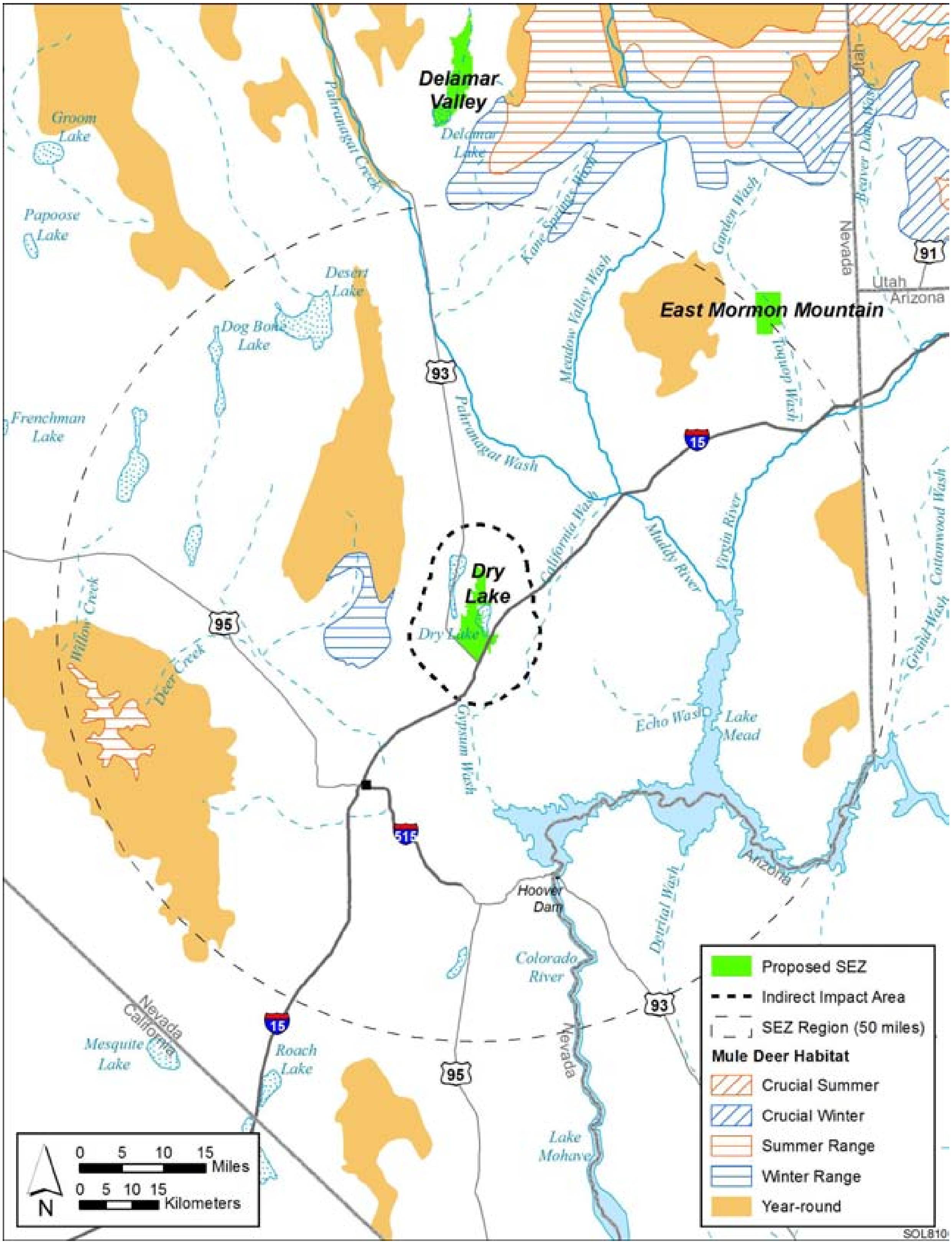

FIGURE 11.3.11.3-1 Location of the Proposed Dry Lake SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Dry Lake SEZ. Species that could occur within the area of the SEZ would include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*, common), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and red fox (*Vulpes vulpes*) (CDFG 2008; NDCNR 2002; USGS 2007).

The nongame (small) mammals include rodents, bats, mice, and shrews. Representative species for which potentially suitable habitat occurs within the proposed Dry Lake SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), canyon mouse (*P. crinitis*), deer mouse (*P. maniculatus*), desert kangaroo rat (*Dipodomys deserti*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's pocket mouse (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), southern grasshopper mouse (*O. torridus*), western harvest mouse (*Reithrodontomys megalotis*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (CDFG 2008; NDCNR 2002; USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), long-legged myotis (*M. volans*), silver-haired bat (*Lasionycteris noctivagans*), and western pipistrelle (*Parastrellus hesperus*) (CDFG 2008; NDCNR 2002; USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ. Several other special status bat species that could occur within the SEZ area are addressed in Section 11.3.12.1.

Table 11.3.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Dry Lake SEZ. Special status mammal species are discussed in Section 11.3.12.

11.3.11.3.2 Impacts

The types of impacts mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.3.11.3.3, below, identifies design features of particular relevance to mammals for the proposed Dry Lake SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 11.3.11.3.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly.

TABLE 11.3.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Dry Lake SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Big Game				
Cougar (*Puma concolor*)	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,545,800 acres[g] of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	139,147 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Mule deer (*Odocoileus hemionus*)	Most habitats, including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provides abundant browse and cover. About 4,124,500 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	130,619 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Small Game and Furbearers				
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 4,119,100 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	126,413 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

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TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Small Game and Furbearers (Cont.)				
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,530,700 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	141,870 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Bobcat (*Lynx rufus*)	Most habitats other than subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 4,284,700 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	130,252 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Coyote (*Canis latrans*)	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 4,883,100 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	145,616 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Small Game and Furbearers (Cont.)				
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 3,299,400 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,955 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Gray fox (*Urocyon cinereoargenteus*)	Deserts, open forests, and brush. Prefers wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 3,679,500 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	135,869 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Kit fox (*Vulpes macrotis*)	Desert and semi-desert areas with relatively open vegetative cover and soft soils. Seeks shelter in underground burrows. About 4,055,200 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,657 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Small Game and Furbearers (Cont.)				
Red fox (*Vulpes vulpes*)	Most common in open woodlands, pasturelands, riparian areas, and agricultural lands. About 3,228,100 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	120,116 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Nongame (small) Mammals				
Big brown bat (*Eptesicus fuscus*)	Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 3,786,300 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	132,296 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Botta's pocket gopher (*Thomomys bottae*)	Variety of habitats including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 3,056,900 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,948 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b] Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 3,724,300 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	136,135 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Cactus mouse (*Peromyscus eremicus*)	Variety of areas including desert scrub, semi-desert chaparral, desert wash, semi-desert grassland, and cliff and canyon habitats. About 4,194,400 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,439 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
California myotis (*Myotis californicus*)	Desertscrub, semi-desert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 3,370,900 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	135,573 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Canyon mouse (*Peromyscus crinitus*)	Associated with rocky substrates in a variety of habitats including desert scrub, sagebrush shrublands, woodlands, cliffs and canyons, and volcanic rock and cinder lands. Source of free water not required. About 3,889,900 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,283 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Deer mouse (*Peromyscus maniculatus*)	Tundra; alpine and subalpine grasslands; plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran desert scrub habitats. About 4,456,300 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	138,024 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Desert kangaroo rat (*Dipodomys deserti*)	Most arid areas with deep sands such as stabilized sand dunes, sandy patches in salt desert scrub, and bottoms of desert washes. About 65,100 acres of potentially suitable habitat occurs in the SEZ region.	426 acres of potentially suitable habitat lost (0.07% of available potentially suitable habitat) during construction and operations	3,413 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats.

TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Desert shrew (*Notiosorex crawfordi*)	Usually in arid areas with adequate cover such as semi-arid grasslands, shortgrass plains, desert scrub, chaparral slopes, shortgrass plains, oak savannas and woodlands, and alluvial fans. About 4,330,300 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	143,057 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,620,700 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	144,680 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Hoary bat (*Lasiurus cinereus*)	Chaparral, shortgrass plains, scrub-grassland, desertscrub, forests and woodlands. Usually roosts in trees, also in caves, rock crevices, and houses. About 3,659,900 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	132,367 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Little pocket mouse (*Perognathus longimembris*)	Mostly sandy and gravelly soils, but also stony soils and rarely rocky sites. About 3,962,000 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,361 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-legged myotis (*Myotis volans*)	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 3,768,200 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,727 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-tailed pocket mouse (*Chaetodipus formosus*)	Common in sagebrush, desert scrub, and desert succulent shrub habitats with rocky or stony groundcover. About 4,163,700 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	142,502 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b] Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Merriam's kangaroo rat (*Dipodomys merriami*)	Plains grasslands, scrub-grasslands, desertscrub, shortgrass plains, oak and juniper savannahs, mesquite dunes, and creosote flats. About 3,994,200 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	133,062 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Northern grasshopper mouse (*Onychomys leucogaster*)	Occurs in grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 4,039,600 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	126,413 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Silver-haired bat (*Lasionycteris noctivagans*)	Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savannah and desertscrub habitats. Roosts under bark, in hollow trees, caves and mines. Forages over clearings and open water. About 3,793,100 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	132,296 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Southern grasshopper mouse (*Onychomys torridus*)	Low, arid, shrub and semiscrub vegetation of deserts. About 3,952,700 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	131,432 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Western harvest mouse (*Reithrodontomys megalotis*)	Various habitats including scrub-grasslands, temperate swamps and riparian forests, salt marshes, shortgrass plains, oak savannah, dry fields, agricultural areas, deserts, and desertscrub. Grasses are the preferred cover. About 2,181,400 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	117,980 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 3,403,000 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	132,296 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Nongame (small) Mammals (Cont.)				
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Low deserts, semi-desert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends nights and other periods of inactivity in underground burrows. About 4,221,200 acres of potentially suitable habitat occurs within the SEZ region.	12,519 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	141,863 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Yuma myotis (*Myotis yumanensis*)	Riparian areas, grasslands, semi-desert shrubland, mountain brush, woodlands, and deserts. It occurs where there is open water, regardless of the habitat. Roosts in caves, mines, cliffs, crevices, buildings, and swallow nests. About 3,543,600 acres of potentially suitable habitat occurs in the SEZ region.	12,519 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	132,101 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

[a] Potentially suitable habitat was determined using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 12,519 acres of direct effect within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 12,519 acres of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

Footnotes continued on next page.

TABLE 11.3.11.3-1 (Cont.)

[e] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1% but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[f] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[g] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 11.3.11.3.3).

Table 11.3.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed Dry Lake SEZ.

Cougar

Up to 12,519 acres (50.7 km^2) of potentially suitable cougar habitat could be lost by solar energy development within the proposed Dry Lake SEZ. This represents about 0.3% of potentially suitable cougar habitat within the SEZ region. About 140,000 acres (567 km^2) of potentially suitable cougar habitat occurs within the area of indirect effect. Overall, impacts on cougar from solar energy development in the SEZ would be small.

Mule Deer

Based on land cover analyses, up to 12,519 acres (50.7 km^2) of potentially suitable mule deer habitat could be lost by solar energy development within the proposed Dry Lake SEZ. This represents about 0.3% of potentially suitable mule deer habitat within the SEZ region. Over 130,000 acres (526 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effect. Based on mapped mule deer ranges, the closest year-round range is about 8 mi (13 km) from the SEZ; the closest winter range is about 7 mi (11 km) from the SEZ; and the closest summer range is about 37 mi (60 km) from the SEZ (Figure 11.3.11.3-1). Therefore, solar energy development within the proposed Dry Lake SEZ would not be expected to have direct or indirect effects on the range of mule deer. Overall, impacts on mule deer from solar energy development in the SEZ would be small.

Other Mammals

Direct impacts on other representative mammal species (i.e., small game, furbearers, and small [nongame] mammals) would be small as 0.07 to 0.6% of their potentially suitable habitat within the SEZ region would be lost. Larger areas of potentially suitable habitat for these species occur within the area of potential indirect effects (i.e., up 5.4% for the western harvest mouse).

Summary

Overall, direct impacts on mammal species would be small, as 0.6% or less of potentially suitable habitats for the representative mammal species would be lost (Table 11.3.11.3-1). Larger areas of potentially suitable habitat for mammal species occur within the area of potential indirect effects (e.g., up to 5.4% of potentially suitable habitat for the western harvest mouse). Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (for example, impacts caused by dust generation, erosion, and sedimentation) would be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.3.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important for reducing impacts on mammals are best established when considering project-specific details, design features that can be identified at this time are:

- Fencing around the solar energy development should not block the free movement of mammals, particularly big game species.

- Playa and wash habitats should be avoided.

If these SEZ-specific design features are implemented in addition to other programmatic design features, impacts on mammals could be reduced. Any residual impacts are anticipated to be small given the relative abundance of potentially suitable habitats in the SEZ region. However, potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ; therefore, species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.3.11.4 Aquatic Biota

11.3.11.4.1 Affected Environment

This section addresses aquatic habitats and biota known to occur on the proposed Dry Lake SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. There are no perennial or intermittent streams within the proposed Dry Lake SEZ. Although ephemeral washes may cross the SEZ, these drainages only contain water following rainfall and typically do not support wetland or riparian habitats. Approximately 981 acres (4 km^2) of Dry Lake are located within the SEZ along the eastern border. Dry Lake is the only water body present in the SEZ. Although it rarely has standing water, temporary ponding may occur, especially after rainfall. Dry lakes and associated wetlands in desert regions typically do not support aquatic habitat, but they may contain aquatic biota adapted to desiccating conditions (Graham 2001). On the basis of information from ephemeral pools in the American Southwest, ostracods (seed shrimp) and small planktonic crustaceans (e.g., copepods or cladocerans) are expected to be present, and larger branchiopod crustaceans such as fairy shrimp could occur (Graham 2001). Various types of insects that have aquatic larval stages, such as dragonflies and a variety of midges and other flies, may also occur depending on pool longevity, distance to permanent water features, and the abundance of other invertebrates for prey (Graham 2001). However, more site-specific data is needed to fully evaluate aquatic biota present in Dry Lake.

There are no perennial water bodies or stream features within the area of indirect effects. There are 6,185 acres (25 km^2) of dry lakes present in the area of indirect effects, along with associated wetlands. Portions of two intermittent streams (California Wash and Gypsum Wash) totaling 7 mi (11 km) are present within the area of indirect effects. California Wash carries water into the Muddy River, a perennial stream containing federally endangered fish species such as the Moapa dace (*Moapa coriacea)* and Virgin River chub (*Gile seminuda*). Gypsum Wash drains water from upland areas into Lake Mead. Both streams are typically dry and are not expected to contain permanent aquatic habitat or communities. However, such ephemeral or intermittent stream reaches may contain a diverse seasonal community of fish and invertebrates, with the latter potentially present in a dormant state even in dry periods (Levick et al. 2008). More site-specific data is needed to fully evaluate aquatic biota present in California Wash and Gypsum Wash.

Outside of the potential indirect effects area, but within 50 mi (80 km) of the SEZ, there are 125,352 acres (507 km^2) of permanent lake (Lake Mead), 10,798 acres (44 km^2) of the Colorado River, and 37,244 (151 km^2) of dry lake. There are also several stream features, including 131 mi (211 km) of perennial streams and 276 mi (444 km) of intermittent streams. The nearest perennial stream (Muddy River) and permanent water body (Lake Meade) are both more than 14 mi (24 km) away from the SEZ. Within the SEZ and the area of potential indirect effects, dry lakes are the primary surface water features present; they represent approximately 16% of dry lake habitat available within the overall analysis area. Several springs are located within 50 mi (80 km) of the Dry Lake SEZ, including springs on the north shore of Lake Meade, and springs within the Desert NWR and the Moapa Valley NWR. Historically, some springs on the north shore of Lake Meade contained native fishes like the speckled dace (*Rhinichthys osculus*), but introduced fishes like cichlids have reduced or eliminated native species (Courtenay and Deacon 1983). Springs within the Desert NWR contain a diverse community of spring snails as well as the endangered Pahrump poolfish (*Empetrichthys latos*), which is present in Corn Creek. Non-native fish species such as goldfish and crayfish are also present in the Desert NWR. The Moapa Valley NWR also contains stream and spring systems that support four species of protected native fish: Moapa dace, Virgin River chub (*Gila seminuda*), Moapa White River springfish, and the Moapa speckled dace (*Rhinichthys osculus moapa*). Non-native species of fish exist in the Moapa NWR, primarily in the Muddy River and its tributaries, and include blue tilapia (*Oreochromis aurea*), shortfin molly (*Poecilia mexicana*), and mosquitofish (*Gambusia affinis*). Highly seasonal populations of aquatic gastropod snails exist in the Muddy River and associated warm springs, several of which, such as the Moapa pebblesnail (*Fluminicola avernalis,* the grated tryonia (*Tryonia clathrata*) are species of concern. The Moapa Warm Springs riffle beetle (*Stenelmis moapae*), the Amargosa naucorid (*Pelocoris shoshone shoshone*), and the Moapa naucorid (*Usingerina moapensis*) are aquatic invertebrates found in the Moapa Valley NWR and all are species of concern. Preferred habitat for aquatic invertebrates in Moapa Valley NWR varies from fast moving waters with clean cobble bottom to marshy pool habitats.

11.3.11.4.2 Impacts

The types of impacts that could occur on aquatic habitats and biota due to development of utility-scale solar energy facilities are discussed in detail in Section 5.10.3. Effects particularly relevant to aquatic habitats and communities are water withdrawal and changes in water, sediment, and contaminant inputs associated with runoff.

No permanent water bodies or streams are present within the boundaries of the Dry Lake SEZ, and the nearest perennial surface waters are greater than14 mi (22 km) from the SEZ boundary. Therefore, no direct impacts on these features are expected. Dry Lake and its associated wetlands, as well as several washes, are present within the SEZ, and runoff of water and sediment as well as airborne particulate deposition into these features is possible, especially if ground disturbance occurs near Dry Lake. However, the surface water features in the SEZ are typically dry and are not connected to any permanent surface water. Surveys of ephemeral and intermittent surface water features within the SEZ would be necessary to determine the potential for impacts on aquatic biota. California Wash and Gypsum Wash are intermittent streams located in the area of indirect effects that could receive runoff and fugitive dust from solar development activities within the SEZ. Neither California Wash nor Gypsum Wash is likely to contain aquatic habitat, but both streams flow into perennial surface waters, and soils entering these streams could potentially affect aquatic habitat and biota at downstream locations. The implementation of commonly used engineering practices to control water runoff and sediment deposition into streams and water bodies would help to minimize the potential for impacts on aquatic organisms.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). There are no permanent surface waters in the proposed Dry Lake SEZ or area of indirect effects. Obtaining cooling water from other perennial surface water features in the region could affect water levels and, as a consequence, aquatic organisms in those water bodies. Groundwater is generally more than 100 ft (30 m) below ground and does not supply water to any surface water feature except the Colorado River via a subsurface connection to the California Wash Basin. Thus, groundwater withdrawals for solar energy needs could affect surface water levels and aquatic habitat in the Colorado River. In addition, groundwater withdrawals could alter the size and chemical and physical conditions of groundwater-dependent springs (including those on the north shore of Lake Meade and within Desert NWR and Moapa NWR) in the vicinity of the SEZ, and adversely affect associated aquatic communities. Historically, groundwater withdrawals have resulted in the loss or reduction of native species in desert springs. Consequently, the effect of groundwater withdrawals for solar energy development on pool and spring aquatic communities is of particular concern. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

As identified in Section 5.10.3, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning for a solar energy facility. Contaminants could potentially enter Dry Lake and wetlands within the SEZ, especially if heavy machinery is used in or nearby these features. However, these areas are typically dry; therefore no impacts on aquatic communities are expected. The introduction of contaminants can be minimized by avoiding construction near Dry Lake. Contaminants are not likely to affect aquatic habitat and biota, given the distance (14 mi [22 km]) and lack of hydrologic connection of the SEZ to any perennial surface water.

11.3.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of programmatic design features presented in Appendix A, Section A.2.2, could greatly reduce or eliminate the potential for effects on aquatic biota and aquatic habitats from development and operation of solar energy facilities. While the most SEZ-specific design features are best established when specific project details are being considered, SEZ-specific design features that can be identified at this time are as follows:

- Appropriate engineering controls should be implemented to minimize the amount of surface water runoff and fugitive dust reaching California Wash and Gypsum Wash.

- Minimize or eliminate the impact of groundwater withdrawals on streams near the SEZ such as the Muddy River and springs such as those along the north shore of Lake Meade and within Desert NWR and Moapa NWR.

If these SEZ-specific design features are implemented in addition to programmatic design features and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the Dry Lake SEZ would be negligible.

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11.3.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Dry Lake SEZ. Special status species include the following types of species[3]:

- Species listed as threatened or endangered under the ESA;

- Species that are proposed for listing, are under review, or are candidates for listing under the ESA;

- Species that are listed by the BLM as sensitive;

- Species that are listed by the State of Nevada[4]; and

- Species that have been ranked by the State of Nevada as S1 or S2, or species of concern by the State of Nevada or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the Dry Lake SEZ center (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the NDOW NNHP (Miskow 2009; NDCNR 2004, 2009a, 2009b), SWReGAP (USGS 2004, 2005a, 2007), and the USFWS ECOS (USFWS 2010). Information reviewed consisted of county-level occurrences as determined from NatureServe, element occurrences provided by the NNHP, as well as modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from the SWReGAP. The 50-mi (80-km) SEZ region intersects Clark and Lincoln Counties, Nevada, as well as Mohave County, Arizona. However, the SEZ and affected area occurs only in Clark County, Nevada. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

11.3.12.1 Affected Environment

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the Dry Lake SEZ, the area of direct effects included only the SEZ itself. Due to the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to

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[3] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008d). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[4] State-listed species for the state of Nevada are those protected under NRS 501.110 (animals) or NRS 527 (plants).

connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ due to the proximity of an existing federal highway (see Section 11.3.1.2 for a discussion of development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary. Indirect effects considered in the assessment included effects from groundwater withdrawals, surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but did not include ground-disturbing activities. For the most part, the potential magnitude of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary land cover habitat type within the affected area is Sonora-Mojave creosote desert scrub (see Section 11.3.10). Potentially unique habitats in the affected area in which special status species may reside include cliff and rock outcrops, desert washes, playas, and riparian habitats. There are no permanent aquatic habitats known to occur on the SEZ or within 5 mi (8 km) from the SEZ boundary. However, a portion of one dry lake playa (Dry Lake) occurs on the SEZ; an additional unnamed dry lake playa and an intermittent stream (California Wash) occur within 5 mi (8 km) of the SEZ boundary.

In scoping comments on the proposed Dry Lake SEZ (Stout 2009), the USFWS expressed concern that groundwater withdrawals from the Garnet Valley groundwater basin associated with solar energy development on the SEZ may reduce the regional groundwater supply that supports spring-fed aquatic habitats in the SEZ region, including habitats in the Pahranagat and Moapa Valleys. This includes species that occur in aquatic and riparian habitat associated with the following springs: Moapa Warm Springs (including Big Muddy Spring) and Corn Creek Spring (Figure 11.3.12.1-1). Although these areas are outside of the affected area as defined above, they are included in the evaluation because of the possible effect of groundwater withdrawals.

All special status species known to occur within the Dry Lake SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats in Appendix J. Of these species, 62 could be affected by solar energy development on the SEZ (including those dependent on groundwater discharge in the region), based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 11.3.12.1-1. For many of the species listed in the table (especially plants), their predicted potential occurrence in the affected area is based only on a general correspondence between mapped land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 m) from the SEZ.

Based on NNHP records and information provided by the USFWS, the following seven special status species are known to occur within the affected area of the Dry Lake SEZ:

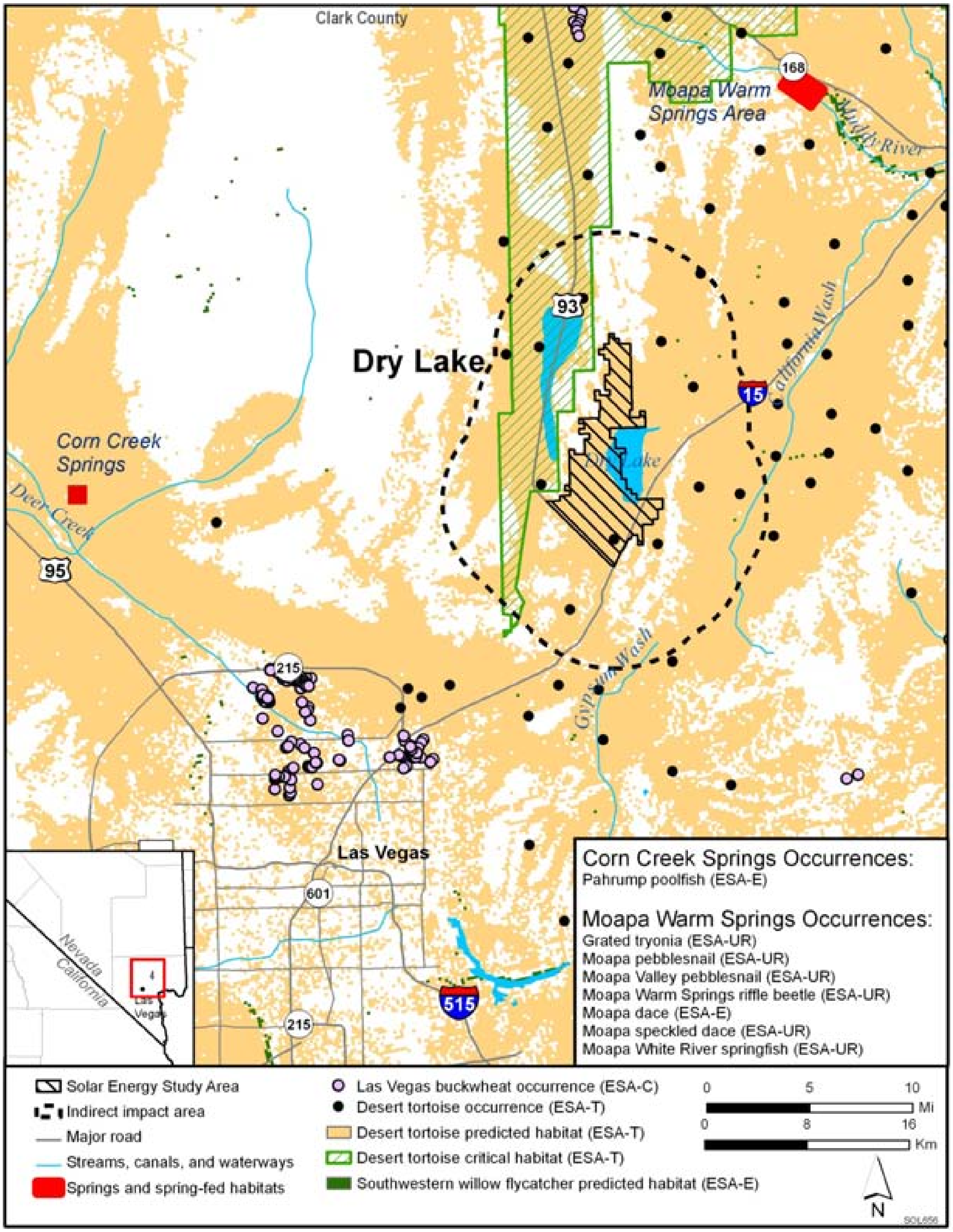

FIGURE 11.3.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA, Candidates for Listing under the ESA, or Species under Review for ESA Listing in the Affected Area of the Proposed Dry Lake SEZ (Sources: Miskow 2009; USGS 2007)

TABLE 11.3.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Dry Lake SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants						
Ackerman milkvetch	*Astragalus ackermanii*	NV-S2	Endemic to the Sheep and Pintwater ranges of southern Nevada in crevices and ledges of carbonate cliffs in mixed shrub, sagebrush, and juniper woodland at elevations between 4,000 and 6,200 ft.[h] Nearest recorded occurrence is 16 mi[i] northwest of the SEZ in the Desert NWR. About 4,304,500 acres[j] of potentially suitable habitat occurs in the SEZ region.	12,500 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	137,800 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effects; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.
Alkali mariposa lily	*Calochortus striatus*	BLM-S; FWS-SC; NV-S1	Restricted to wetlands in the western Mojave Desert including alkaline seeps, springs, and meadows at elevations between 2,600 and 4,600 ft. Nearest recorded occurrence is 21 mi southwest of the SEZ. About 79,850 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	375 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Antelope Canyon goldenbush	*Ericameria cervina*	NV-S1	Rock crevices and talus in shadscale and Douglas-fir-bristlecone pine woodland on calcareous substrates and ash flow tuff. Elevation ranges between 3,100 and 8,800 ft. Nearest recorded occurrence is 35 mi east of the SEZ. About 556,200 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	11,600 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

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TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Bearded screwmoss	*Pseudocrossidium crinitum*	NV-S1	Known from only 12 occurrences in Nevada on or near gypsiferous deposits and outcrops or limestone boulders, especially on east to north facing slopes of loose, uncompacted soil and associated with other mosses and lichens at elevations between 1,300 and 2,300 ft. Nearest recorded occurrence is 18 mi east of the SEZ. About 334,400 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	11,600 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Beaver dam breadroot	*Pediomelum castoreum*	FWS-SC	Dry, sandy desert communities. Nearest recorded occurrence is 19 mi northeast of the SEZ. About 65,000 acres of potentially suitable habitat occurs in the SEZ region.	425 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat)	3,000 acres of potentially suitable habitat (4.6% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash habitat on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Charleston goldenbush	*Ericameria compacta*	NV-S2	Endemic to the Spring and Sheep ranges southern Nevada, where the species is known from 10 occurrences on forested carbonate slopes, and adjacent ridges and low outcrops, within the subalpine and montane conifer communities at elevations between 2,850 and 11,300 ft. Nearest recorded occurrence is 18 mi northwest of the SEZ in the Desert NWR. About 409,350 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	11,600 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Dune sunflower	*Helianthus deserticola*	NV-S2	Sand dunes on dry, open, deep, loose sandy soils of aeolian deposits, vegetated dunes, and dune skirt areas, on flats and gentle slopes of all aspects, generally in alkaline areas. Elevation ranges between 1,325 and 4,900 ft. Nearest recorded occurrence is 22 mi east of the SEZ along the Muddy River. About 105,700 acres of potentially suitable habitat occurs in the SEZ region.	850 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat)	4,700 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash and desert pavement habitats on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Gold Butte moss	*Didymodon nevadensis*	BLM-S; NV-S1	Gypsiferous deposits and outcrops or limestone boulders, especially on east- to north-facing slopes of loose soil, and associated with other mosses and lichens. Elevation ranges between 1,300 and 2,300 ft. Nearest recorded occurrence is 15 mi southeast of the SEZ in the Lake Mead NRA. About 359,200 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	11,600 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Halfring milkvetch	*Astragalus mohavensis* var. *hemigyrus*	BLM-S; FWS-SC; NV-S2	Endemic to Nevada on carbonate gravels and derivative soils on terraced hills and ledges, open slopes, and along washes within the creosote-bursage, blackbrush, and mixed-shrub habitat communities. Elevation ranges between 3,000 and 5,600 ft. Nearest recorded occurrence is 15 mi northwest of the SEZ in the Desert N WR. About 422,200 acres of potentially suitable habitat occurs in the SEZ region.	425 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat)	15,000 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash habitat on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Las Vegas bearpoppy[k]	***Arctomecon californica***	NV-P; FWS-SC	Open, dry, spongy or powdery, often dissected or hummocked soils with high gypsum content, typically with well-developed soil crust, in areas of generally low relief on all aspects and slopes, with a sparse cover of other gypsum-tolerant species. Elevation ranges between 1,050 and 3,650 ft. Nearest recorded occurrence is 5 mi south of the SEZ. About 65,400 acres of potentially suitable habitat occurs in the SEZ region.	425 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat)	1,250 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert pavement habitat on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.
Las Vegas buckwheat	*Eriogonum corymbosum* var. *nilesii*	ESA-C; BLM-S; NV-S1	Restricted to southern Nevada in the vicinity of Las Vegas on or near gypsum soils, in washes, drainages, or in areas of generally low relief. Elevation ranges between 1,900 and 3,850 ft. Nearest recorded occurrence is 12 mi southwest of the SEZ. About 63,000 acres of potentially suitable habitat occurs in the SEZ region.	425 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat)	3,400 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash habitat on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations a. The potential for impact and need for mitigation should be developed in coordination with the USFWS and the NDOW.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Littlefield milkvetch	*Astragalus preussii* var. *laxiflorus*	NV-S1	Endemic to the Lake Mead region of Arizona and Nevada and disjunctly in California on alkaline clay flats and gravelly washes within shadscale and chenopod scrub at elevations between 2,300 and 2,450 ft. Nearest recorded occurrence is 13 mi southeast of the SEZ. About 122,200 acres of potentially suitable habitat occurs in the SEZ region.	430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	3,700 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash and playa habitats on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.
Meadow Valley sandwort	***Eremogone stenomeres***	NV-S2	Endemic to Clark and Lincoln counties, Nevada on limestone cliffs at elevations between 2,950 and 3,950 ft. Nearest recorded occurrence is 1 mi west of the SEZ. About 334,400 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	11,600 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Mottled milkvetch	*Astragalus lentiginosus* var. *stramineus*	NV-S1	Restricted to the lower Virgin River Valley in Mohave County, Arizona, and Clark County, Nevada, on sandy and gravelly flats and dunes at elevations between 2,000 and 3,000 ft. Nearest recorded occurrence is 40 mi northeast of the SEZ. About 65,400 acres of potentially suitable habitat occurs in the SEZ region.	425 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	1,275 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert pavement habitat on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
New York Mountains catseye	*Cryptantha tumulosa*	NV-S2	Gravelly or clay, granitic or carbonate substrates within Mojave desert scrub, creosotebush scrub, and pinyon-juniper woodland at elevation between 4,500 and 9,900 ft. Nearest recorded occurrence is 10 mi northwest of the SEZ in the Desert NWR. About 4,066,100 acres of potentially suitable habitat occurs in the SEZ region.	12,500 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	127,300 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. See the Ackerman milkvetch for a list of other potential mitigations.
Parish's phacelia	*Phacelia parishii*	BLM-S; FWS-SC; NV-S2	Aquatic habitats and wetlands in moist to superficially dry, open, flat, mostly barren, salt-crusted silty-clay soils on valley bottoms, lake deposits, playa edges in proximity to seepage areas surrounded by saltbush scrub vegetation. Elevation ranges from 2,200 to 5,950 ft. Nearest recorded occurrence is 19 mi southwest of the SEZ. About 81,700 acres of potentially suitable habitat occurs in the SEZ region.	430 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	4,100 acres of potentially suitable habitat (5.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash and playa habitats on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Rock phacelia	*Phacelia petrosa*	BLM-S; NV-S2	Dry limestone and volcanic talus slopes of foothills, washes, and gravelly canyon bottoms on substrates derived from calcareous material. Inhabits mixed desert scrub, creosotebush, and blackbrush at elevations between 2,500 and 5,800 ft. Nearest recorded occurrence is 9 mi west of the SEZ in the Desert NWR. About 4,242,700 acres of potentially suitable habitat occurs in the SEZ region.	12,500 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	142,750 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See the Ackerman milkvetch for a list of potential mitigations applicable to all special status plant species.
Rosy two-tone beard-tongue	***Penstemon bicolor* ssp. *roseus***	BLM-S; FWS-SC	Calcareous, granitic, or volcanic soils in washes, roadsides, scree at outcrop bases, rock crevices, or similar places receiving runoff, within creosote-bursage, blackbrush, and mixed-shrub. Elevation ranges between 1,800 and 4,850 ft. Known to occur on the SEZ and throughout the affected area. About 524,100 acres of potentially suitable habitat occurs in the SEZ region.	550 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	15,500 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash habitats on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Rough dwarf greasebush	*Glossopetalon pungens* var. *pungens*	BLM-S; NV-S2	Endemic to the Spring and Sheep ranges in southern Nevada, where the species is known from seven occurrences in the crevices of carbonate cliffs and outcrops, generally avoiding southerly exposures, within pinyon-juniper, mountain mahogany, and montane conifer communities. Elevation ranges from 4,400 to 7,800 ft. Nearest recorded occurrence is 17 mi west of the SEZ in the DNWR. About 606,000 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	11,600 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Rough fringemoss	*Crossidium seriatum*	NV-S2	Known from only eight occurrences in Nevada in sandstone and gypsiferous bluffs, outcrops, rock piles, and soils, often protected on the north or east sides of rocks or shrubs, or at bases of bluffs at elevations between 1,300 and 2,450 ft. Nearest recorded occurrence is 15 mi southeast of the SEZ in the Lake Mead NRA. About 399,800 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	12,875 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Sheep fleabane	*Erigeron ovinus*	BLM-S; FWS-SC; NV-S2	Endemic to Mount Irish and the Sheep and Groom ranges in southern Nevada, where the species is known from fewer than 15 occurrences in crevices of carbonate cliffs and ridgeline outcrops within pinyon-juniper and montane conifer woodland. Elevation ranges from 3,600 to 8,400 ft. Nearest recorded occurrence is 17 mi northwest of the SEZ in the Desert NWR. About 576,650 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	11,600 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Sheep Mountain milkvetch	*Astragalus amphioxys* var. *musimonum*	BLM-S; FWS-SC; NV-S2	Restricted to the foothills of the Sheep Mountains in southern Nevada (historically occurred in Arizona). Occurs in carbonate alluvial gravels, particularly along drainages, roadsides, and in other microsites with enhanced runoff, at elevations between 4,400 and 6,000 ft. Nearest recorded occurrence is 6 mi northwest of the SEZ in the Desert NWR. About 3,884,600 acres of potentially suitable habitat occurs in the SEZ region.	12,500 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	131,100 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See the Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Silverleaf sunray	*Enceliopsis argophylla*	BLM-S; NV-S1	Nearly entirely confined to Clark County, Nevada, in dry, open, relatively barren areas on gypsum badlands, volcanic gravels, or loose sands, within creosote-bursage habitat. Elevation ranges from 1,200 to 2,400 ft. Nearest recorded occurrence is 15 mi east of the SEZ. About 89,100 acres of potentially suitable habitat occurs in the SEZ region.	425 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	1,265 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert pavement habitat on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.
Sticky buckwheat	*Eriogonum viscidulum*	NV-P; FWS-SC; NV-S2	Known only from Clark County, Nevada, and Mohave County, Arizona, on deep, loose sandy soils in washes, flats, roadsides, steep aeolian slopes, and stabilized dunes. Elevation ranges from 1,200 to 2,200 ft. Nearest recorded occurrence is 21 mi northeast of the SEZ. About 65,000 acres of potentially suitable habitat occurs in the SEZ region.	425 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat)	3,375 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash habitat on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.
Sweet moustache moss	*Trichostomum sweetii*	NV-S1	Known from only two occurrences in Nevada on sandstone bluffs and sandstone-derived soil, often shaded by rocks at elevations between 2,000 and 2,230 ft. Nearest recorded occurrence is 21 mi southeast of the SEZ in the Lake Mead NRA. About 65,400 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	1,265 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Threecorner milkvetch	***Astragalus geyeri* var. *triquetrus***	NV-P; FWS-SC; NV-S2	Known only from Clark County, Nevada, and Mohave County, Arizona on open, deep sandy soils, desert washes, or dunes, generally stabilized by vegetation and/or a gravel veneer. Elevations range from 1,500 to 2,500 ft. Nearest recorded occurrence is about 1 mi east of the SEZ. About 105,700 acres of potentially suitable habitat occurs in the SEZ region.	850 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat)	4,700 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash and pavement habitats on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.
Virgin River thistle	*Cirsium virginense*	NV-S1	Known from only a few locations in Washington County, Utah, Mohave County, Arizona, and Clark County, Nevada, in open, moist, alkaline clay soils of seep and spring areas or gypsum knolls at elevations between 1,950 and 6,550 ft. Nearest recorded occurrence is 34 mi east of the SEZ. About 60,700 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	300 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
White bearpoppy	*Arctomecon merriamii*	BLM-S	Endemic to the Mojave Desert of California and Nevada in barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft. Nearest recorded occurrence is 19 mi southwest of the SEZ. About 358,000 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	11,600 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Yellow two-tone beard-tongue	***Penstemon bicolor* ssp. *bicolor***	BLM-S; FWS-SC; NV-S2	Endemic to Clark County, Nevada, on mostly BLM lands in the vicinity of Las Vegas on calcareous or carbonate soils in washes, roadsides, rock crevices, or outcrops at elevations between 2,500 and 5,500 ft. Nearest recorded occurrence is from a dry lake approximately 2 mi west of the SEZ. About 524,100 acres of potentially suitable habitat occurs in the SEZ region.	550 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	15,500 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash habitat on the SEZ could reduce impacts. In addition, see the Ackerman milkvetch for a list of other potential mitigations.
Invertebrates						
Grated tryonia	*Tryonia clathrata*	ESA-UR; BLM-S; NV-S2	Endemic to the Muddy River spring system in southeastern Nevada on algae and detritus substrates of slow moving freshwater spring systems. Nearest recorded occurrence is from Big Muddy Spring, approximately 15 mi north of the SEZ. About 500 acres of potentially suitable habitat associated with the Warm Springs Area occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 500 acres of potentially suitable habitat in the Warm Springs Area could be affected by groundwater withdrawals.	Small to large overall impact. The impact of water withdrawal on the Garnet Valley regional groundwater system that supports aquatic and mesic habitat in the SEZ region would depend on the volume of water withdrawn to support solar energy development on the SEZ. Avoiding or limiting withdrawals from this regional groundwater system could reduce impacts on this species to negligible levels. Note that these potential mitigation measures apply to all special status species with habitats dependent upon groundwater that may be affected by development on the SEZ. The potential for impact and need for mitigation should be determined in coordination with the USFWS and the NDOW.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Moapa pebblesnail	*Pyrgulopsis avernalis*	ESA-UR; NV-S1	Endemic to Moapa Springs in Clark County, Nevada, in freshwater springs and brooks. Nearest recorded occurrence is from Big Muddy Spring, approximately 15 mi north of the SEZ. About 500 acres of potentially suitable habitat associated with the Warm Springs Area occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 500 acres of potentially suitable habitat in the Warm Springs Area could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species. The potential for impact and need for mitigation should be determined in coordination with the USFWS and the NDOW.
Moapa Valley pebblesnail	*Pyrgulopsis carinifera*	ESA-UR; NV-S1	Endemic to the Moapa Valley in Clark County, Nevada, in freshwater spring-fed habitats. Nearest recorded occurrence is from Big Muddy Spring, approximately 15 mi north of the SEZ. About 28 mi of potentially suitable habitat associated with the Warm Springs Area and Muddy River occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 28 mi of potentially suitable habitat in the Muddy River could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species. The potential for impact and need for mitigation should be determined in coordination with the USFWS and NDOW.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Moapa Warm Spring riffle beetle	*Stenelmis moapa*	ESA-UR; BLM-S; NV-S1	Endemic to the Warm Springs Area of Clark County, Nevada, in swift, shallow waters of freshwater warm outlet springs on gravel substrates. Nearest recorded occurrence is from Big Muddy Spring, approximately 15 mi north of the SEZ. About 500 acres of potentially suitable habitat associated with the Warm Springs Area occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 500 acres of potentially suitable habitat in the Warm Springs Area could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species. The potential for impact and need for mitigation should be determined in coordination with the USFWS and the NDOW.
Mojave gypsum bee	*Andrena balsamorhizae*	BLM-S; NV-S2	Endemic to Nevada on gypsum soils associated with habitats of its single larval host plant, silverleaf sunray. Such habitats include warm desert shrub communities on dry slopes and sandy washes. Nearest recorded occurrence is 8 mi south of the SEZ. About 3,819,500 acres of potentially suitable habitat occurs in the SEZ region.	12,500 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	127,300 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats may reduce impacts on this species.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Mojave poppy bee	*Perdita meconis*	BLM-S; NV-S2	Known only from Clark County, Nevada where the species is dependent on poppy plants (genus *Arctomecon*). in roadsides, washes, and barren desert areas on gypsum soils. Nearest recorded occurrence is in the vicinity of Lake Mead, approximately 17 mi south of the SEZ. About 418,000 acres of potentially suitable habitat occurs in the SEZ region.	550 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	13,300 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert wash habitat on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats may reduce impacts on this species.
Pahranagat naucorid	*Pelocoris shoshone shoshone*	BLM-S; NV-S1	Known only to occur in the Muddy and White River Basins in southern Nevada in quiet waters of warm spring-fed habitats. Nearest recorded occurrence is from Big Muddy Spring, approximately 15 mi north of the SEZ. Approximately 68 mi of potentially suitable habitat in the Muddy and White River Basins occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 68 mi of potentially suitable habitat in the Muddy and White River Basins could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Red-tailed blazing star bee	*Megandrena mentzeliae*	NV-S2	Endemic to southern Nevada, where it is known only from Clark County. The species is primarily associated with the host plant *Mentzelia tricuspis*. Such habitats include open, dry, barren areas with gypsum to gravelly soils. Nearest recorded occurrence is 13 mi northwest of the SEZ in the Desert NWR. About 105,700 acres of potentially suitable habitat occurs in the SEZ region.	425 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	1,500 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert pavement habitat on the SEZ could reduce impacts. Pre-disturbance surveys, avoiding or minimizing disturbance to occupied habitats, or compensatory mitigation of occupied habitats on the SEZ may also reduce impacts on this species.
Spring Mountains springsnail	*Pyrgulopsis deaconi*	BLM-S; NMV-S1	Endemic to freshwater springs of the Spring Mountains in southern Nevada. Known to occur in Clark County, Nevada. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Warm Springs naucorid	*Limnocoris moapensis*	NV-S1	Endemic to southern Nevada, where it is restricted to the Warm Springs Area among the pebble beds of quiet waters or stream outlets. Nearest recorded occurrence is from Big Muddy Spring, approximately 15 mi north of the SEZ. Approximately 500 acres of potentially suitable habitat in the Warm Springs Area occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 500 acres of potentially suitable habitat in the Warm Springs Area could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species.
Fish						
Moapa dace	*Moapa coriacea*	ESA-E; NV-P; NV-S1	Endemic to Clark County, Nevada, where the species is restricted to 6 mi of aquatic habitat in the warm spring area at the headwaters of the Muddy River. Preferred habitat includes spring pools, outflows, and the main stem of the Muddy River, where the water is clear and warm. Nearest recorded occurrences are from Moapa and Big Muddy Springs, approximately 15 mi north of the SEZ. Approximately 6 mi of potentially suitable habitat in the Warm Springs Area and Muddy River occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 6 mi of potentially suitable habitat in the Warm Springs Area and Muddy River could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species. The potential for impact and need for mitigation should be determined in consultation with the USFWS and the NDOW.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Fish (Cont.)						
Moapa speckled dace	*Rhinichthys osculus moapae*	ESA-UR; BLM-S; NV-P; NV-S1	Endemic to Clark County, Nevada, where it is restricted to the Muddy River in shallow cobble riffles. Nearest recorded occurrences are from Muddy River, approximately 15 mi northeast of the SEZ. Approximately 28 mi of potentially suitable habitat in the Muddy River occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 28 mi of potentially suitable habitat in the Muddy River could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species. The potential for impact and need for mitigation should be determined in coordination with the USFWS and the NDOW.
Moapa White River springfish	*Crenichthys baileyi moapae*	ESA-UR; NV-P; NV-S2	Endemic to southern Nevada, where it is restricted to five warm-water springs in the upper Muddy River in spring pools and backwaters in spring outflows. More abundant in and near the springs than in the river. Nearest recorded occurrences are from Muddy River, approximately 15 mi northeast of the SEZ. Approximately 500 acres of potentially suitable habitat in the Warm Springs Area occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 500 acres of potentially suitable habitat in the Warm Springs Area could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species. The potential for impact and need for mitigation should be determined in coordination with the USFWS and the NDOW.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Fish (Cont.)						
Pahrump poolfish	*Empetrichthys latos latos*	ESA-E; NV-P; NV-S1	Historically endemic to the Pahrump Valley in southern Nye County, Nevada. It is currently extirpated from its native range. Introduced populations occur in three spring-fed habitats in Clark and White Pine Counties, Nevada: Corn Creek Springs, Shoshone Springs, and an irrigation reservoir fed by Sandstone Spring. Nearest recorded occurrence is from Corn Creek Springs in the Desert NWR, approximately 23 mi west of the SEZ. Approximately 5 acres of potentially suitable habitat in Corn Creek Springs occurs in the SEZ region.	0 acres	0 acres within the 5-mi area surrounding the SEZ, but approximately 5 acres of potentially suitable habitat in Corn Creek Springs could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species. The potential for impact and need for mitigation should be determined in consultation with the USFWS and the NDOW.
Amphibians						
Southwestern toad	*Bufo microscaphus*	BLM-S; FWS-SC; NV-S2	Woodlands and low-elevation riparian habitats in association with permanent or semipermanent water bodies including streams, ditches, flooded fields, irrigated croplands, and permanent reservoirs. Nearest recorded occurrences are along the Meadow Valley Wash, approximately 50 mi north of the SEZ. About 19,100 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	50 acres of potentially suitable habitat (0.3% of available potentially suitable habitat). Additional potentially suitable riparian habitats in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles						
Desert tortoise	***Gopherus agassizii***	ESA-T; NV-P; NV-S2	Desert creosotebush communities on firm soils for digging burrows along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Known to occur on the SEZ and throughout the affected area. About 2,762,500 acres of potentially suitable habitat occurs in the SEZ region.	15,000 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	106,250 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and the NDOW.
Gila monster	*Heloderma suspectum*	BLM-S; NV-P; FWS-SC; CA-S1; NV-S2	Rocky, deeply incised areas of desert scrub, thorn scrub, desert riparian, oak woodland, and semidesert grassland. Occurs in lower mountain slopes, rocky bajadas, canyon bottoms, and arroyos at elevations below 3,950 ft. Known to occur in Clark County, Nevada. About 3,175,900 acres of potentially suitable habitat occurs in the SEZ region.	14,700 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	124,100 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds						
American peregrine falcon	*Falco peregrinus*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in SEZ region in open habitats, including deserts, shrublands, and woodlands associated with high, near vertical cliffs and bluffs above 200 ft. When not breeding, activity is concentrated in areas with ample prey, such as farmlands, marshes, lakes, rivers, and urban areas. Nearest recorded occurrences are from the metropolitan area of Las Vegas, Nevada, approximately 22 mi southwest of the SEZ. About 4,171,400 acres of potentially suitable habitat occurs in the SEZ region.	14,900 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	137,700 acres of potentially suitable foraging or nesting habitat (2.8% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Crissal thrasher	*Toxostoma crissale*	BLM-S; FWS-SC	Year-round resident in SEZ region. Nests in dense thickets of mesquite or low trees in desert riparian and desert wash habitats. Also occurs in washes within pinyon-juniper habitats. Known to occur in Clark County, Nevada. About 81,000 acres of potentially suitable habitat occurs in the SEZ region.	350 acres of potentially suitable foraging and nesting habitat lost (0.4% of available potentially suitable habitat)	3,440 acres of potentially suitable foraging and nesting habitat (4.2% of available potentially suitable habitat).	Small overall impact. Avoiding or minimizing disturbance to desert wash and riparian habitat on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats (especially nesting habitats) on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident in SEZ region in grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodland. Known to occur in Clark County, Nevada. About 417,500 acres of potentially suitable habitat occurs in the SEZ region.	340 acres of potentially suitable foraging habitat lost (0.1% of available potentially suitable habitat)	15,150 acres of potentially suitable foraging habitat (3.6% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
LeConte's thrasher	*Toxostoma lecontei*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in SEZ region in saltbush-cholla scrub communities in desert flats, dunes, or alluvial fans. Known to occur in Clark County, Nevada. About 3,817,950 acres of potentially suitable habitat occurs in the SEZ region.	15,000 acres of potentially suitable foraging and nesting habitat lost (0.4% of available potentially suitable habitat)	127,500 acres of potentially suitable foraging and nesting habitat (3.3% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats (especially nesting habitats) on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Phainopepla	*Phainopepla nitens*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in project area in desert scrub, mesquite, pinyon-juniper woodland, desert riparian areas and orchards. Nests in trees or shrubs. Nearest recorded occurrences are from the Meadow Valley Wash and Muddy River systems, approximately 20 mi east of the SEZ. About 1,038,500 acres of potentially suitable habitat occurs in the SEZ region.	340 acres of potentially suitable foraging and nesting habitat lost (<0.1% of available potentially suitable habitat)	9,850 acres of potentially suitable foraging and nesting habitat (0.9% of available potentially suitable habitat). Additional potentially suitable riparian habitats in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Potentially suitable nesting habitat in riparian habitats in the Moapa and Pahranagat Valleys may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent species. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats (especially nesting habitats) on the SEZ or compensatory mitigation of direct effects on occupied habitats on the SEZ could reduce impacts.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Southwestern willow flycatcher	*Empidonax traillii extimus*	ESA-E; NV-P; NV-S1	Summer breeding resident in SEZ region in riparian shrublands and woodlands. Nests in thickets, scrubby and brushy areas, open second growth, swamps, and open woodlands. Nearest recorded occurrences are from the Muddy and Virgin River systems, approximately 20 mi east of the SEZ. About 183,400 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	50 acres of potentially suitable foraging and nesting habitat (<0.1% of available potentially suitable habitat). Additional potentially suitable riparian habitats in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. No direct impact. Potentially suitable nesting habitat in riparian habitats in the Moapa and Pahranagat Valleys may be affected by groundwater withdrawal. See grated tryonia for potential mitigation measures applicable to all groundwater-dependent species. The potential for impact and need for mitigation should be determined in consultation with the USFWS and the NDOW.
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; FWS-SC	Summer breeding resident in SEZ region in open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports throughout the SEZ region. Nests in burrows constructed by mammals (prairie dog, badger, and the like). Known to occur in Clark County, Nevada. About 4,034,600 acres of potentially suitable habitat occurs in the SEZ region.	14,750 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	125,500 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows and habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals						
Big free-tailed bat	*Nyctinomops macrotis*	BLM-S; NV-S1	Year-round resident in SEZ region. Roosts in rock crevices on cliff faces or in buildings. Forages primarily in coniferous forests and arid shrublands to feed on moths. Known to occur in Clark County, Nevada. About 4,048,200 acres of potentially suitable habitat occurs in the SEZ region.	15,600 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	141,575 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Brazilian free-tailed bat	*Tadarida brasiliensis*	BLM-S; NV-P	Year-round resident in SEZ region. Forages in desert grassland, old field, savanna, shrubland, and woodland habitats as well as urban areas. Roosts in old buildings, caves, mines, and hollow trees. Known to occur in Clark County, Nevada. About 3,722,850 acres of potentially suitable habitat occurs in the SEZ region.	15,200 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	133,500 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Nelson's bighorn sheep	***Ovis canadensis nelsoni***	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, but may use them as corridors for travel between mountain ranges. Known to occur in the Sheep Mountains, approximately 5 mi west of the SEZ, and potentially suitable year-round habitat occurs within the affected area. May utilize portions of the SEZ as migratory corridors. About 593,900 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	8,400 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	Small overall impact; no direct affect. Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to important movement corridors within the area of direct effects.
Pallid bat	*Antrozous pallidus*	BLM-S; NV-P; FWS-SC	Year-round resident in SEZ region in low elevation desert communities, including grasslands, shrublands, and woodlands. Roosts in caves, crevices, and mines. Nearest recorded occurrences are from the Desert NWR, approximately 10 mi west of the SEZ. About 3,706,300 acres of potentially suitable habitat occurs in the SEZ region.	15,100 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	134,100 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Silver-haired bat	*Lasionycteris noctivagans*	BLM-S; FWS-SC	Year-round resident in SEZ region in high-elevation (1,600 to 8,500 ft) forested areas of aspen, cottonwood, white fir, pinyon-juniper, subalpine fir, willow, and spruce. May also forage in arid shrublands. Roosts in tree foliage, cavities, under loose bark, caves, mines, and under rock ledges. Rarely hibernates in caves. Nearest recorded occurrences are from the Muddy River, approximately 15 mi northeast of the SEZ. About 3,586,800 acres of potentially suitable habitat occurs in the SEZ region.	14,800 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	130,100 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Spotted bat	*Euderma maculatum*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in SEZ region near forests and shrubland habitats throughout the SEZ region. Roosts and hibernates in caves and rock crevices. Nearest recorded occurrences are from the vicinity of Las Vegas, approximately 16 mi southwest of the SEZ. About 4,404,950 acres of potentially suitable habitat occurs in the SEZ region.	15,000 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	139,300 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; NV-P; NV-S2	Year-round resident in SEZ region near forests and shrubland habitats below 9,000 ft elevation throughout the SEZ region. Roosts in caves, mines, and buildings for day roosting. Nearest recorded occurrences are from the Desert NWR, approximately 10 mi west of the SEZ. About 3,861,200 acres of potentially suitable habitat occurs in the SEZ region.	14,900 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	131,100 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Western mastiff bat	*Eumops perotis*	NV-P; FWS-SC; NV-S1	Summer resident in project area in many open semiarid habitats, including conifer and deciduous woodlands, shrublands, grasslands, chaparral, and urban areas. Roosts in crevices in cliff faces, buildings, and tall trees. Nearest occurrences are from the vicinity of Las Vegas, approximately 20 mi southwest of the SEZ. About 97,800 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	200 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Western small-footed myotis	*Myotis ciliolabrum*	BLM-S; FWS-SC	Year-round resident in SEZ region in woodland and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Nearest recorded occurrences are from the Desert NWR, approximately 10 mi west of the SEZ. About 4,325,600 acres of potentially suitable habitat occurs in the SEZ region.	14,900 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	137,600 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

[a] BLM-S = listed as a sensitive species by the BLM; ESA-C = candidate for listing under the ESA; ESA-E = listed as endangered under the ESA; ESA-T = listed as threatened under the ESA; ESA-UR = under review for listing under the ESA; FWS-SC = USFWS species of concern; NV-P = protected in the State of Nevada under NRS 501.110 (animals) or NRS 527 (plants); NV-S1 = ranked as S1 in the State of Nevada; NV-S2 = ranked as S2 in the State of Nevada.

[b] For plant species, potentially suitable habitat was determined by using SWReGAP land cover types. For terrestrial vertebrate species, potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from groundwater withdrawal, surface runoff, dust, noise, lighting, and so on from project developments. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Indirect effects on groundwater-dependent species were considered outside these defined areas.

Footnotes continued on next page.

TABLE 11.3.12.1-1 (Cont.)

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[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: $\leq$1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but $\leq$10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert ft to m, multiply by 0.3048.

[i] To convert mi to km, multiply by 1.609.

[j] To convert acres to km^2, multiply by 0.004047.

[k] Species in bold text have been recorded or have designated critical habitat within 5 mi (8 km) of the SEZ boundary.

Las Vegas bearpoppy, Meadow Valley sandwort, rosy two-tone beardtongue, threecorner milkvetch, yellow two-tone beardtongue, desert tortoise, and Nelson's bighorn sheep. In addition to these species, there are 13 groundwater-dependent species or species with habitats that may be dependent on groundwater discharge from the Garnet Valley groundwater basin. These species include grated tryonia, Moapa pebblesnail, Moapa Valley pebblesnail, Moapa Warm Spring riffle beetle, Pahranagat naucorid, Spring Mountain springsnail, Warm Springs naucorid, Moapa dace, Moapa speckled dace, Moapa White River springfish, Pahrump poolfish, phainopepla, and southwestern willow flycatcher.

11.3.12.1.1 Species Listed under the Endangered Species Act That Could Occur in the Affected Area

In scoping comments on the proposed Dry Lake SEZ (Stout 2009), the USFWS expressed concern for impacts of project development within the SEZ on habitat for the Mojave population of the desert tortoise—a species listed as threatened under the ESA. The USFWS also expressed concern that groundwater withdrawals for development on the SEZ from the Garnet Valley regional groundwater system might also reduce the groundwater supply that supports aquatic and riparian habitats for various ESA-listed species in the SEZ region. The following ESA-listed species that may occur outside the area of indirect effects but that could be affected by groundwater withdrawals within the SEZ are considered: Moapa dace (endangered), Pahrump poolfish (endangered), and southwestern willow flycatcher (endangered). These species are discussed below, and information on their habitats is presented in Table 11.3.12.1-1; additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

Desert Tortoise

The Mojave population of the desert tortoise is listed as threatened under the ESA and is known to occur in the SEZ region in desert shrubland habitats. The species is known to occur on the SEZ and within the area of indirect effects; designated critical habitat occurs immediately adjacent to the western boundary of the proposed Dry Lake SEZ in the Mormon Mesa critical habitat unit (Figure 11.3.12.1-1). Desert tortoise surveys in the Mormon Mesa critical habitat unit conducted by the USFWS have indicated a desert tortoise density of about 1.6 to 3.2 individuals per km^2 (Stout 2009). Extrapolated across the size of the Dry Lake SEZ, the USFWS has estimated that the Dry Lake SEZ may support up to 213 desert tortoises.

According to the SWReGAP habitat suitability model, approximately 121,250 acres (491 km^2) of potentially suitable habitat for this species occurs in the affected area; 15,000 acres (61 km^2) occurs within the SEZ and 106,250 acres (430 km^2) occurs in the area of indirect effects. The USGS desert tortoise model (Nussear et al. 2009) identifies the SEZ as having overall high habitat suitability for desert tortoise (suitability score greater than or equal to 0.8 out of 1.0). According to the SWReGAP habitat suitability model, approximately 2,762,500 acres (11,180 km^2) of potentially suitable habitat for this species occurs in the SEZ region (Table 11.3.12.1-1).

Southwestern Willow Flycatcher

The southwestern willow flycatcher is a small neotropical migrant bird listed as endangered under the ESA that inhabits riparian shrublands, woodlands, and thickets in the southwestern United States. The nearest recorded occurrence of this species is from riparian areas along the Muddy River, approximately 20 mi (32 km) east of the SEZ. Potentially suitable breeding and foraging habitats for this species within the Moapa Valley are dependent upon surface discharges from the Garnet Valley regional groundwater system. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, approximately 50 acres (0.2 km^2) of potentially suitable habitat is expected to occur within the area of indirect effects within 5 mi (8 km) of the SEZ boundary. This potentially suitable riparian habitat and other potentially suitable riparian habitat in the SEZ region, especially along the Muddy River, could be affected by groundwater withdrawals. Approximately 183,400 acres (742 km^2) of potentially suitable habitat occurs throughout the SEZ region (Figure 11.3.12.1-1).

Groundwater-Dependent Species

The USFWS (Stout 2009) identified the potential for impacts on various species that could result from groundwater withdrawals from the Garnet Valley groundwater basin that would serve solar energy development on the Dry Lake SEZ. As discussed previously and on the basis of the analysis presented in Section 11.3.9.2, three ESA-listed species could be affected by groundwater withdrawals on the Dry Lake SEZ: Moapa dace, Pahrump poolfish, and southwestern willow flycatcher. The southwestern willow flycatcher is discussed above.

Moapa Dace. The Moapa dace is a small fish listed as endangered under the ESA. This species is endemic to the Muddy (Moapa) River and associated thermal spring systems within the Warm Springs Area of Clark County, Nevada. Historically, the Moapa dace inhabited 25 springs and approximately 10 mi (16 km) of the upper Muddy River system. Currently, the species is restricted to 3 springs and less than 6 mi (10 km) of the Muddy River system. Preferred habitats include spring pools, outflows, and the main stem of the Muddy River, where water is clear and warm. Habitat use varies with age—juveniles tend to occur in spring pools and outflows, while adults tend to occur in outflows and in the Muddy River. This species is known to occur in spring habitats of the Warm Springs Area, approximately 15 mi (24 km) north of the SEZ (Figure 11.3.12.1-1; Table 11.3.12.1-1). Critical habitat for this species has not been designated.

Pahrump Poolfish. The Pahrump poolfish is a small fish listed as endangered under the ESA. This species is endemic to the Pahrump Valley in southern Nye County, Nevada. Natural populations of this species have been extirpated, but introduced populations exist in three spring-fed habitats in Clark and White Pine Counties, Nevada: Corn Creek Springs (Desert NWR), Shoshone Springs, and an irrigation reservoir fed by Sandstone Spring (Spring Mountain State Park). The introduced population in Corn Creek Springs is located approximately 23 mi (37 km) west of the SEZ (Figure 11.3.12.1-1; Table 11.3.12.1-1). This habitat is about 5 acres (<0.1 km^2) in size and represents the only available potentially suitable habitat for this species in the SEZ region. Critical habitat for this species has not been designated.

11.3.12.1.2 Species That Are Candidates for Listing under the ESA

In scoping comments on the proposed Dry Lake SEZ (Stout 2009), the USFWS did not mention any species that are candidates for listing under the ESA that may be affected by solar energy development on the Dry Lake SEZ. However, there is one ESA candidate species—the Las Vegas buckwheat—that may occur within the affected area of the Dry Lake SEZ. This species is endemic to southern Nevada in the vicinity of Las Vegas. It inhabits areas of gypsum soils, washes, drainages, or areas of low relief at elevations between 1,900 and 3,850 ft (580 and 1,175 m). The nearest recorded occurrence of this species is approximately 12 mi (19 km) southwest of the SEZ (Figure 11.3.12.1-1; Table 11.3.12.1-1). Additional basic information on life history, habitat needs, and threats to populations of this species is provided in Appendix J.

11.3.12.1.3 Species That Are under Review for Listing under the ESA

The USFWS identified three invertebrate species (mollusks) under review for ESA listing that may be indirectly affected by solar energy development within the SEZ (Stout 2009): grated tryonia, Moapa pebblesnail, and Moapa Valley pebblesnail. These species do not occur within 5 mi (8 km) of the SEZ boundary, but they do occur in aquatic habitats dependent on groundwater discharge from the Garnet Valley regional groundwater system in the Warm Springs Area and the Moapa Valley, which could be affected by groundwater withdrawals on the Dry Lake SEZ. In addition to these species, the Moapa Warm Springs riffle beetle, Moapa speckled dace, and Moapa White River springfish are other species under review for ESA listing with habitats dependent upon this same groundwater system (Table 11.3.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of these species. General information on each species is provided below.

Grated Tryonia

The grated tryonia is an aquatic snail known from the Muddy River system in southern Nevada. The nearest known occurrence of this species is from Big Muddy Spring, approximately 15 mi (24 km) north of the SEZ (Figure 11.3.12.1-1).

Moapa Pebblesnail

The Moapa pebblesnail is an aquatic snail restricted to the Moapa Springs in Clark County, Nevada. The nearest known occurrence of this species is from Big Muddy Spring, approximately 15 mi (24 km) north of the SEZ (Figure 11.3.12.1-1).

Moapa Valley Pebblesnail

The Moapa Valley pebblesnail is a freshwater mollusk restricted to spring-fed habitats in the Moapa Valley of southern Nevada. The nearest known occurrence of this species is from Big Muddy Spring, approximately 15 mi (24 km) north of the SEZ (Figure 11.3.12.1-1).

Moapa Warm Springs Riffle Beetle

The Moapa Warm Springs riffle beetle is an aquatic insect restricted to the Warm Springs Area of Clark County, Nevada. The nearest known occurrence of this species is from Big Muddy Spring, approximately 15 mi (24 km) north of the SEZ (Figure 11.3.12.1-1).

Moapa Speckled Dace

The Moapa speckled dace is a fish restricted to the Muddy River system in Clark County, Nevada. The nearest known occurrence of this species is from the Muddy River, approximately 15 mi (24 km) north of the SEZ (Figure 11.3.12.1-1).

Moapa White River Springfish

The Moapa White River springfish is restricted to warm water springs in the upper Muddy River. The nearest known occurrence of this species is from the Muddy River, approximately 15 mi (24 km) north of the SEZ (Figure 11.3.12.1-1).

11.3.12.1.4 BLM-Designated Sensitive Species

A total of 35 BLM-designated sensitive species may occur in the affected area of the Dry Lake SEZ (Table 11.3.12.1-1), including the following: (1) plants: alkali mariposa lily, Gold Butte moss, halfring milkvetch, Las Vegas buckwheat, Parish's phacelia, rosy two-tone beardtongue, rough dwarf greasebush, sheep fleabane, Sheep Mountain milkvetch, silverleaf sunray, white bearpoppy, and yellow two-tone beardtongue; (2) invertebrates: grated tryonia, Moapa Warm Spring riffle beetle, Mojave gypsum bee, Mojave poppy bee, Pahranagat naucorid, and Spring Mountains springsnail; (3) fish: Moapa speckled dace; (4) amphibian: southwestern toad; (5) reptile: Gila monster; (6) birds: American peregrine falcon, crissal thrasher, ferruginous hawk, LeConte's thrasher, phainopepla, and western burrowing owl; and (7) mammals: big free-tailed bat, Brazilian free-tailed bat, Nelson's bighorn sheep, pallid bat, silver-haired bat, spotted bat, Townsend's big-eared bat, and western small-footed bat. The occurrences of the following 4 BLM-designated sensitive species have been previously discussed because of their known or pending status under the ESA (Sections 11.3.12.1.1, 11.3.12.1.2, and 11.3.12.1.3): Las Vegas buckwheat, grated tryonia, Warm Springs riffle beetle, and Moapa speckled dace. Of the remaining 31 BLM-designated sensitive species with potentially suitable habitat in the affected area, occurrences of the following species intersect the affected area of the Dry Lake SEZ: rosy two-tone beardtongue, yellow two-tone beardtongue, and Nelson's bighorn sheep. Habitats in which BLM-designated sensitive species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are presented in Table 11.3.12.1-1. These species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Alkali Mariposa Lily

The alkali mariposa lily is a perennial forb restricted to wetlands in the western Mojave Desert. It inhabits alkaline seeps, springs, and meadows at elevations between 2,600 and 4,600 ft (792 and 1,400 m). This species is known to occur about 21 mi (34 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat does not occur on the SEZ; however, potentially suitable riparian and wetland habitat may occur in the area of indirect effects (within 5 mi [8 km] of the SEZ boundary) (Table 11.3.12.1-1).

Gold Butte Moss

The Gold Butte moss is a bryophyte (moss) known only from Nevada and Texas on gypsiferous deposits and outcrops or limestone boulders. This species is typically associated with other mosses and lichens at elevations between 1,300 and 2,300 ft (400 and 700 m). This species is known to occur about 15 mi (24 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat does not occur on the SEZ; however, potentially suitable rocky cliffs and outcrops may occur in the area of indirect effects (within 5 mi [8 km] of the SEZ boundary) (Table 11.3.12.1-1).

Halfring Milkvetch

The halfring milkvetch is a perennial forb endemic to Nevada on carbonate gravels and derived soils on terraced hills, ledges, open slopes, and along washes at elevations between 3,000 and 5,600 ft (915 and 1,700 m). This species is known to occur about 15 mi (24 km) northwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species may occur on the SEZ and throughout other portions of the affected area (Table 11.3.12.1-1).

Parish's Phacelia

The Parish's phacelia is an annual forb known from Arizona, California, and Nevada. This species inhabits wetlands and other mesic sites such as valley bottoms, lake deposits, and playa edges. This species is known to occur about 19 mi (30 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species may occur on the SEZ and throughout other portions of the affected area (Table 11.3.12.1-1).

Rosy Two-Tone Beardtongue

The rosy two-tone beardtongue is a perennial forb known from Arizona, California, and Nevada. This species occurs on calcareous, granitic, or volcanic substrates in washes, roadsides, scree and outcrop bases, rock crevices, or similar places receiving enhanced runoff at elevations between 1,800 and 4,850 ft (550 and 1,480 m). This species is known to occur on the SEZ and throughout the affected area. According to the SWReGAP land cover model, potentially suitable habitat for this species may occur on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

Rough Dwarf Greasebush

The rough dwarf greasebush is a perennial shrub endemic to the Spring and Sheep ranges in southern Nevada. This species inhabits crevices of carbonate cliffs and outcrops, generally within pinyon-juniper and montane coniferous woodlands. This species is known to occur about 17 mi (27 km) west of the SEZ in the Desert National Wildlife Range. According to the SWReGAP land cover model, potentially suitable habitat does not occur on the SEZ; however, potentially suitable habitat may occur in the area of indirect effects (within 5 mi [8 km] west of the SEZ boundary [Table 11.3.12.1-1]).

Sheep Fleabane

The sheep fleabane is a perennial forb endemic to Mount Irish and the Sheep and Groom ranges in southern Nevada. This species inhabits crevices of carbonate cliffs and outcrops, generally within pinyon-juniper and montane coniferous woodlands. This species is known to occur about 17 mi (27 km) northwest of the SEZ in the Desert NWR. According to the SWReGAP land cover model, potentially suitable habitat does not occur on the SEZ; however, potentially suitable habitat may occur in the area of indirect effects (within 5 mi [8 km] west of the SEZ boundary [Table 11.3.12.1-1]).

Sheep Mountain Milkvetch

The Sheep Mountain milkvetch is a perennial forb known from the foothills of the Sheep Mountains in southern Nevada. This species occurs on carbonate alluvial gravels, drainages, roadsides, and other microsites with enhanced runoff at elevations between 4,400 and 6,000 ft (1,340 and 1,830 m). This species is known to occur about 6 mi (10 km) northwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species may occur on the SEZ and throughout other portions of the affected area (Table 11.3.12.1-1).

Silverleaf Sunray

The silverleaf sunray is a perennial forb primarily known from southern Nevada. This species occurs in dry, open, relatively barren areas on gypsum badlands, volcanic gravels, or loose sands at elevations between 1,200 and 2,400 ft (365 and 730 m). This species is known to occur about 15 mi (24 km) east of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species may occur on the SEZ and throughout other portions of the affected area (Table 11.3.12.1-1).

White Bearpoppy

The white bearpoppy is a perennial forb endemic to the Mojave Desert of California and Nevada. This species inhabits barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft (610 and 1,800 m). This species is known to occur as near as 19 mi (30 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat does not occur on the SEZ; however, potentially suitable habitat may occur in the area of indirect effects (within 5 mi [8 km] west of the SEZ boundary [Table 11.3.12.1-1]).

Yellow Two-Tone Beardtongue

The yellow two-tone beardtongue is a perennial forb endemic to Clark County, Nevada on mostly BLM lands in the vicinity of Las Vegas. This species occurs on calcareous or carbonate soils in washes, roadsides, rock crevices, or outcrops at elevations between 2,500 and 5,500 ft (760 and 1,675 m). This species is known to occur in the affected area of the SEZ about 2 mi (3 km) west of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species may occur on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

Mojave Gypsum Bee

The Mojave gypsum bee is an insect endemic to Nevada, where the species is restricted to gypsum soils associated with habitats of its single larval host plant, silverleaf sunray. Such habitats include warm desert shrub communities, dry, open, relatively barren areas on gypsum badlands, and volcanic gravels. This species is known to occur about 8 mi (13 km) south of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species may occur on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

Mojave Poppy Bee

The Mojave poppy bee is an insect known only from Clark County, Nevada, where it is dependent on poppy plants (*Arctemocon* spp.). Such habitats include roadsides, washes, and barren desert areas. The nearest recorded occurrence of this species is from the vicinity of Lake Mead approximately 17 mi (27 km) south of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species may occur on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

Gila Monster

The Gila monster is a desert lizard with a scattered distribution in the Mojave and Sonoran Deserts. This species inhabits areas of rocky, deeply incised topography, including canyon bottoms, rocky bajadas, washes, desert scrub, desert riparian areas, oak woodlands, and semi-arid grasslands. This species is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species may occur on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

American Peregrine Falcon

The American peregrine falcon occurs throughout the western United States in areas with high vertical cliffs and bluffs that overlook large open areas such as deserts, shrublands, and woodlands. Nests are usually constructed on rock outcrops and cliff faces. Foraging habitat varies from shrublands and wetlands to farmland and urban areas. Nearest occurrences of this species are in the vicinity of Las Vegas about 22 mi (35 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round foraging habitat for the American peregrine falcon may occur within the affected area of the Dry Lake SEZ. Most of the suitable habitat for this species in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable nesting habitat (rocky cliffs and outcrops) on the SEZ, but approximately 11,600 acres (47 km^2) of potentially suitable nesting habitat occurs in the area of indirect effects.

Crissal Thrasher

The crissal thrasher is a year-round resident in the deserts of southeastern California, southern Nevada, and western Arizona. The species is known to occur in Clark County, Nevada. This species nests and forages in dense thickets of mesquite or low trees in desert riparian and desert wash habitats. Individuals may occasionally occur in pinyon-juniper habitats. According to the SWReGAP habitat suitability model, potentially suitable year-round foraging and nesting habitat for the crissal thrasher may occur on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

Ferruginous Hawk

The ferruginous hawk occurs throughout the western United States. According to the SWReGAP habitat suitability model, potentially suitable winter foraging habitat for this species occurs only within the affected area of the Dry Lake SEZ. This species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. This species is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, suitable foraging habitat for the ferruginous hawk may occur on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

LeConte's Thrasher

The LeConte's thrasher is an uncommon year-round resident in Arizona, southern California, and southern Nevada. This species inhabits saltbush-cholla scrub communities in desert flats, dunes, or alluvial fans. This species is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable year-round foraging and nesting habitat for the LeConte's thrasher may occur on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1). The availability of nest sites within the affected area has not been determined, but desert scrub habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Phainopepla

The phainopepla occurs in the southwestern United States and Mexico in desert scrub, mesquite, and pinyon-juniper woodland communities, as well as desert riparian areas and orchards. Nests are typically constructed in trees and shrubs 3 to 45 ft (1 to 15 m) above the ground. This species is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable foraging or nesting habitat for this species may occur on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1). Potentially suitable nesting habitat in riparian areas in the Moapa Valley and other locations outside of the 5-mi (8-km) area surrounding the SEZ could be affected by groundwater withdrawals from the Garnet Valley regional groundwater system for construction and operations of solar energy facilities on the Dry Lake SEZ.

Western Burrowing Owl

The western burrowing owl forages in grasslands, shrublands, open disturbed areas, and nests in burrows usually constructed by mammals. This species occurs in Clark County, Nevada. According to the SWReGAP habitat suitability model for the western burrowing owl, potentially suitable year-round foraging and nesting habitat may occur in the affected area of the Dry Lake SEZ. Potentially suitable foraging and breeding habitat is expected to occur on the SEZ and in other portions of the affected area (Table 11.3.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Big Free-Tailed Bat

The big free-tailed bat is a year-round resident in the Dry Lake SEZ region, where it forages in a variety of habitats including coniferous forests and desert shrublands. The species roosts in rock crevices or in buildings. This species is known to occur in Clark County, Nevada. The SWReGAP habitat suitability model for the big free-tailed bat indicates that potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, but approximately 11,600 acres (47 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Brazilian Free-Tailed Bat

The Brazilian free-tailed bat is known from isolated locations throughout the southwestern United States and is considered to be a year-round resident in the Dry Lake SEZ region. The species roosts in buildings, caves, mines, and hollow trees. Foraging occurs in desert grasslands, old fields, savannas, shrublands, woodlands, and urban areas. This species is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, but approximately 11,600 acres (47 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is one of several subspecies of bighorn sheep known to occur in the southwestern United States. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats and may utilize desert valleys as corridors for travel between range habitats. This species is known to occur in the Sheep Mountains, approximately 5 mi (8 km) west of the Dry Lake SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ. However, information provided by the NDOW indicates that a portion of the year-round range for the Nelson's bighorn sheep intersects the SEZ. Despite the apparent lack of suitable habitat on the SEZ, this species may utilize portions of the Dry Lake SEZ as a migratory corridor between mountain ranges. Potentially suitable habitat for the Nelson's bighorn sheep occurs in the area of indirect effects (within 5 mi [8 km] outside the SEZ boundary [Table 11.3.12.1-1]).

Pallid Bat

The pallid bat is a large pale bat with large ears common in desert grasslands and shrublands in the southwestern United States. It roosts in caves, crevices, and mines. The species is a year-round resident throughout the Dry Lake SEZ region. The nearest recorded occurrence is from the Desert NWR, approximately 10 mi (16 km) west of the SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 11.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, but approximately 11,600 acres (47 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Silver-Haired Bat

According to the SWReGAP habitat suitability model, the silver-haired bat is a year-round resident in the Dry Lake SEZ region, where it occurs in montane forested habitats such as aspen, pinyon-juniper, and spruce communities. Foraging may occur in desert shrubland habitats. This species roosts in tree foliage, cavities, or under loose bark. The species is known to occur about 15 mi (24 km) northeast of the SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 11.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs, outcrops, and woodlands) on the SEZ, but approximately 11,600 acres (47 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Spotted Bat

According to the SWReGAP habitat suitability model, the spotted bat is a year-round resident in the Dry Lake SEZ region, where it occurs in a variety of forested and shrubland habitats. It roosts in caves and rock crevices. The species is known to occur in the vicinity of Las Vegas, Nevada, approximately 16 mi (26 km) southwest of the SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 11.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, but approximately 11,600 acres (47 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, the species forages year-round in a wide variety of desert and nondesert habitats in the Dry Lake SEZ region. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. The nearest recorded occurrence is from the Desert National Wildlife Range, approximately 10 mi (16 km) west of the SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 11.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, but approximately 11,600 acres (47 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Western Small-Footed Bat

The western small-footed bat is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, this species is a year-round resident in southern Nevada, where it occupies a wide variety of desert and nondesert habitats, including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, tunnels, beneath boulders or loose bark, buildings, and other man-made structures.

The nearest recorded occurrence is from the Desert NWR, approximately 10 mi (16 km) west of the SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 11.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, but approximately 11,600 acres (47 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Groundwater-Dependent Species

Four BLM-designated sensitive species not present within 5 mi (8 km) of the SEZ boundary do occur in areas dependent on groundwater discharge from the Garnet Valley regional groundwater system. Groundwater pumped from that system for solar energy development on the Dry Lake SEZ could affect aquatic and riparian habitats dependent on that groundwater. The following BLM-designated sensitive species inhabit areas dependent upon groundwater discharge in the SEZ region: Pahranagat Naucorid, Spring Mountains springsnail, southwestern toad, and phainopepla. The phainopepla is discussed above.

Pahranagat Naucorid. The Pahranagat naucorid is an aquatic insect known to occur only in the Muddy and White River Basins in southern Nevada. It inhabits warm quiet waters of spring-fed systems. The nearest recorded occurrence is from Big Muddy Spring, approximately 15 mi (24 km) north of the SEZ (Table 11.3.12.1-1).

Spring Mountains Springsnail. The Spring Mountains springsnail is endemic to freshwater springs of the Spring Mountains in southern Nevada. This species is known to occur in Clark County, Nevada. The amount of suitable habitat for this species in the SEZ region has not been determined (Table 11.3.12.1-1).

Southwestern Toad. The southwestern toad is an amphibian that occupies scattered habitats in Arizona, Nevada, New Mexico, and Utah. It occurs in woodlands and low-elevation riparian habitats in association with permanent or semipermanent water bodies. The nearest recorded occurrence of this species is from riparian areas along the Meadow Valley Wash, approximately 50 mi (80 km) north of the SEZ (Table 11.3.12.1-1).

11.3.12.1.5 State-Listed Species

There are 18 species listed by the State of Nevada that may occur in the Dry Lake SEZ affected area (Table 11.3.12.1-1). These state-listed species include the following: (1) plants: Las Vegas bearpoppy, sticky buckwheat, and threecorner milkvetch; (2) fish: Moapa dace, Moapa speckled dace, Moapa White River springfish, and Pahrump poolfish; (3) reptile: desert tortoise; (4) birds: American peregrine falcon, LeConte's thrasher, phainopepla, and southwestern willow flycatcher; and (5) mammals: Brazilian free-tailed bat, pallid bat, spotted bat, Townsend's big-eared bat, and western mastiff bat. All these species are protected in Nevada under NRS 501 or NRS 527. Of these species, the following four have not been previously described because of their status under the ESA or BLM: Las Vegas bearpoppy, sticky buckwheat, threecorner milkvetch, and western mastiff bat. These species as related to the SEZ are described in this section and in Table 11.3.12.1-1. Additional life history information for these species is provided in Appendix J.

Las Vegas Bearpoppy

The Las Vegas bearpoppy is a perennial forb known from only northwestern Arizona and southern Nevada. This species occurs in open, dry, spongy or powdery, or hummocked soils with high gypsum content, typically with well-developed soil crust, in areas of generally low relief with a sparse cover of other gypsum-tolerant species. This species is known to occur in the affected area of the Dry Lake SEZ, as near as 5 mi (8 km) south of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species occurs on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

Sticky Buckwheat

The sticky buckwheat is a perennial forb known only from Clark County, Nevada, and Mohave County, Arizona. This species is dependent on sand dune communities, where it occurs on deep, loose sandy soils in washes, flats, roadsides, steep aeolian slopes, and stabilized dunes at elevation between 1,200 and 2,200 ft (365 and 670 m). The nearest recorded occurrences of this species are approximately 21 mi (34 km) northeast of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species occurs on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

Threecorner Milkvetch

The threecorner milkvetch is a perennial forb known only from Clark County, Nevada, and Mohave County, Arizona. This species inhabits open, deep sandy soils, desert washes, or dunes, generally stabilized by vegetation and/or a gravel veneer at elevations between 1,500 and 2,500 ft (455 and 760 m). The threecorner milkvetch was identified in the scoping comments by the USFWS for the Dry Lake SEZ (Stout 2009); it is a USFWS species of concern. This species is known to occur in the affected area of the SEZ, about 1 mi (1.6 km) east of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species occurs on the SEZ and in portions of the area of indirect effects (Table 11.3.12.1-1).

Western Mastiff Bat

The western mastiff bat is an uncommon year-round resident in Arizona and southern California; the species is a summer resident in southern Nevada. The western mastiff bat occupies a wide variety of open semiarid habitats, including conifer and deciduous woodlands, shrublands, grasslands, chaparral, and urban areas. The species roosts in crevices in cliff faces, buildings, and tall trees. Nearest occurrences are from the vicinity of Las Vegas, approximately 20 mi southwest of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ. However, potentially suitable foraging or roosting habitat may occur in portions of the area of indirect effects (Table 11.3.12.1-1).

11.3.12.1.6 Rare Species

There are 60 rare species (i.e., state rank of S1 or S2 in Nevada or a species of concern by the USFWS or State of Nevada) that may be affected by solar energy development on the Dry Lake SEZ (Table 11.3.12.1-1). Of these species, 15 have not been discussed previously: (1) plants: Ackerman milkvetch, Antelope Canyon goldenbush, bearded screwmoss, beaver dam breadroot, Charleston goldenbush, dune sunflower, Littlefield milkvetch, Meadow Valley sandwort, mottled milkvetch, New York Mountains catseye, rough fringemoss, sweet moustache moss, and Virgin River thistle; and (2) invertebrates: red-tailed blazing star bee and Warm Springs naucorid. These species as related to the SEZ are described in Table 11.3.12.1-1.

11.3.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Dry Lake SEZ is presented in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 11.3.12.1, following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 11.3.12.3).

Solar energy development within the Dry Lake SEZ could affect a variety of habitats (see Sections 11.3.9 and 11.3.10). These impacts on habitats could in turn affect special status species dependent on those habitats. Based on NNHP records, the following 7 special status species are known to occur within 5 mi (8 km) of the SEZ boundary: Las Vegas bearpoppy, Meadow Valley sandwort, rosy two-tone beardtongue, threecorner milkvetch, yellow two-tone beardtongue, desert tortoise, and Nelson's bighorn sheep. There are 15 species that occur more than 5 mi (8 km) from the SEZ boundary in aquatic and riparian habitats (particularly within the Moapa Valley) that could be affected by groundwater withdrawals from the Garnet Valley regional groundwater system. These species include the following: (1) invertebrates: grated tryonia, Moapa pebblesnail, Moapa Valley pebblesnail, Moapa Warm Spring riffle beetle, Pahranagat naucorid, Spring Mountain springsnail, and Warm Springs naucorid; (2) fish: Moapa dace, Moapa speckled dace, Moapa White River springfish, Pahrump poolfish; (3) amphibian: southwestern toad; and (4) birds: phainopepla and southwestern willow flycatcher. Withdrawals from this regional groundwater system may be needed to support construction and operations of solar energy facilities on the Dry Lake SEZ, and these could in turn affect special status species with habitats dependent on groundwater. Other special status species may occur on the SEZ or within the affected area based on the presence of potentially suitable habitat. As discussed in Section 11.3.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 11.3.1.2, impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ, where ground-disturbing activities are expected to occur. Indirect impacts could result from groundwater withdrawals, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project developments are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., desert dunes, washes, and playas). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce groundwater consumption, runoff, sedimentation, spills, and fugitive dust.

11.3.12.2.1 Impacts on Species Listed under the ESA

In scoping comments on the proposed Dry Lake SEZ (Stout 2009), the USFWS expressed concern for impacts of project development within the SEZ on habitat for the Mojave population of the desert tortoise—a species listed as threatened under the ESA. In addition, three other species listed under the ESA may be affected by solar energy development (particularly groundwater withdrawals) on the Dry Lake SEZ: Moapa dace, Pahrump poolfish, and southwestern willow flycatcher. Impacts on these species are discussed below and summarized in Table 11.3.12.1-1.

Desert Tortoise

The Mojave population of the desert tortoise is listed as threatened under the ESA and the species is known to occur on the Dry Lake SEZ and within 5 mi (8 km) of the SEZ boundary (Figure 11.3.12.1-1). According to the USFWS (Stout 2009), desert tortoise populations have the potential to occur on the Dry Lake SEZ, and designated critical habitat for this species occurs in the Mormon Mesa critical habitat unit west of the SEZ (Figure 11.3.12.1-1). According to the SWReGAP habitat suitability model, approximately 15,000 acres (61 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations of solar energy development on the SEZ (Table 11.3.12.1-1). This direct effects area represents about 0.5% of available suitable habitat of the desert tortoise in the region. About 106,250 acres (430 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.8% of the available suitable habitat in the region (Table 11.3.12.1-1).

Based on estimates of desert tortoise density in the Mormon Mesa critical habitat unit adjacent to the western border of the SEZ, the USFWS estimated that full-scale solar energy development on the SEZ may directly affect up to 213 desert tortoises on the SEZ (USFWS 2009b). In addition to direct impacts, development on the SEZ could indirectly affect desert tortoises by fragmenting and degrading habitats between the Mormon Mesa critical habitat unit and other potentially suitable habitats in the vicinity of the Dry Lake SEZ. Fragmentation would be exacerbated by the installation of exclusionary fencing at the perimeter of the SEZ or individual project areas.

The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to reduce these impacts to negligible levels. Avoidance of all potentially suitable habitats for this species is not a feasible means of mitigating impacts, because these habitats (desert scrub) are widespread throughout the area of direct effects. Pre-disturbance surveys to determine the abundance of desert tortoises on the SEZ, to remove them from the affected area, and the implementation of a desert tortoise translocation plan and compensation plan could be used to reduce direct impacts.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions of incidental take statements) for the desert tortoise, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, translocation actions, and compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. Consultation with the NDOW should also occur to determine any state mitigation requirements.

There are inherent dangers to tortoises associated with their capture, handling, and translocation from the SEZ. These actions, if done improperly, can result in injury or death. To minimize these risks and as stated above, the desert tortoise translocation plan should be developed in consultation with the USFWS, and follow the *Guidelines for Handling Desert Tortoises During Construction Projects* (Desert Tortoise Council 1994) and other current translocation guidance provided by the USFWS. Consultation will identify potentially suitable recipient locations, density thresholds for tortoise populations in recipient locations, procedures for pre-disturbance clearance surveys and tortoise handling, as well as disease testing and post-translocation monitoring and reporting requirements. Despite some risk of mortality or decreased fitness, translocation is widely accepted as a useful strategy for the conservation of the desert tortoise (Field et al. 2007).

To offset impacts of solar development on the SEZ, compensatory mitigation may be needed to balance the acreage of habitat lost with acquisition of lands that would be improved and protected for desert tortoise populations (USFWS 1994). Compensation can be accomplished by improving the carrying capacity for the desert tortoise on the acquired lands. Other mitigation actions may include funding for the habitat enhancement of the desert tortoise on existing federal lands. Consultation with the USFWS and the NDOW would be necessary to determine the appropriate mitigation ratio to acquire, enhance, and preserve desert tortoise compensation lands.

Southwestern Willow Flycatcher

The southwestern willow flycatcher is listed as endangered under the ESA and is known to occur in the Moapa and Virgin River Valleys, approximately 20 mi (32 km) east of the Dry Lake SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, approximately 50 acres (0.2 km^2) of potentially suitable habitat occurs in the area of potential indirect effects within 5 mi (8 km) of the SEZ; this area represents less than 0.1% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

Riparian habitats in the vicinity of the Dry Lake SEZ (particularly within the Moapa Valley) that may provide suitable nesting and foraging habitat for the southwestern willow flycatcher may be affected by spring discharges associated with the Garnet Valley regional groundwater system. Withdrawals from this system for solar energy development on the Dry Lake SEZ could reduce groundwater discharge in these riparian areas, thus affecting habitat availability and quality for the southwestern willow flycatcher. As discussed for below for other groundwater-dependent species, impacts on this species could range from small to large depending upon the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals (Table 11.3.12.1-1). However, direct impacts on this species or its habitats are not likely to occur, because suitable habitats do not exist on the SEZ.

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system could reduce impacts on the southwestern willow flycatcher to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions of incidental take statements) for the southwestern willow flycatcher, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. Consultation with the NDOW should also occur to determine any state mitigation requirements.

Groundwater-Dependent Species

There are two species listed as threatened or endangered under the ESA that do not occur within 5 mi (8 km) of the SEZ boundary but do occur in areas dependent on groundwater discharge from the Garnet Valley basin: the Moapa dace (endangered) and the Pahrump poolfish (endangered). Groundwater withdrawn from this basin for construction and operations of solar energy facilities on the Dry Lake SEZ could affect aquatic and riparian habitats within the SEZ region, including habitat for the ESA-listed species dependent on groundwater. Such impacts would result from the lowering of the water table and alteration of hydrologic processes.

Impacts of groundwater depletion from solar energy development in the Dry Lake SEZ cannot be quantified without identification of the cumulative amount of groundwater withdrawals needed to support development on the SEZ. Consequently, the overall impact on these species could range from small to large and would depend in part on the solar energy technology deployed, the scale of development within the SEZ, the type of cooling system used, and the degree of influence water withdrawals in the SEZ on drawdown and surface water discharges in habitats supporting these species (Table 11.3.12.1-1).

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system would reduce impacts on the groundwater-dependent species to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified through application of a regional groundwater model.

11.3.12.2.2 Impacts on Species That Are Candidates for Listing under the ESA

In scoping comments on the proposed Dry Lake SEZ, the USFWS did not mention any species that are candidates for listing under the ESA that may be affected by solar energy development on the SEZ (Stout 2009). However, one ESA candidate species—the Las Vegas buckwheat—may occur within the affected area of the Dry Lake SEZ. This species is endemic to southern Nevada in the vicinity of Las Vegas. The Las Vegas buckwheat inhabits areas of gypsum soils, washes and drainages, or areas of low relief at elevations between 1,900 and 3,850 ft (580 and 1,175 m). The nearest recorded occurrence of this species is approximately 12 mi (19 km) southwest of the SEZ (Figure 11.3.12.1-1; Table 11.3.12.1-1). According to the

SWReGAP land cover model, approximately 425 acres (2 km^2) of potentially suitable desert wash habitat on the SEZ may be directly affected by construction and operations of solar energy development on the SEZ (Table 11.3.12.1-1). This direct effects area represents about 0.7% of available suitable habitat in the region. About 3,400 acres (14 km^2) of potentially suitable desert wash habitat occurs in the area of potential indirect effects; this area represents about 5.4% of the available potentially suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the Las Vegas buckwheat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat on the SEZ could reduce direct impacts on this species. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ could reduce impacts. If avoidance or minimization is not a feasible option, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development. The potential for impact and need for mitigation should be developed in coordination with the USFWS and the NDOW.

11.3.12.2.3 Impacts on Species That Are under Review for Listing under the ESA

There are six species currently under review for ESA listing that may be affected by solar energy development on the Dry Lake SEZ: the grated tryonia, Moapa pebblesnail, Moapa Valley pebblesnail, Moapa Warm Springs riffle beetle, Moapa speckled dace, and Moapa White River springfish. These species do not occur within 5 mi (8 km) of the SEZ boundary, but they do occur in the Muddy (Moapa) River system, which is located between 15 and 20 mi (24 and 32 km) north and northeast of the Dry Lake SEZ and is hydrologically connected to groundwater in the Garnet Valley. Groundwater from the Garnet Valley basin may be used to support solar energy development on the Dry Lake SEZ. Potential impacts on these species (which could range from small to large) and mitigations that could reduce those impacts would be similar to those described for groundwater-dependent ESA-listed species in Section 11.3.12.2.1. For all these species, potential impacts and mitigation options should be discussed with the USFWS prior to project development.

11.3.12.2.4 Impacts on BLM-Designated Sensitive Species

There are 30 BLM-designated sensitive species that are not previously discussed as listed under the ESA, candidates, or under review for ESA listing. Impacts on these BLM-designated sensitive species that may be affected by solar energy development on the Dry Lake SEZ are discussed below.

Alkali Mariposa Lily

The alkali mariposa lily is known to occur approximately 21 mi (34 km) southwest of the Dry Lake SEZ. According to the SWReGAP land cover model, potentially suitable alkaline seeps and springs do not occur on the SEZ. However, approximately 375 acres (2 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents 0.5% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the alkali mariposa lily from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because no potentially suitable habitat for this species occurs in the area of direct effects and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Gold Butte Moss

The Gold Butte moss is known to occur approximately 15 mi (24 km) southeast of the Dry Lake SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops do not occur on the SEZ. However, approximately 11,600 acres (47 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents 3.2% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the Gold Butte moss from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because no potentially suitable habitat for this species occurs in the area of direct effects and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Halfring Milkvetch

The halfring milkvetch is known to occur approximately 15 mi (24 km) northwest of the Dry Lake SEZ. According to the SWReGAP land cover model, approximately 425 acres (2 km^2) of potentially suitable desert wash habitat on the SEZ may be directly affected by construction and operations of solar energy development (Table 11.3.12.1-1). This direct effects area represents about 0.7% of available suitable habitat in the region. About 15,000 acres (61 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.6% of the available potentially suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the halfring milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat on the SEZ may reduce direct impacts to negligible levels. Impacts also could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not a feasible option, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or more of these options could be designed to completely offset the impacts of development.

Parish's Phacelia

The Parish's phacelia is known to occur approximately 19 mi (30 km) southwest of the Dry Lake SEZ. According to the SWReGAP land cover model, approximately 430 acres (2 km^2) of potentially suitable desert wash and playa habitats on the SEZ may be directly affected by construction and operations of solar energy development (Table 11.3.12.1-1). This direct effects area represents about 0.5% of available suitable habitat in the region. About 4,100 acres (17 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 5.0% of the available potentially suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the Parish's phacelia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash and playa habitats in the area of direct effects and the implementation of mitigation measures described previously for the halfring milkvetch could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Rosy Two-Tone Beardtongue

The rosy two-tone beardtongue is known to occur on the Dry Lake SEZ and in other portions of the affected area. According to the SWReGAP land cover model, approximately 550 acres (2 km^2) of potentially suitable habitat on the SEZ may be directly affected by construction and operations of solar energy development on the SEZ (Table 11.3.12.1-1). This direct effects area is mostly desert wash habitat and represents 0.1% of available suitable habitat in the region. About 15,500 acres (63 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.0% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the rosy two-tone beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat in the area of direct effects and the implementation of mitigation measures described previously for the halfring milkvetch could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Rough Dwarf Greasebush

The rough dwarf greasebush is known to occur approximately 17 mi (27 km) west of the Dry Lake SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliff and outcrop and pinyon-juniper habitats for this species do not occur on the SEZ. However, approximately 11,600 acres (47 km^2) of potentially suitable habitat occurs in the area of indirect effects (within 5 mi [8 km] of the SEZ); this area represents 1.9% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the rough dwarf greasebush from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because no potentially suitable habitat for this species occurs in the area of direct effects and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Sheep Fleabane

The sheep fleabane is known to occur approximately 17 mi (27 km) northwest of the Dry Lake SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliff and outcrop and pinyon-juniper habitats for this species do not occur on the SEZ. However, approximately 11,600 acres (47 km^2) of potentially suitable habitat occurs in the area of indirect effects within 5 mi (8 km) of the SEZ; this area represents 2.0% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the sheep fleabane from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because no potentially suitable habitat for this species occurs in the area of direct effects and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Sheep Mountain Milkvetch

The Sheep Mountain milkvetch is known to occur about 6 mi (10 km) northwest of the Dry Lake SEZ. According to the SWReGAP land cover model, approximately 12,500 acres (51 km^2) of potentially suitable habitat on the SEZ may be directly affected by construction and operations of solar energy development on the SEZ (Table 11.3.12.1-1). This direct effects area represents 0.3% of available suitable habitat in the region. About 131,100 acres (531 km^2) of potentially suitable grassland habitat occurs in the area of potential indirect effects; this area represents about 3.4% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the Sheep Mountain milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats (desert shrublands) is not a feasible means of mitigating impacts on this species, because potentially suitable shrubland habitat is widespread throughout the area of direct effects and in other portions of the SEZ region. For this and all other special status plant species, impacts may be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not feasible, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or more of these options could be designed to completely offset the impacts of development.

Silverleaf Sunray

The silverleaf sunray is known to occur about 15 mi (24 km) east of the Dry Lake SEZ. According to the SWReGAP land cover model, approximately 425 acres (2 km^2) of potentially suitable desert pavement habitat on the SEZ may be directly affected by construction and operations of solar energy development (Table 11.3.12.1-1). This direct effects area represents 0.5% of available suitable habitat in the region. About 1,265 acres (5 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 1.4% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the silverleaf sunray from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert pavement habitat on the SEZ and the implementation of mitigation measures described previously for the Sheep Mountain milkvetch could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White Bearpoppy

The white bearpoppy is known to occur approximately 19 mi (30 km) southwest of the Dry Lake SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliff and outcrops do not occur on the SEZ. However, approximately 11,600 acres (47 km^2) of potentially suitable habitat occurs in the area of indirect effects within 5 mi (8 km) of the SEZ; this area represents 3.2% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the white bearpoppy from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because no potentially suitable habitat for this species occurs in the area of direct effects and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Yellow Two-Tone Beardtongue

The yellow two-tone beardtongue is known to occur approximately 2 mi (3 km) west of the Dry Lake SEZ. According to the SWReGAP land cover model, approximately 550 acres (2 km^2) of potentially suitable habitat on the SEZ may be directly affected by construction and operations of solar energy development on the SEZ (Table 11.3.12.1-1). This direct effects area is mostly desert wash habitat and represents 0.1% of available suitable habitat in the region. About 15,500 acres (63 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.0% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the yellow two-tone beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat in the area of direct effects and the implementation of mitigation measures described previously for the halfring milkvetch could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Gypsum Bee

The Mojave gypsum bee is known to occur about 8 mi (13 km) south of the Dry Lake SEZ. According to the SWReGAP land cover model, approximately 12,500 acres (51 km^2) of potentially suitable habitat on the SEZ may be directly affected by construction and operations of solar energy development (Table 11.3.12.1-1). This direct effects area represents 0.3% of available suitable habitat in the region. About 127,300 acres (515 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.3% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the Mojave gypsum bee from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats (desert shrublands and washes) is not a feasible means of mitigating impacts on this species, because potentially suitable shrubland habitat is widespread throughout the area of direct effects and in other portions of the SEZ region. Direct impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or more of these options could be designed to completely offset the impacts of development.

Mojave Poppy Bee

The Mojave poppy bee is known to occur about 17 mi (27 km) south of the Dry Lake SEZ. According to the SWReGAP land cover model, approximately 550 acres (2 km^2) of potentially suitable habitat on the SEZ may be directly affected by construction and operations of solar energy development (Table 11.3.12.1-1). This direct effects area is mostly desert wash habitat and represents 0.1% of available suitable habitat in the region. About 13,300 acres (54 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.2% of the available suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the Mojave poppy bee from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat on the SEZ could reduce direct impacts on this species. Direct impacts could also be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or more of these options could be designed to completely offset the impacts of development.

Gila Monster

The Gila monster is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, approximately 14,700 acres (59 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents about 0.5% of potentially suitable habitat in the SEZ region. About 124,100 acres (502 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.9% of the potentially suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the Gila monster from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats (desert scrub) is not a feasible means of mitigating impacts on this species, because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region. Direct impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not feasible, individuals could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or more of these options could be designed to completely offset the impacts of development.

American Peregrine Falcon

The American peregrine falcon is a year-round resident in the Dry Lake SEZ region and is known to occur about 22 mi (35 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, approximately 14,900 acres (60 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 137,700 acres (557 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.8% of the potentially suitable habitat in the SEZ region (Table 11.3.12.1-1). Most of this area could serve as foraging habitat (open shrublands). On the basis of an evaluation of SWReGAP land cover data, potentially suitable nest sites for this species (rocky cliffs and outcrops) do not occur on the SEZ, but approximately 11,600 acres (47 km^2) of this habitat may occur in the area of indirect effects.

The overall impact on the American peregrine falcon from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because direct effects would occur only on potentially suitable foraging habitat and the amount of this habitat in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible means of mitigating impacts on this species, because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

Crissal Thrasher

The crissal thrasher is a year-round resident in the Dry Lake SEZ region and is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, approximately 350 acres (1.5 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 3,440 acres (14 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 4.2% of the potentially suitable habitat in the SEZ region (Table 11.3.12.1-1). This potentially suitable habitat on the SEZ and within the area of indirect effects may represent potentially suitable nesting or foraging habitat for this species.

The overall impact on the crissal thrasher from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable habitat in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoiding or minimizing disturbance to desert wash and riparian habitat on the SEZ could reduce impacts on the crissal thrasher. In addition, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats (especially nests) in the area of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development.

Ferruginous Hawk

The ferruginous hawk is a winter resident in the Dry Lake SEZ region and is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, approximately 340 acres (1.5 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.1% of potentially suitable habitat in the SEZ region. About 15,150 acres (61 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.6% of the potentially suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because direct effects would occur only on potentially suitable foraging habitat and the amount of this habitat in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible means of mitigating impacts on this species, because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

LeConte's Thrasher

The LeConte's thrasher is a year-round resident in the Dry Lake SEZ region and is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, approximately 15,000 acres (61 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 127,500 acres (516 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.3% of the potentially suitable habitat in the SEZ region (Table 11.3.12.1-1). This potentially suitable habitat on the SEZ and within the area of indirect effects may represent potentially suitable nesting or foraging habitat for this species.

The overall impact on the LeConte's thrasher from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable habitat in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats (desert scrub) is not a feasible means of mitigating impacts on this species, because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region. However, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats (especially nests) in the area of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Phainopepla

The phainopepla is a year-round resident in the Dry Lake SEZ region and is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, approximately 340 acres (1.5 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations of solar energy development (Table 11.3.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat of the phainopepla in the SEZ region. About 9,850 acres (40 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 0.9% of the available suitable habitat in the region (Table 11.3.12.1-1).

Riparian habitats in the Moapa Valley that may provide suitable nesting and foraging habitat for the phainopepla may be affected by spring discharges associated with the Garnet Valley regional groundwater basin. Solar energy development on the SEZ may require water from the same regional groundwater basin that supports these riparian habitats. As discussed for groundwater-dependent species in Section 11.3.12.2.1, impacts on this species could range from small to large depending upon the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals (Table 11.3.12.1-1).

The implementation of programmatic design features and complete avoidance or limitation of groundwater withdrawals from the regional groundwater system would reduce impacts on the phainopepla to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified. In addition, avoiding or minimizing disturbance to riparian areas on the SEZ would reduce direct impacts on the phainopepla. Impacts also could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats (especially nests) in the area of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Western Burrowing Owl

The western burrowing owl is a year-round resident in the Dry Lake SEZ region and is known to occur in Clark County, Nevada. According to the SWReGAP habitat suitability model, approximately 14,750 acres (60 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 125,500 acres (508 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.1% of the potentially suitable habitat in the SEZ region (Table 11.3.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting in the affected area has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the western burrowing owl, because potentially suitable desert shrub habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. Impacts on the western burrowing owl could be reduced to negligible levels by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat in the area of direct effects.

Big Free-Tailed Bat

The big free-tailed bat is a year-round resident within the Dry Lake SEZ region, and potentially suitable habitat may occur in the affected area of the SEZ. According to the SWReGAP habitat suitability model, approximately 15,600 acres (63 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 141,575 acres (573 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.5% of the available suitable habitat in the region (Table 11.3.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (rocky cliffs and outcrops) does not occur on the SEZ, but about

11,600 acres (47 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the big free-tailed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitat is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Brazilian Free-Tailed Bat

The Brazilian free-tailed bat is a year-round resident within the Dry Lake SEZ region and potentially suitable habitat may occur in the affected area of the SEZ. According to the SWReGAP habitat suitability model, approximately 15,200 acres (62 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 133,500 acres (540 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.6% of the available suitable habitat in the region (Table 11.3.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (rocky cliffs and outcrops) does not occur on the SEZ, but about 11,600 acres (47 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the Brazilian free-tailed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is known to occur within the affected area of the Dry Lake SEZ (Sheep Mountains), but suitable range habitat is not expected to occur on the SEZ. However, approximately 8,400 acres (34 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.4% of the available suitable habitat in the region (Table 11.3.12.1-1). Despite the apparent lack of suitable habitat on the SEZ, the Nelson's bighorn sheep may utilize portions of the Dry Lake SEZ as a migratory corridor between range habitats.

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because no potentially suitable habitat for this species has been identified in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features it expected to be sufficient to reduce indirect impacts on this species to negligible levels. Impacts on the Nelson's bighorn sheep could be further reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to important movement corridors within the area of direct effects.

Pallid Bat

The pallid bat is a year-round resident within the Dry Lake SEZ region, and potentially suitable habitat may occur in the affected area of the SEZ. According to the SWReGAP habitat suitability model, approximately 15,100 acres (62 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 134,100 acres (543 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.6% of the available suitable habitat in the region (Table 11.3.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (rocky cliffs and outcrops) does not occur on the SEZ, but about 11,600 acres (47 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the pallid bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Silver-Haired Bat

The silver-haired bat is a year-round resident within the Dry Lake SEZ region, and potentially suitable habitat may occur in the affected area of the SEZ. According to the SWReGAP habitat suitability model, approximately 14,800 acres (62 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 130,100 acres (526 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.6% of the available suitable habitat in the region (Table 11.3.12.1-1).

Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (rocky cliffs, outcrops, and woodland habitat) does not occur on the SEZ, but about 11,600 acres (47 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the silver-haired bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Spotted Bat

The spotted bat is a year-round resident within the Dry Lake SEZ region, and potentially suitable habitat may occur in the affected area of the SEZ. According to the SWReGAP habitat suitability model, approximately 15,000 acres (61 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.3% of potentially suitable habitat in the SEZ region. About 139,300 acres (564 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 3.2% of the available suitable habitat in the region (Table 11.3.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (rocky cliffs and outcrops) does not occur on the SEZ, but about 11,600 acres (47 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident within the Dry Lake SEZ region, and potentially suitable habitat may occur in the affected area. According to the SWReGAP habitat suitability model, approximately 14,900 acres (60 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 131,100 acres (530 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.4% of the available suitable foraging habitat in the region (Table 11.3.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (rocky cliffs and outcrops) does not occur on the SEZ, but about 11,600 acres (47 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Western Small-Footed Myotis

The western small-footed myotis is a year-round resident within the Dry Lake SEZ region, and potentially suitable habitat may occur in the affected area. According to the SWReGAP habitat suitability model, approximately 14,900 acres (60 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.3.12.1-1). This direct effects area represents 0.3% of potentially suitable habitat in the SEZ region. About 137,600 acres (557 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.2% of the available suitable foraging habitat in the region (Table 11.3.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (rocky cliffs and outcrops) does not occur on the SEZ, but about 11,600 acres (47 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the western small-footed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Groundwater-Dependent Species

There are four BLM-designated sensitive species that may be affected by solar energy development on the Dry Lake SEZ: the Pahranagat naucorid, Spring Mountains springsnail, southwestern toad, and phainopepla. These species do not occur within 5 mi (8 km) of the SEZ boundary, but they do occur in areas dependent on groundwater discharge from the Garnet Valley groundwater basin, from which groundwater may also be used to support solar energy development on the Dry Lake SEZ (Table 11.3.12.1-1). Potential impacts on these species (which could range from small to large) and mitigations that could reduce those impacts would be similar to those described for groundwater-dependent ESA-listed species in Section 11.3.12.2.1. For all these species, potential impacts and mitigation options should be discussed with the USFWS prior to project development. Additional impacts and mitigation for the phainopepla are discussed above.

11.3.12.2.5 Impacts on State-Listed Species

There are 18 species listed by the State of Nevada that may be affected by solar energy development on the Dry Lake SEZ (Table 11.3.12.1-1). Of these species, impacts on the following four state-listed species have not been previously described: Las Vegas bearpoppy, sticky buckwheat, threecorner milkvetch, and western mastiff bat. Impacts on each of these four species are discussed below and summarized in Table 11.3.12.1-1.

Las Vegas Bearpoppy

The Las Vegas bearpoppy is known to occur within the affected area of the Dry Lake SEZ, approximately 5 mi (8 km) south of the SEZ. According to the SWReGAP land cover model, approximately 425 acres (2 km^2) of potentially suitable desert pavement habitat on the SEZ may be directly affected by construction and operations of solar energy development (Table 11.3.12.1-1). This direct effects area represents about 0.7% of available suitable habitat in the region. About 1,250 acres (5 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 1.9% of the available potentially suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the Las Vegas bearpoppy from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert pavement habitat on the SEZ and the implementation of mitigation measures described previously for the Sheep Mountain milkvetch (Section 11.3.12.2.4) could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Sticky Buckwheat

The sticky buckwheat is known to occur approximately 21 mi (34 km) northeast of the Dry Lake SEZ. According to the SWReGAP land cover model, approximately 125 acres (0.5 km^2) of potentially suitable disturbed roadside habitat on the SEZ may be directly affected by construction and operations of solar energy development (Table 11.3.12.1-1). This direct effects area represents about 0.1% of available suitable habitat in the region. About 440 acres (2 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 0.4% of the available potentially suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the sticky buckwheat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels. In addition, the implementation of mitigation measures described previously for the Sheep Mountain milkvetch (Section 11.3.12.2.4) could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Threecorner Milkvetch

The threecorner milkvetch is known to occur within the affected area of the Dry Lake SEZ, approximately 1 mi (1.6 km) east of the SEZ. According to the SWReGAP land cover model, approximately 850 acres (3.5 km^2) of potentially suitable desert wash pavement habitats on the SEZ may be directly affected by construction and operations of solar energy development (Table 11.3.12.1-1). This direct effects area represents about 0.8% of available suitable habitat in the region. About 4,700 acres (19 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 4.4% of the available potentially suitable habitat in the SEZ region (Table 11.3.12.1-1).

The overall impact on the threecorner milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash and pavement habitats on the SEZ and the implementation of mitigation measures described previously for the Sheep Mountain milkvetch (Section 11.3.12.2.4) could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Western Mastiff Bat

The western mastiff bat is a summer resident in the Dry Lake SEZ region and is known to occur approximately 20 mi (32 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ (Table 11.3.12.1-1). However, about 200 acres (1 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.2% of the available suitable habitat in the region (Table 11.3.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland.

The overall impact on the western mastiff bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake SEZ is considered small, because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

11.3.12.2.6 Impacts on Rare Species

There are 60 rare species (i.e., state rank of S1 or S2 in Nevada or a species of concern by the USFWS or State of Nevada) that may be affected by solar energy development on the Dry Lake SEZ (Table 11.3.12.1-1). Impacts on 15 rare species have not been discussed previously: (1) plants: Ackerman milkvetch, Antelope Canyon goldenbush, bearded screwmoss, beaver dam breadroot, Charleston goldenbush, dune sunflower, Littlefield milkvetch, Meadow Valley sandwort, mottled milkvetch, New York Mountains catseye, rough fringemoss, sweet moustache moss, and Virgin River thistle; and (2) invertebrates: red-tailed blazing star bee and Warm Springs naucorid. Impacts on and potential mitigation for these species are presented in Table 11.3.12.1-1.

11.3.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when specific project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 11.3.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Consultation with the USFWS and the NDOW should be conducted to address the potential for impacts on the following four species currently listed as threatened or endangered under the ESA: Moapa dace, Pahrump poolfish, desert tortoise, and southwestern willow flycatcher. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Coordination with the USFWS and NDOW should be conducted for the following seven species that are candidates or under review for listing under the ESA that may be affected by solar energy development on the SEZ: Las Vegas buckwheat, grated tryonia, Moapa pebblesnail, Moapa Valley pebblesnail, Moapa Warm Spring riffle beetle, Moapa speckled dace, and Moapa White River springfish. Coordination would identify an appropriate survey protocol and mitigation requirements, which may include avoidance, minimization, translocation, or compensation.

- Avoiding or minimizing disturbance to desert wash habitat on the SEZ could reduce or eliminate impacts on the following 10 special status species: beaver dam breadroot, dune sunflower, halfring milkvetch, Las Vegas buckwheat, Littlefield milkvetch, Parish's phacelia, rosy two-tone beardtongue, sticky buckwheat, threecorner milkvetch, and yellow two-tone beardtongue.

- Avoiding or minimizing disturbance to desert pavement habitat on the SEZ could reduce or eliminate impacts on the following six special status species: dune sunflower, Las Vegas bearpoppy, mottled milkvetch, silverleaf sunray, threecorner milkvetch, and red-tail blazing star bee.

- Avoiding or minimizing disturbance to playa habitat on the SEZ could reduce or eliminate impacts on the following two special status species: Littlefield milkvetch and Parish's phacelia.

- Avoidance or minimization of groundwater withdrawals from the Garnet Valley basin could reduce or eliminate impacts on the following 13 groundwater-dependent special status species: grated tryonia, Moapa pebblesnail, Moapa Valley pebblesnail, Moapa Warm Springs riffle beetle, Spring Mountains springsnail, Warm Springs naucorid, Moapa dace, Moapa speckled dace, Moapa White River springfish, Pahrump poolfish, southwestern toad, phainopepla, and southwestern willow flycatcher.

- Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized, by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and the NDOW.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species could be reduced.

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11.3.13 Air Quality and Climate

11.3.13.1 Affected Environment

11.3.13.1.1 Climate

The proposed Dry Lake SEZ is located in the north-central portion of Clark County in southernmost Nevada. Nevada lies on the eastern lee side of the Sierra Nevada Range, which markedly influences the climate of the state under the prevailing westerlies (NCDC 2010a). In addition, the mountains east and north of Nevada act as barriers to the cold arctic air masses, and thus long periods of extremely cold weather are uncommon. The SEZ lies at an average elevation of about 2,110 ft (643 m) in the northeastern portion of the Mojave Desert, which has an extremely arid climate marked by mild winters and hot summers, large daily temperature swings due to dry air, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Las Vegas McCarran International Airport, about 25 mi (40 km) southwest of the Dry Lake SEZ boundary, and at the Valley of Fire State Park, about 18 mi (29 km) east, are summarized below.

A wind rose from the Las Vegas McCarran International Airport, based on data collected 33 ft (10 m) above the ground over the 5-year period 2005 to 2009, is presented in Figure 11.3.13.1-1 (NCDC 2010b). During this period, the annual average wind speed at the airport was about 7.1 mph (3.2 m/s); the prevailing wind direction was from the south-southwest (about 15.3% of the time) and secondarily from the southwest (about 12.7% of the time). South-southwesterly winds occurred more frequently throughout the year. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 18.3% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were the highest in spring at 8.6 mph (3.8 m/s); lower in summer and fall at 7.6 mph (3.4 m/s) and 6.2 mph (2.8 m/s), respectively; and lowest in winter at 6.0 mph (2.7 m/s).

In southern Nevada, the summers are long and hot, while the winters are short and mild (NCDC 2010a). For the period 1972 to 2010, the annual average temperature at the Valley of Fire State Park was 69.2°F (20.7°C) (WRCC 2010c). December was the coldest month, with an average minimum temperature of 38.2°F (3.4°C), and July was the warmest, with an average maximum of 105.6°F (40.9°C). In the summer, daytime maximum temperatures over 100°F (37.8°C) are common, and minimums are in the 70s. The minimum temperatures recorded were below freezing (≤32°F [0°C]) during the colder months (from November to March, with a peak of about 4 days in January and December), but subzero temperatures were never recorded. During the same period, the highest temperature, 117°F (47.2°C), was reached in July 1973 and the lowest, 12°F (−11.1°C), in December 1990. In a typical year, about 140 days had a maximum temperature of at least 90°F (32.2°C), while about 11 days had minimum temperatures at or below freezing.

Because of the rain shadow effect caused by the Sierra Nevada Range to the west, very little precipitation occurs in Nevada (NCDC 2010a). For the 1972 to 2010 period, annual precipitation at the Valley of Fire State Park averaged about 6.45 in. (16.4 cm) (WRCC 2010c).

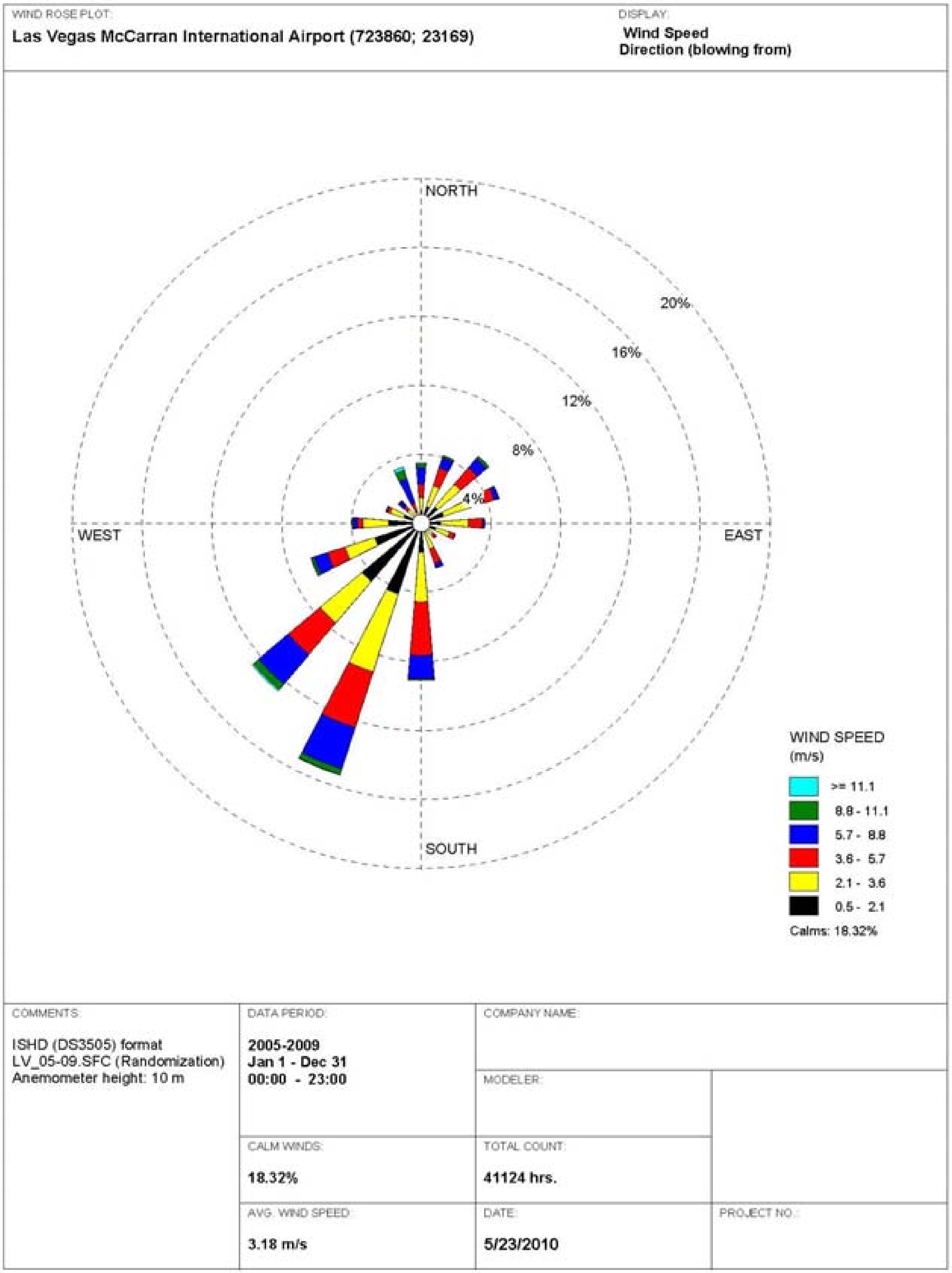

FIGURE 11.3.13.1-1 Wind Rose at 33 ft (10 m) at the Las Vegas McCarran International Airport, Nevada, 2005 to 2009 (Source: NCDC 2010b)

On average, 30 days a year have measurable precipitation (0.01 in. [0.025 cm] or higher). Seasonally, precipitation is the highest during winter (about 40% of the annual total) and evenly distributed among the other three seasons. Snow occurs mostly from November to February but is a rarity in the area. The annual average snowfall at the Valley of Fire State Park was about 0.3 in. (0.8 cm), with the highest monthly snowfall of 3.0 in. (7.6 cm) in February 1987 and December 1998.

The proposed Dry Lake SEZ is far from major water bodies (more than 260 mi [418 km] to the Pacific Ocean). Severe weather events, such as severe thunderstorms and tornadoes are rare in Clark County, which encompasses the Dry Lake SEZ (NCDC 2010c).

In Nevada, flooding could occur from melting of heavy snowpack. On occasion, heavy summer thunderstorms also cause flooding of local streams, usually in sparsely populated mountainous areas, but they are seldom destructive (NCDC 2010a). Since 1993, 99 floods (88 flash floods, 9 urban/small stream floods, and 2 floods), most of which occurred from July through September (NCDC 2010c), were reported in Clark County. These floods caused 4 deaths and 12 injuries, and did cause significant property damage. In January 2005, heavy rain and rapid snow melt caused extensive flooding in southern Lincoln and northeast Clark Counties that brought about significant property damage.

In Clark County, 53 hail events in total have been reported since 1961, some of which caused property damage. Hail measuring 1.75 in. (4.4 cm) in diameter was reported more than 10 times. Fifty-two high wind events have been reported in Clark County since 1995, and those up to a maximum wind speed of 81 mph (36 m/s) have occurred more frequently in March and April, causing no death, 1 injury, and some property and crop damage (NCDC 2010c). In Clark County, 139 thunderstorm wind events have been reported since 1959, and those up to a maximum wind speed of 116 mph (52 m/s) have occurred primarily from July through September, causing 3 deaths, 12 injuries, and significant property damage (NCDC 2010c).

In Clark County, one dust storm event was reported in 2002 (NCDC 2010c). However, the ground surface of the SEZ is covered primarily with gravelly clay loam to gravelly sandy loam (and very stony loam), both of which have relatively moderate dust storm potential. High winds can trigger large amounts of blowing dust in areas of Clark County that have dry and loose soils with sparse vegetation. Dust storms can deteriorate air quality and visibility and may have adverse effects on health, particularly for people with asthma or other respiratory problems. Clark County experienced between 2 and 4 high-wind events per year during the 2002 to 2004 period when dust levels exceeded federal health standards (Clark County DAQEM 2005). In Clark County, dust storm events with unhealthy PM_{10} levels are likely to occur during late winter and early spring.

Hurricanes and tropical storms formed off the coast of Central America and Mexico but weaken over the cold waters off the California coast. Accordingly, hurricanes never hit Nevada: Historically, two tropical depressions have passed within 100 mi (160 km) of the proposed Dry Lake SEZ (CSC 2010). In the period from 1950 to July 2010, a total of 11 tornadoes (0.2 per year) were reported in Clark County (NCDC 2010c). Most tornadoes occurring in Clark County were relatively weak (i.e., one was F [uncategorized[5]], six were F0, and four were F1 on the Fujita tornado scale), and these tornadoes caused no deaths or injuries, although they did cause some property damage. Most of these tornadoes occurred far from the SEZ; the nearest one hit about 11 mi (18 km) southeast of the SEZ.

TABLE 11.3.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Clark County, Nevada, Encompassing the Proposed Dry Lake SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)[c]
SO_2	50,105
NO_x	79,225
CO	355,591
VOCs	254,008
PM_{10}	55,787
$PM_{2.5}$	14,131

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

[c] To convert tons to kilograms, multiply by 907.

Source: WRAP (2009).

11.3.13.1.2 Existing Air Emissions

Clark County has many industrial emission sources over the county, and several coal- and natural gas–fired power plants release substantial amounts of SO_2 and/or NO_x emissions. Several emission sources, such as natural gas–fired power plants, are located in and around the southern portion of the proposed Dry Lake SEZ. Several major roads, such as I-15, I-215, I-515, U.S. 93, U.S. 95, and several state routes, exist in Clark County. Thus, onroad mobile source emissions are substantial, especially CO emissions in Clark County. Data on annual emissions of criteria pollutants and VOCs in Clark County are presented in Table 11.3.13.1-1 for 2002 (WRAP 2009). Emissions data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, point sources were primary contributors to total emissions of SO_2 (about 85%) and NO_x (about 48%). Onroad sources were primary contributors to CO emissions (about 51%) and secondary contributors to NO_x (about 28%), while nonroad sources were secondary contributors to CO emissions (about 34%). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions accounted for most of VOC emissions (about 83%). Area sources were primary contributors to PM_{10} and $PM_{2.5}$ emissions (about 88% and 80%, respectively). In Clark County, fire emissions sources were minor contributors to criteria pollutants and VOCs.

In 2005, Nevada produced about 56.3 MMt of *gross*[6] carbon dioxide equivalent (CO_2e)[7] emissions, which is about 0.8% of total U.S. GHG emissions in that year (NDEP 2008). Gross

[5] Not categorized by the Fujita tornado scale because damage level was not reported.

[6] Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

[7] A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

GHG emissions in Nevada increased by about 65% from 1990 to 2005 because of Nevada's rapid population growth, compared to 16.3% growth in U.S. GHG emissions during the same period. In 2005, electrical generation (48%) and transportation (30%) were the primary contributors to gross GHG emission sources in Nevada. Fuel use in the residential, commercial, and industrial sectors combined accounted for about 12% of total state emissions. Nevada's *net* emissions were about 51.3 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in Nevada. Its estimate of CO_2 emissions from fossil fuel combustion was 49.6 MMt, which was comparable to the state's estimate. Electric power generation and transportation accounted for about 52.7% and 33.6% of the CO_2 emissions total, respectively, while the residential, commercial, and industrial sectors accounted for the remainder (about 13.7%).

11.3.13.1.3 Air Quality

The EPA set NAAQS for six criteria pollutants (EPA 2010a): SO_2, NO_2, CO, O_3, PM (PM_{10} and $PM_{2.5}$), and Pb. Nevada has its own State Ambient Air Quality Standards (SAAQS), which are similar to the NAAQS but with some differences (NAC 445B.22097). In addition, Nevada has set standards for 1-hour H_2S, which are not addressed by the NAAQS. The NAAQS and Nevada SAAQS for criteria pollutants are presented in Table 11.3.13.1-2.

Clark County is located administratively within the Las Vegas Intrastate Air Quality Control Region (Title 40, Part 81, Section 80 of the *Code of Federal Regulations* [40 CFR 81.80]). Clark County has experienced air quality problems, notably CO, ozone, and PM_{10} pollution due to rapid population and industrial growth along with long-range transport of air pollutants from the South Coast Air Basin, including Los Angeles. Currently, portions of Clark County are designated as being in nonattainment for CO, 8-hour ozone, and PM_{10} (40 CFR 81.329). The Dry Lake SEZ is located outside the CO and PM_{10} nonattainment areas but within the 8-hour ozone nonattainment area. Accordingly, the area surrounding the proposed Dry Lake SEZ is in attainment for all six criteria pollutants except 8-hour ozone.

As briefly discussed in Section 11.3.13.1.1, Clark County frequently experiences natural dust storm events, which cause PM_{10} exceedances of the NAAQS. Western states frequently plagued by natural dust storms requested that the EPA develop a commonsense policy, called the Natural Events Policy (NEP), to address high PM_{10} pollution caused by natural events. Under the NEP, state and local governments are required to develop a Natural Events Action Plan (NEAP), which provides alternatives for controlling significant sources of human-caused windblown dust, with the understanding that dust storms sometimes override the best dust control efforts. Clark County prepared an NEAP for review and comment by the EPA, and should reevaluate the NEAP every 5 years at a minimum and make appropriate changes to the plan (Clark County DAQEM 2005). The NEAP is applicable to the Las Vegas Valley, currently designated as a PM_{10} nonattainment area, and to the Apex Valley, which encompasses the Dry Lake SEZ.

Ambient concentration data representative of the proposed Dry Lake SEZ for all criteria pollutants except Pb are available for Clark County. To characterize ambient air quality around

TABLE 11.3.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed Dry Lake SEZ in Clark County, Nevada, 2004 to 2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	SAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	75 ppb[d]	NA[e]	NA	NA
	3-hour	0.5 ppm	0.5 ppm	0.009 ppm (1.8%)	Las Vegas, 2005
	24-hour	0.14 ppm	0.14 ppm	0.008 ppm (5.7%)	Las Vegas, 2005
	Annual	0.030 ppm	0.030 ppm	0.006 ppm (20%)	Las Vegas, 2005
NO_2	1-hour	100 ppb[f]	NA	NA	NA
	Annual	0.053 ppm	0.053 ppm	0.006 ppm (11%)	North Las Vegas, 2007
CO	1-hour	35 ppm	35 ppm	5.7 ppm (16%)	Las Vegas, 2004
	8-hour	9 ppm	9 ppm	3.9 ppm (43%)	Las Vegas, 2005
O_3	1-hour	0.12 ppm[g]	0.12 ppm	0.104 ppm (87%)	North Las Vegas, 2005
	8-hour	0.075 ppm	NA	0.081 ppm (108%)	North Las Vegas, 2007
PM_{10}	24-hour	150 $\mu g/m^3$	150 $\mu g/m^3$	97 $\mu g/m^3$ (65%)	North Las Vegas, 2006
	Annual	NA	50 $\mu g/m^3$	22 $\mu g/m^3$ (44%)	North Las Vegas, 2008
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	NA	10.2 $\mu g/m^3$ (29%)	North Las Vegas, 2005
	Annual	15.0 $\mu g/m^3$	NA	4.1 $\mu g/m^3$ (27%)	North Las Vegas, 2005
Pb	Calendar quarter	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	NA	NA
	Rolling 3-month	0.15 $\mu g/m^3$ [h]	NA	NA	NA

a Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 µm; PM_{10} = particulate matter with a diameter of ≤10 µm; and SO_2 = sulfur dioxide.

b Monitored concentrations are the second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5}$ and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

c Values in parentheses are background concentration levels as a percentage of NAAQS or SAAQS, respectively. Calculation of 1-hour SO_2 and NO_2 to NAAQS was not made, because no measurement data based on new NAAQS are available.

d Effective August 23, 2010.

e NA = not applicable or not available.

f Effective April 12, 2010.

g The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

h Effective January 12, 2009.

Sources: EPA (2010a,b); NAC 445B.22097.

the SEZ, ambient concentrations of NO_2, O_3, PM_{10}, and $PM_{2.5}$ from the Apex station, which is located just outside the southern Dry Lake SEZ boundary, are presented. CO concentrations at the East Tonopah station in Las Vegas, which is the farthest downwind station of Las Vegas, were presented. The East Sahara Avenue station, which is on the outskirts of Las Vegas, has only one SO_2 monitor in the area. No Pb measurements have been made in the state of Nevada because of low Pb concentration levels after the phaseout of leaded gasoline. The highest background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 11.3.13.1-2 (EPA 2010b). Other than O_3, which approaches the 1-hour standard but exceeds the 8-hour NAAQS, the highest concentration levels were lower than their respective standards (up to 65%).

The PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, the EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. Several Class I areas are located in Arizona and Utah; one is within 62 mi (100 km) of the proposed SEZ. The nearest is Grand Canyon NP in Arizona (40 CFR 81.403), about 53 mi (85 km) east-southeast of the Dry Lake SEZ. This Class I area is not located downwind of prevailing winds at the Dry Lake SEZ (Figure 11.3.13.1-1). The next nearest Class I area includes Zion NP in Utah, which is located about 108 mi (173 km) northeast of the SEZ.

11.3.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low levels of emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using HTFs, fuel could be used to maintain the temperature of the HTFs for more efficient daily start up.) Conversely, use of solar facilities to generate electricity could displace air emissions that would otherwise be released from fossil fuel power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Dry Lake SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.3.13.3 below identifies SEZ-specific design features of particular relevance to the Dry Lake SEZ.

11.3.13.2.1 Construction

The Dry Lake SEZ site has a relatively flat terrain; thus, only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required.

However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[8] However, no receptors were modeled for PSD analysis at the nearest Class I area, Grand Canyon NP in Arizona, because it is about 53 mi (85 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the Grand Canyon NP were selected as surrogates for the PSD analysis. For the Dry Lake SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions of 3,000 acres (12.1 km^2) each and 6,000 acres (24.3 km^2) total in the southern portion of the SEZ, close to the nearest residences near North Las Vegas,

- Surface hourly meteorological data from the Las Vegas McCarran International Airport and upper air sounding data from the Mercury/Desert Rock Airport for the 2005 to 2009 period, and

- A regularly spaced receptor grid over a modeling domain of 62 × 62 mi (100 km × 100 km) centered on the proposed SEZ, and additional discrete receptors at the SEZ boundaries.

Results

The modeling results for concentration increments and total concentrations (modeled plus background concentrations) for both PM_{10} and $PM_{2.5}$ that would result from construction-related fugitive emissions are summarized in Table 11.3.13.2-1. Maximum 24-hour PM_{10} concentration

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8 To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/SAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

TABLE 11.3.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Dry Lake SEZ

			Concentration ($\mu g/m^3$)				Percentage of NAAQS/SAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ SAAQS	Increment	Total
PM_{10}	24 hours	H6H	579	97.0	676	150	386	450
	Annual	–[d]	88.4	22.0	110	50	177	221
$PM_{2.5}$	24 hours	H8H	38.0	10.2	48.2	35	109	138
	Annual	–	8.8	4.1	12.9	15.0	59	86

a $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

b Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

c See Table 11.3.13.1-2.

d A dash indicates not applicable.

increments modeled to occur at the site boundaries would be an estimated 579 $\mu g/m^3$, which far exceeds the relevant standard level of 150 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 676 $\mu g/m^3$ would also exceed the standard level at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 28 $\mu g/m^3$ at Moapa (closest downwind community, about 19 mi [31 km] northeast of the SEZ), about 20 $\mu g/m^3$ at Moapa Valley and Overton, and about 10 to 15 $\mu g/m^3$ at upwind communities such as North Las Vegas, about 12 mi (19 km) southwest of the SEZ. Annual average modeled concentration increments and total concentrations (increment plus background) for PM_{10} at the SEZ boundary would be about 88.4 $\mu g/m^3$ and 110 $\mu g/m^3$, respectively, which are higher than the SAAQS level of 50 $\mu g/m^3$. Annual PM_{10} increments would be much lower, about 0.7 $\mu g/m^3$ at Moapa, about 0.3 $\mu g/m^3$ at Moapa Valley and Overton, and less than 0.5 $\mu g/m^3$ at North Las Vegas. Total 24-hour $PM_{2.5}$ concentrations would be 48.2 $\mu g/m^3$ at the SEZ boundary, which is higher than the NAAQS level of 35 $\mu g/m^3$; modeled increments contribute about four times the amount of background concentration to this total. The total annual average $PM_{2.5}$ concentration would be 12.9 $\mu g/m^3$, which is lower than the NAAQS level of 15.0 $\mu g/m^3$. At Moapa, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 1.0 and 0.1 $\mu g/m^3$, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—Grand Canyon NP, Arizona—would be about 14.4 and 0.21 $\mu g/m^3$, or 180% and 5.2% of the PSD increments for the Class I area, respectively. These surrogate receptors are more than 23 mi (37 km) from the Grand Canyon NP, and thus, predicted concentrations in Grand Canyon NP would be lower than the above values (about 105% of the PSD increments for 24-hour PM_{10}, somewhat higher than the PSD increments), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Annual $PM_{2.5}$ concentration levels are predicted to be lower than its standard level. Modeling indicates that emissions from construction activities are anticipated to somewhat exceed Class I PSD PM_{10} increments at the nearest federal Class I area (Grand Canyon NP in Arizona). Construction activities are not subject to the PSD program, and the comparison provides only a screen for gauging the magnitude of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Emissions from the engine exhaust from heavy construction equipment and vehicles have the potential to cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearby federal Class I area. However, SO_x emissions from engine exhaust would be very low, because programmatic design features would require ultra-low-sulfur fuel with a sulfur content of 15 ppm. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 500-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison to solar facility construction, and would be temporary in nature.

11.3.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology, if wet cooling was implemented (drift constitutes low-level PM emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Section M.13.4 of Appendix M.

Estimates of potential air emissions displaced by solar project development at the Dry Lake SEZ are presented in Table 11.3.13.2-2. Total power generation capacity ranging from 1,391 to 2,504 MW is estimated for the Dry Lake SEZ for various solar technologies (see Section 11.3.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). It is estimated that if the Dry Lake SEZ would eventually have development on 80% of its land, emissions avoided could range from 6.4 to 12% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada (EPA 2009c). Avoided emissions could be up to 2.5% of total emissions from electric power systems in the six-state study area. When compared to all source categories, power production from the same solar facilities could displace up to 9.4% of SO_2, 3.5% of NO_x, and 6.2% of CO_2 emissions in the state of Nevada (EPA 2009a; WRAP 2009). These emissions could

TABLE 11.3.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Dry Lake SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
15,649	1,391–2,504	2,437–4,387	3,438–6,189	2,949–5,308	0.020–0.035	1,893–3,407
Percentage of total emissions from electric power systems in Nevada[d]			6.4–12%	6.4–12%	6.4–12%	6.4–12%
Percentage of total emissions from all source categories in Nevada[e]			5.2–9.4%	2.0–3.5%	–[f]	3.5–6.2%
Percentage of total emissions from electric power systems in the six-state study area[d]			1.4–2.5%	0.80–1.4%	0.67–1.2%	0.72–1.3%
Percentage of total emissions from all source categories in the six-state study area[e]			0.73–1.3%	0.11–0.20%	–	0.23–0.41%

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

[b] A capacity factor of 20% was assumed.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.82, 2.42, 1.6×10^{-5}, and 1,553 lb/MWh, respectively, were used for the state of Nevada.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] A dash indicates not estimated.

Sources: EPA (2009a,c); WRAP (2009).

be up to 1.3% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for about 93% of the total electric power generated in Nevada (EPA 2009c). The contribution of natural gas combustion is about 47%, followed by that of coal combustion at about 45%. Thus, solar facilities built in the Dry Lake SEZ could displace relatively more fossil fuel emissions than those built in other states that rely less on fossil fuel–generated power.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for high-voltage lines during rain or very humid conditions. Since the proposed Dry Lake SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

11.3.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but occur on a more limited scale and are of shorter duration. Potential impacts on ambient air quality would be correspondingly smaller than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

11.3.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Dry Lake SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

11.3.14 Visual Resources

11.3.14.1 Affected Environment

The proposed Dry Lake SEZ is located in Clark County in southern Nevada. The SEZ occupies 15,649 acres (63.329 km^2) within the Dry Lake Valley. It extends about 11 mi (18 km) north–south and is about 5.6 mi (9.0 km) wide. The SEZ ranges in elevation from 1,980 ft (603.5 m) in the central portion to 2,540 ft (775 m) in the southwestern portion.

The SEZ lies within the Mojave Basin and Range Level III ecoregion, which consists of broad basins and scattered mountains. Within the region, heavy use of off-road vehicles and motorcycles in some areas has caused soil erosion, and there is relatively little grazing activity because of the lack of water and forage for livestock. Most land is federally owned. Dry Lake SEZ encompasses portions of three Level IV ecoregions. The eastern boundary is within the mostly barren Mojave Playas Level IV ecoregion. Where moisture is sufficient, cold-intolerant trees and woody legumes occur on the Mojave Playas, particularly toward the south. Portions of the northwestern section of the proposed Dry Lake SEZ are in the Arid Footslopes Level IV ecoregion, which is composed of alluvial fans, basalt flows, hills, and low mountains that rise above the floors of the Mojave Desert. A significant portion of the SEZ is within the Creosote Bush-Dominated Basins Level IV ecoregion, which includes valleys that lie between scattered mountain ranges. These valleys contain stream terraces, floodplains, alluvial fans, isolated hills, mesas, buttes, and eroded washes (Bryce et al. 2003).

The SEZ occupies the relatively narrow, generally flat north-south oriented Dry Lake Valley floor. The valley is located east of the Arrow Canyon Range and west of the Dry Lake Range. These mountains vary in elevation from about 3,000 ft (900 m) to over 4,000 ft (1,200 m). The mountain slopes and peaks surrounding the SEZ generally appear to be visually pristine, although transmission corridors cross the mountains at some points. The SEZ and surrounding mountain ranges are shown in Figure 11.3.14.1-1.

The strong horizon line and lines and forms of the surrounding mountain ranges are the dominant visual features in the vicinity of the proposed SEZ. These nearby mountain ranges add significantly to the scenic value of the SEZ. The banded mesas of the Dry Lake Range dominate views east from the SEZ, adding strong horizontal line elements to the landscape, but contrasting strongly with the jagged, angular forms of the Arrow Canyon Range to the west. The surrounding mountains are generally brown in color, but with greens from scattered shrubs visible on some mountains, especially in the Arrow Canyon Range. In contrast, gray to tan gravels dominate the desert floor, which is sparsely dotted with the greens and tans of vegetation. Very light colored, unvegetated playas on the valley floor provide strong color and texture contrast in the central portion of the SEZ.

Vegetation is generally sparse in much of the SEZ, with widely spaced shrubs growing on more or less barren gravel flats. Vegetation within the SEZ is predominantly scrubland, with creosotebush and other low shrubs dominating the desert floor within the SEZ. During an August 2009 site visit, the vegetation presented a range of greens (mostly the olive green of

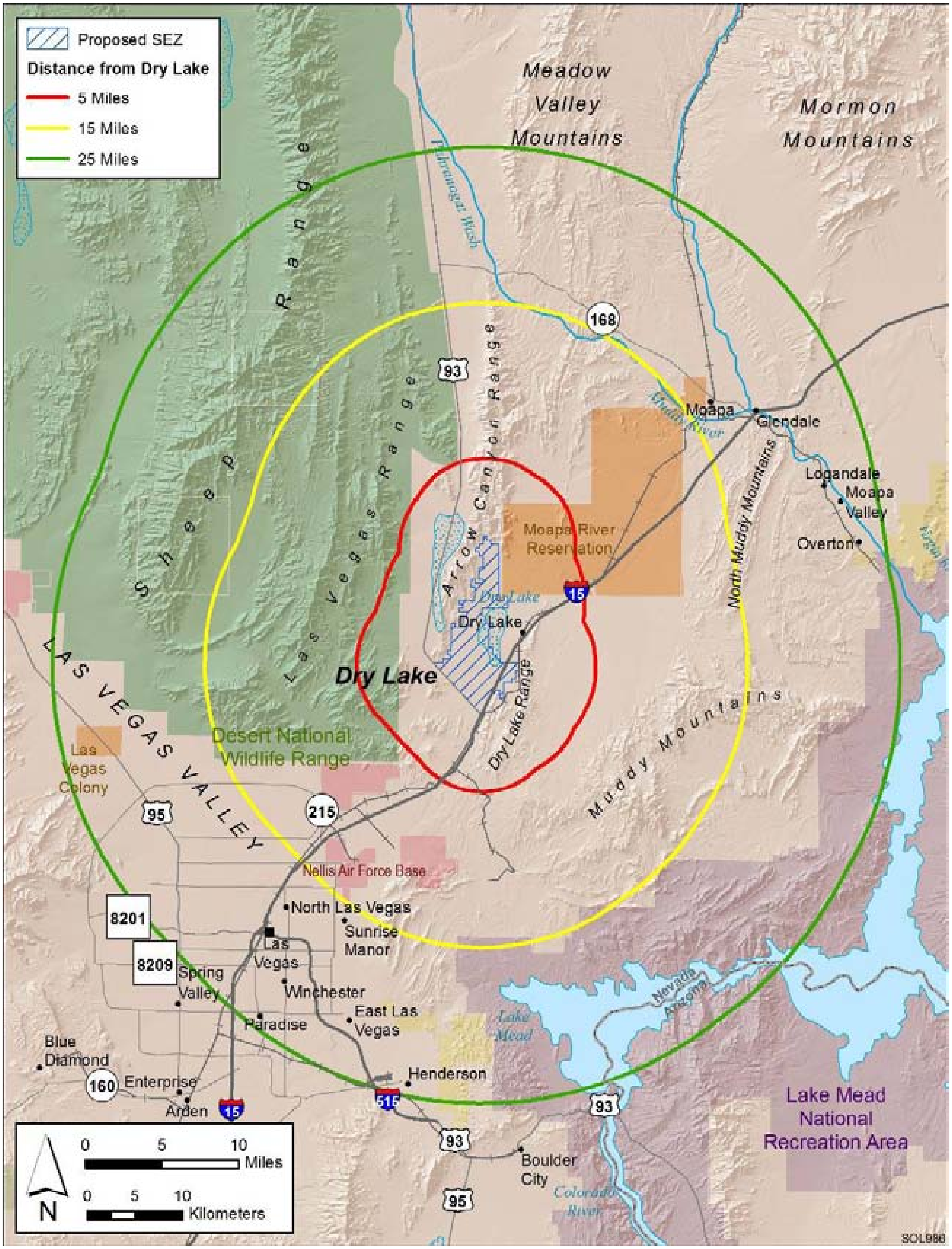

FIGURE 11.3.14.1-1 Proposed Dry Lake SEZ and Surrounding Lands

creosotebushes) with some grays and tans (from lower shrubs), with medium to coarse textures. Visual interest is generally low. No permanent surface water is present within the SEZ.

Major cultural disturbances occur both within and near the SEZ; these disturbances include multiple transmission lines and related facilities, several power plants and other industrial facilities, mining operations, I-40, other roads, a railroad, and debris scattered throughout the SEZ. These cultural disturbances add major contrasts in form, line, color, and texture from many viewpoints within and near the SEZ and greatly reduce the relative visual values within and near the SEZ.

The general lack of topographic relief, water, and physical variety results in low scenic value within the SEZ itself; however, because of the flatness of the landscape, the lack of trees, and the breadth of the open desert, the SEZ presents sweeping views of the surrounding mountains that add significantly to the scenic values within the SEZ viewshed. In general, however, the major cultural disturbances visible throughout Dry Valley have seriously degraded scenic values in the SEZ vicinity. Panoramic views of the SEZ are shown in Figures 11.3.14.1-2, 11.3.14.1-3, and 11.3.14.1-4.

The BLM conducted a VRI for the SEZ and surrounding lands in 2007 (BLM 2009g). The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or KOPs. Based on these three factors, BLM-administered lands are placed into one of four VRI Classes, which represent the relative value of the visual resources. Class I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is presented in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI values for the SEZ and immediate surroundings are VRI Class IV, indicating low visual values. The inventory indicates low scenic quality for the SEZ and its immediate surroundings. Positive scenic quality attributes included landform.

The *Las Vegas Resource Management Plan and Final Environmental Impact Statement* (BLM 1998) indicates that most of the SEZ is managed as VRM Class IV, except the southeast portion of the SEZ near I-15, which is managed as VRM Class III. VRM Class III objectives include partial retention of landscape character and permit moderate modification of the existing character of the landscape. VRM Class IV permits major modification of the existing character of the landscape. The VRM map for the SEZ and surrounding lands is shown in Figure 11.3.14.1.-5. More information about the BLM VRM program is presented in Section 5.12 and in *Visual Resource Management,* BLM Manual Handbook 8400 (BLM 1984).

FIGURE 11.3.14.1-2 Panoramic View of the Proposed Dry Lake SEZ from Western Edge of Dry Lake on Eastern Border of the SEZ, Facing Northwest toward Arrow Canyon Range

FIGURE 11.3.14.1-3 Approximately 180° Panoramic View of the Proposed Dry Lake SEZ from Southeastern Portion of SEZ Facing Northwest, Arrow Canyon Range at Left, Dry Lake Range at Right

FIGURE 11.3.14.1-4 Approximately 120° Panoramic View of the Proposed Dry Lake SEZ from Southwestern Portion of SEZ Facing Northeast, Arrow Canyon Range at Left, Dry Lake at Center, Dry Lake Range at Right

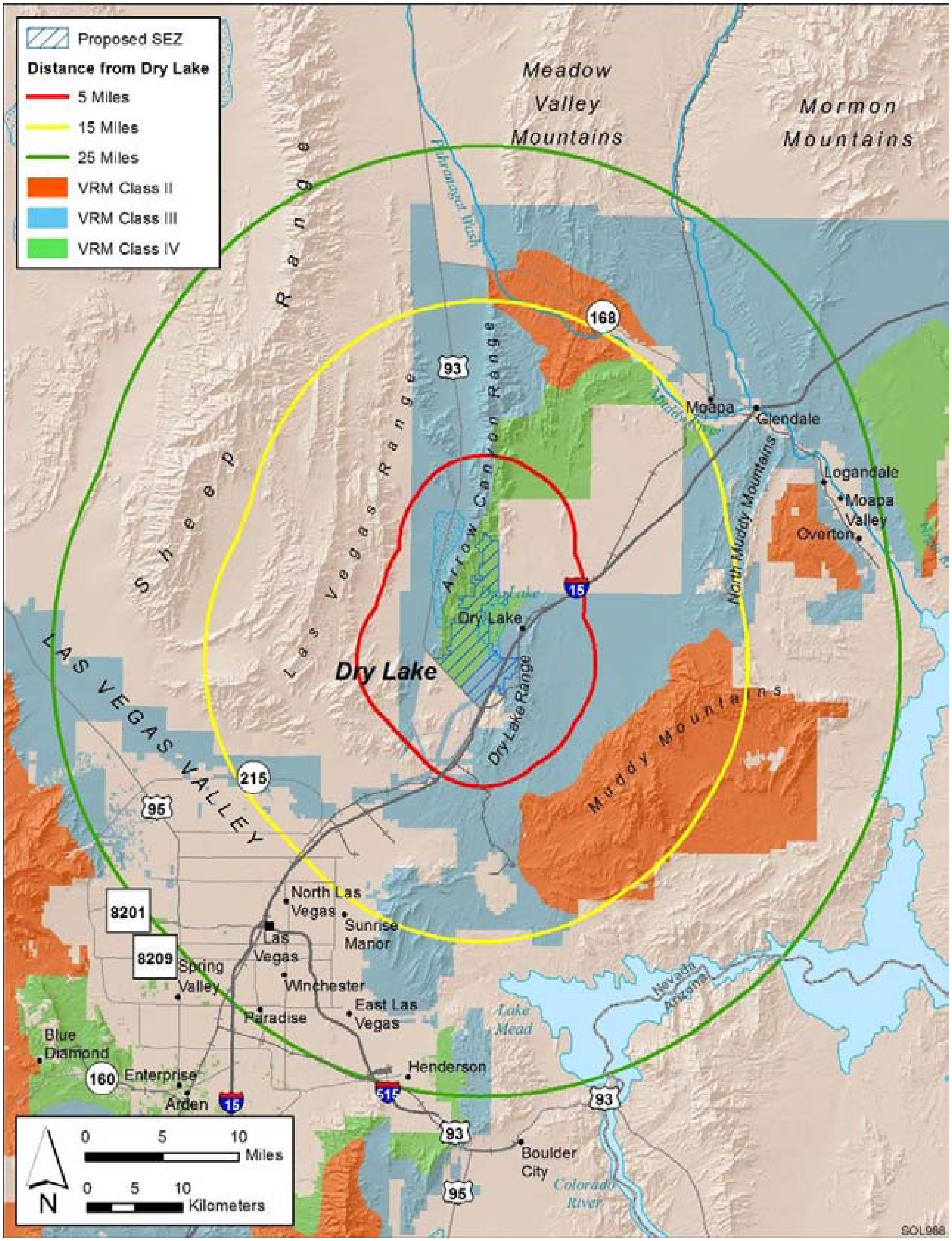

FIGURE 11.3.14.1-5 Visual Resource Management Classes for the Proposed Dry Lake SEZ and Surrounding Lands

11.3.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Dry Lake SEZ and surrounding lands, as well as the impacts of related developments (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project and a relatively complete and accurate description of its major components and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment used in this PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of the PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

11.3.14.2.1 Impacts on the Proposed Dry Lake SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix E. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities utilizing highly reflective surfaces or major light-emitting components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby. Additional, and potentially large impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 11.3.22.4.13 of this PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as seen from nearby KOPs. More information about impact determination using the BLM VRM program is presented in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

11.3.14.2.2 Impacts on Lands Surrounding the Proposed Dry Lake SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there would be no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ would have views of solar facilities in at least some portion of the SEZ (see Appendix M for information on the assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project components associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are presented in Appendix N.

Figure 11.3.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in the figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in this PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]), and for transmission towers and short solar power towers (150 ft [45.7 m]) are described in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 11.3.14.2-2 shows the results of a GIS analysis that overlays selected federal-, state-, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds to illustrate which of these sensitive visual resource areas would have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

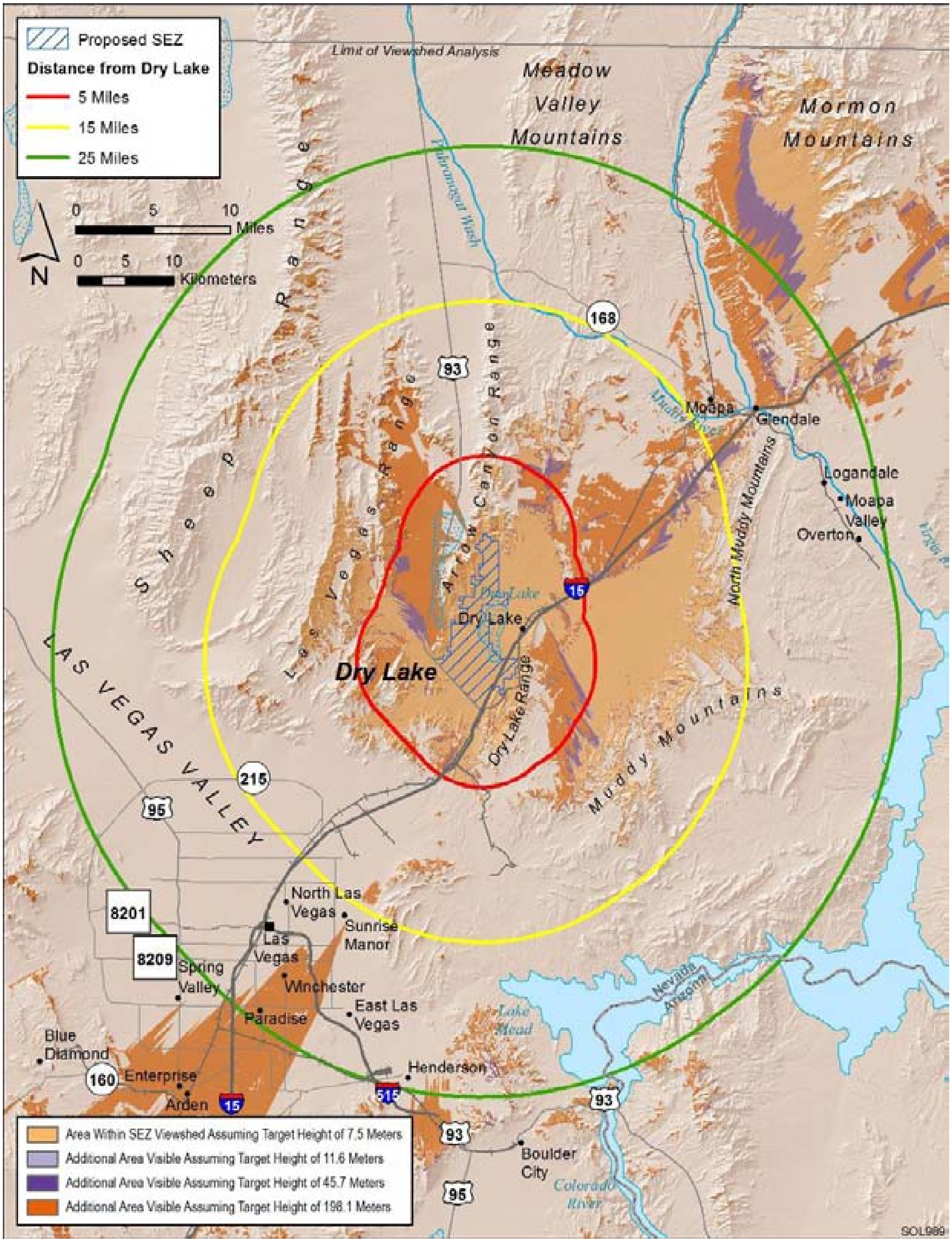

FIGURE 11.3.14.2-1 Viewshed Analyses for the Proposed Dry Lake SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

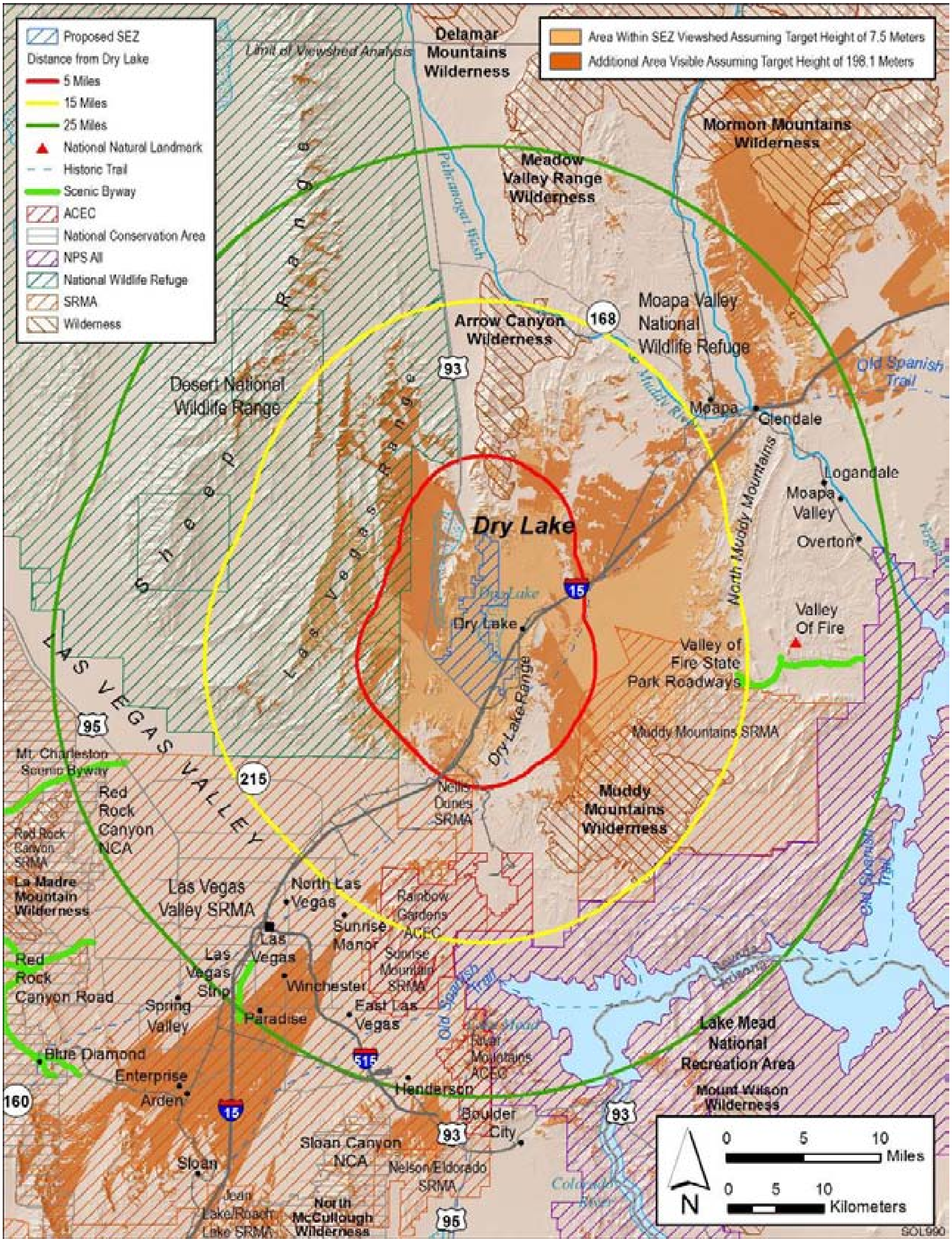

FIGURE 11.3.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Dry Lake SEZ

The scenic resources included in the analyses were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

- All-American Roads, National Scenic Byways, State Scenic Highways; and BLM- and USFS-designated scenic highways/byways;

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Dry Lake SEZ are discussed below. The results of this analysis are also summarized in Table 11.3.14.2-1. Further discussion of impacts on these areas is presented in Sections 11.3.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and Section 11.3.17 (Cultural Resources) of this PEIS.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the landscape as seen by viewers, including changes in the forms, lines, colors, and textures of objects seen. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations where the project might be viewed from; and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

National Recreation Area

- *Lake Mead National Recreation Area*. Lake Mead NRA contains 1,105,951 acres (4,475.625 km^2) and is located about 14 mi (23 km) south of the SEZ at the point of closest approach (see Figure 11.3.14.2-2). Lake Mead NRA offers year-round recreational opportunities for boaters, swimmers, and fishermen, as well as for hikers, wildlife photographers, and roadside sightseers.

  Within the 25-mi (40-km) SEZ viewshed in Lake Mead NRA, visibility of solar facilities within the SEZ would be limited to the southwestern portion of the NRA, in scattered areas of visibility at high elevations in the River Mountains and Black Mountains. The area within the NRA with views of the SEZ includes about 1,826 acres (7.390 km^2) in the 650-ft (198.1-m) viewshed, or 0.2% of the total NRA acreage, and 69 acres (0.28 km^2) in the 24.6-ft (7.5-m) viewshed, or 0.01% of the total NRA acreage. Within the NRA, the areas with potential visibility of solar facilities in the SEZ are located from 19 mi (31 km) south of the SEZ to beyond 25 mi (40 km) from the southeastern boundary of the SEZ.

  For the vast majority of these areas, visibility would be limited to the upper portions of tall power towers within the SEZ, and at the very long distance to the SEZ, minimal visual contrasts would be expected from solar facilities within the SEZ. For scattered areas in the peaks of the River Mountains totaling about 210 acres (0.850 km^2), the upper portions of transmission towers and lower-height power towers might be visible, but expected contrast levels would still be minimal.

TABLE 11.3.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40-km) Viewshed of the Proposed Dry Lake SEZ, Assuming a Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance		
			Visible between	
Feature Type	Feature Name (Total Acreage/Linear Distance)[a]	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Recreation Area	Lake Mead National Recreation Area (1,105,951 acres)	0 acres	0 acres	1,826 acres (0.2%)[b]
National Wildlife Range	Desert National (1,626,903 acres)	12,098 acres (0.7%)	33,632 acres (2%)	5,546 acres (0.3%)
National Historic Trail	Old Spanish	7.3 mi	10.3 mi	5.2 mi
Wilderness Areas	Arrow Canyon (27,521 acres)	764 acres (3%)	721 acres (3%)	0 acres
	Meadow Valley Range (123,481 acres)	0 acres	0 acres	133 acres (0.1%)
	Mormon Mountains (157,645 acres)	0 acres	0 acres	1,051 acres (0.7%)
	Muddy Mountains (44,522 acres)	0 acres	5,764 acres (13%)	34 acres (0.08%)
ACECs	Rainbow Gardens (38,777 acres)	0 acres	680 acres (2%)	164 acres (0.4%)
	River Mountains (10,950 acres)	0 acres	0 acres	1,962 acres (18%)
Scenic Byways	Bitter Springs Backcountry (28 mi)	0 acres	6.3 mi	0 acres
	Las Vegas Strip (4.5 mi)	0 acres	0 acres	0.7 mi
SRMAs	Las Vegas Valley (447,244 acres)	0 acres	1,489 acres (0.3%)	16,677 acres (4%)
	Muddy Mountains (128,493 acres)	391 acres (0.3%)	25,192 acres (20%)	158 acres (0.1%)
	Nellis Dunes (8,921 acres)	389 acres (4%)	59 acres (0.7%)	0 acres

TABLE 11.3.14.2-1 (Cont.)

Feature Type	Feature Name (Total Acreage/Linear Distance)[a]	Feature Area or Linear Distance: Visible within 5 mi	Visible between 5 and 15 mi	Visible between 15 and 25 mi
SRMAs *(Cont.)*	Sunrise Mountain (33,322 acres)	0 acres	726 acres (2%)	165 acres (0.5%)

[a] To convert acres to km^2, multiply by 0.004047. To convert mi to km, multiply by 1.609.

[b] Value in parentheses is percentage of total feature acreage or road length viewable.

If visible, operating power towers in the SEZ would be seen as distant points of light on the northern horizon. At night, sufficiently tall power towers in the SEZ would have red or white flashing hazard navigation lighting that could potentially be visible from the NRA. Under the 80% development scenario analyzed in the PEIS, visual contrast levels from solar energy development within the SEZ would be expected to be minimal for viewpoints within the Lake Mead NRA.

National Wildlife Range

- *Desert*. The 1,626,903-acre (6,583.843-km^2) Desert National Wildlife Range is located 2.3 mi (3.7 km) west of the SEZ at the point of closest approach, west of the Arrow Canyon Range (see Figure 11.3.14.2-2). The NWR extends beyond the 25-mi (40-km) viewshed of the SEZ. The Wildlife Range contains six major mountain ranges, the highest rising from 2,500-ft (762-m) valleys to nearly 10,000 ft (3,048 m). Camping, hiking, backpacking, horseback riding, hunting, and bird watching are all popular activities enjoyed by refuge visitors.

  About 51,276 acres (207.51 km2), or 3 % of the NWR, are within the 650-ft (198.1-m) viewshed of the SEZ, and 23,233 acres (94.021 km2), 1% of the NWR, are within the 24.6-ft (7.5-m) viewshed. The areas within the NWR with potential visibility of solar facilities in the SEZ include the eastern slopes of mountains and ridges of the Las Vegas Range, primarily within 10 mi (16 km) of the SEZ, but extending for some areas to beyond 15 mi (24 km) into the NWR, along the peaks of the Sheep Range.

  For many low-elevation viewpoints in the eastern part of the NWR, the Arrow Canyon Range would completely screen views of solar facilities within the SEZ. For some elevated viewpoints in the eastern portion of the NWR, however, the Arrow Canyon Range would provide only partial screening of the SEZ.

The highest elevations within the NWR within the 25-mi (40-km) SEZ viewshed are the peaks and east-facing slopes of the highest mountains in the Sheep Range. At elevations exceeding 7,000 ft (2,100 m), viewpoints are high enough that the tops of collector/reflector arrays for facilities within the SEZ could be visible, resulting in strong visual contrast levels.

Figure 11.3.14.2-3 is a Google Earth visualization of the SEZ as seen from the peak of Quartzite Mountain in the NWR, about 9.2 mi (14.8 km) west of the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aid for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (140-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, and the tower/heliostat system represents about 100 MW of electric generating capacity. Six power tower models were placed in the SEZ for this and other visualizations shown in this section of this PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 4,900 ft (1,500 m) higher in elevation than the SEZ; this is one of the highest elevations within the SEZ 25-mi (40-km) viewshed. Although the Arrow Canyon Range would still screen solar facilities in substantial portions of the SEZ from view, particularly in the northern portions of the SEZ, much of the SEZ would be visible over the southern end of the Arrow Canyon Range. The view direction is roughly perpendicular to the long north-south axis of the SEZ, and despite the partial screening, the SEZ would stretch across nearly the entire horizontal field of view. From this elevated viewpoint, the tops of collector/reflector arrays for solar facilities within the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase visual contrast with the more natural-appearing surroundings. Ancillary facilities, such as buildings, cooling towers, and transmission towers, as well as any plumes, would likely be visible, and their forms, vertical lines, and movement (for plumes) projecting above the strongly horizontal shapes of the collector/receiver arrays would create additional visual contrasts.

Operating power tower receivers in the nearer portions of SEZ would likely appear as bright non-point light sources against the backdrop of the Dry Valley floor. At night, sufficiently tall the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location. The lighting could attract visual attention, although other lights

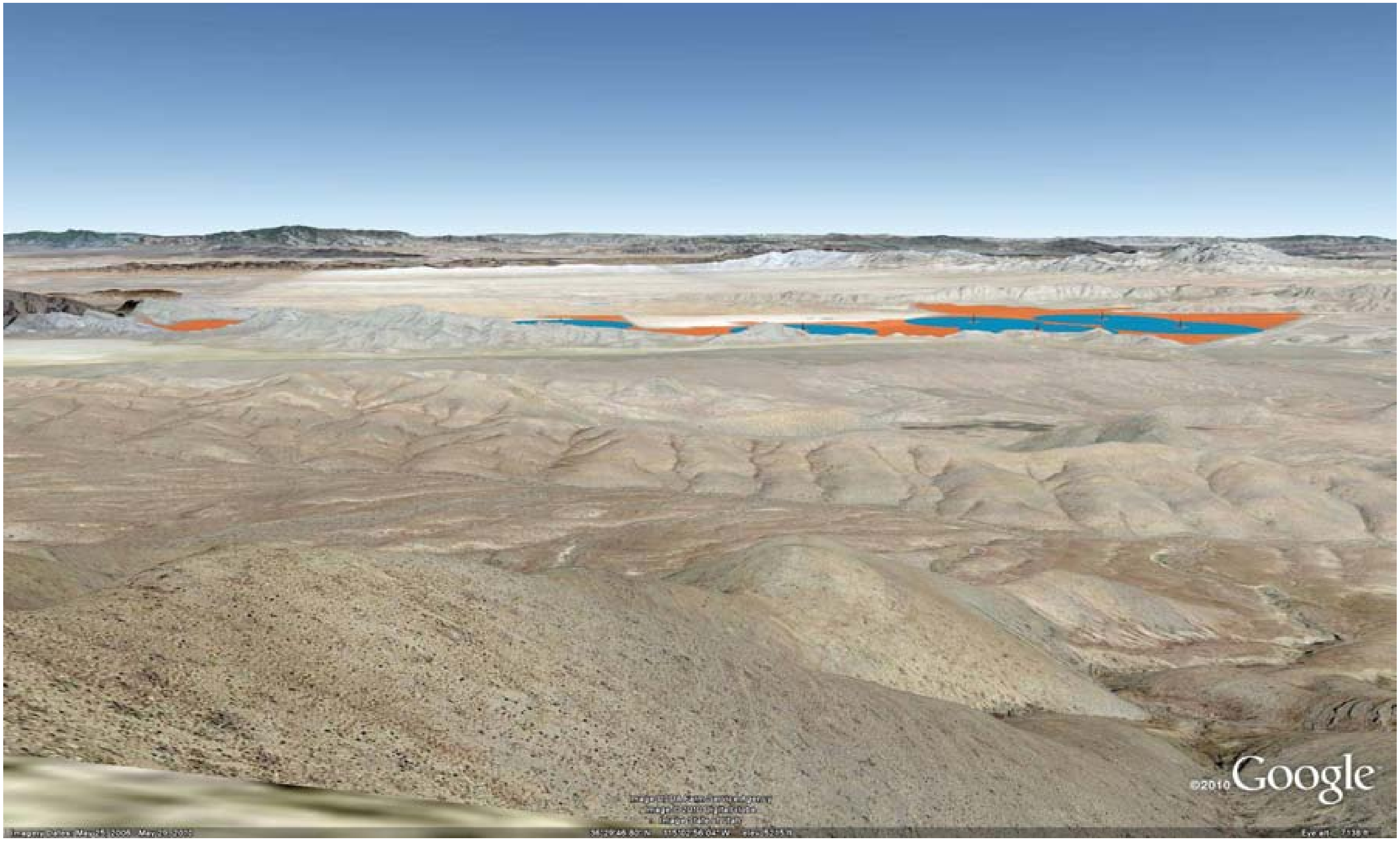

FIGURE 11.3.14.2-3 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Quartzite Mountain in the Desert National Wildlife Range

would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could be visible as well.

Visual contrasts associated with solar facilities within the SEZ would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other visibility factors. Under the 80% development scenario analyzed in the PEIS, strong visual contrasts could be expected at this viewpoint.

Much lower levels of contrast would be expected at lower elevation viewpoints within the WA in the SEZ viewshed, because of more extensive screening of the SEZ by intervening mountains south of the WA.
Figure 11.3.14.2-4 is a Google Earth visualization of the SEZ as seen from the peak of an unnamed low mountain in the Las Vegas Range, about 4.3 mi (6.9 km) west of the westernmost point in the SEZ, although the westernmost portions of the SEZ are screened from view. At 4.3 mi (6.9 km), the viewpoint is with the BLM VRM Programs' foreground/middleground distance of 3 to 5 mi (5 to 8 km).

The viewpoint in the visualization is about 2,300 ft (700 m) higher in elevation than the SEZ. From this much closer but lower viewpoint, the mountains of the Arrow Canyon Range would screen most of the SEZ from view. The view direction is roughly perpendicular to the long north-south axis of the SEZ, and despite the partial screening, the SEZ would stretch across much of the horizontal field of view. The viewpoint is sufficiently elevated that the tops of collector/reflector arrays for solar facilities within the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase visual contrast with the more natural-appearing surroundings.

Ancillary facilities, such as buildings, cooling towers, and transmission towers, as well as any plumes, would likely be visible, and their forms, vertical lines, and movement (for plumes) projecting above the strongly horizontal shapes of the collector/receiver arrays would create additional visual contrasts. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

Where visible, operating power tower receivers in the nearer portions of the SEZ would likely appear as very bright non-point light sources atop discernable tower structures against the backdrop of the Dry Valley floor. At night, sufficiently tall power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location. The lighting could attract visual attention, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could be visible as well.

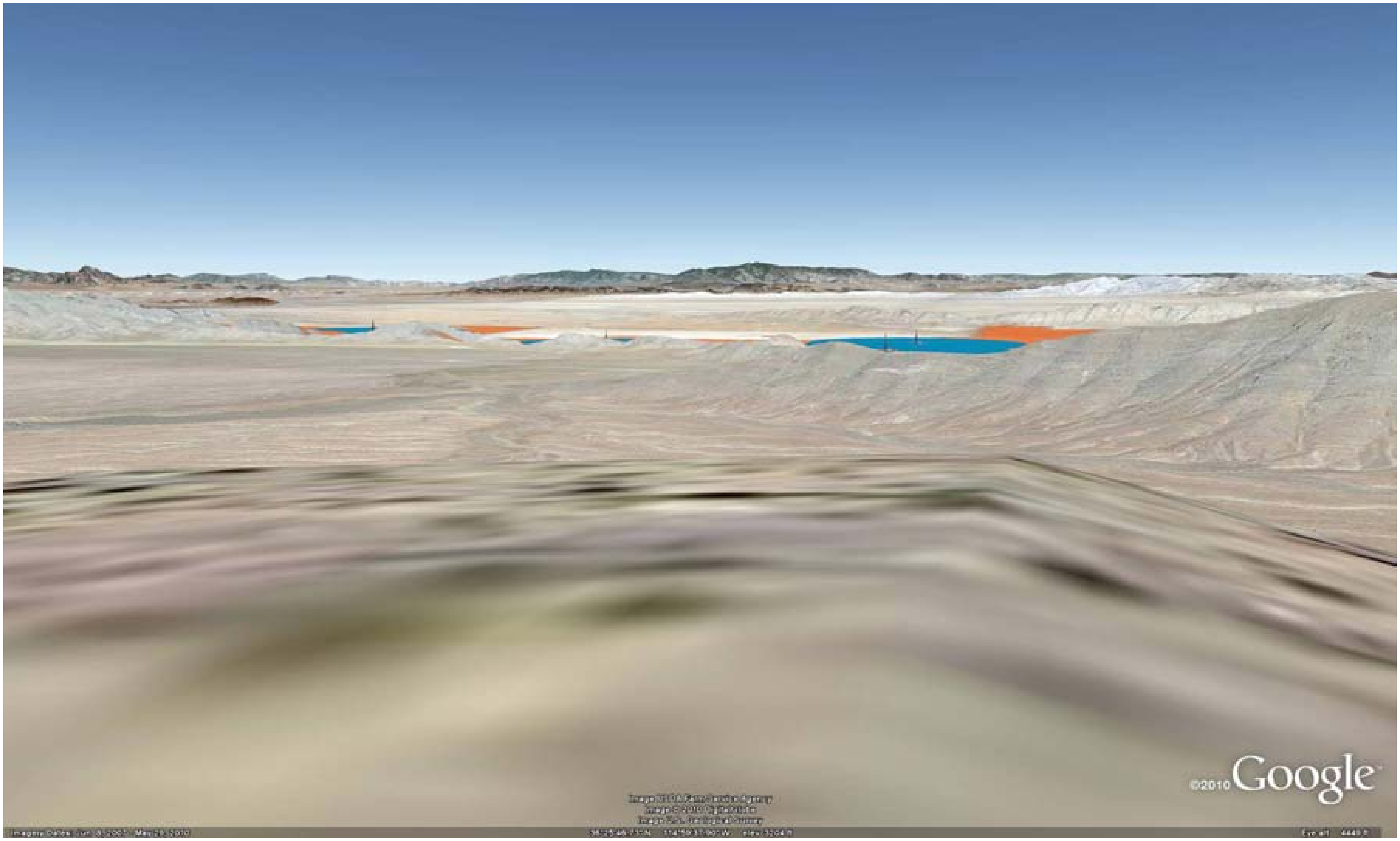

FIGURE 11.3.14.2-4 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Peak in the Las Vegas Range in the Desert National Wildlife Range

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, under the 80% development scenario analyzed in the PEIS, moderate to strong visual contrasts could be expected at this viewpoint.

In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location within the NWR, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, strong levels of visual contrast would be expected for some high-elevation viewpoints in the NWR, with weak or moderate levels of visual contrast expected for most lower-elevation viewpoints in the NWR located within the SEZ 25-mi (40-km) viewshed.

National Historic Trail

- *Old Spanish Trail.* The Old Spanish National Historic Trail is a congressionally designated multistate historic trail that passes within 1.3 mi (2.1 km) of the SEZ at the point of closest approach on the southeast side of the SEZ. About 30 mi (48 km) of the trail are within the viewshed of the SEZ. About 8.8 mi (14.2 km) of the trail located within the viewshed are within a *high-potential segment.*[9] Portions of the trail within the SEZ viewshed range from as close as 1.4 mi (2.3 km) (including the high-potential segment) from the SEZ to beyond 25 mi (40 km) from the SEZ.

  Within 20 mi (32 km) of the SEZ, the trail is oriented generally southwest–northeast, parallel to the Union Pacific Railroad, and through the Moapa River Indian Reservation. The SEZ is within view of the trail for much of the area. Within the viewshed, the trail runs through shrubland and steppes.

  About 30 mi (48 km) of the Old Spanish National Historic Trail are within the SEZ viewshed to the east and northeast of the SEZ (Figure 11.3.14.2-2). For all but about 5 mi (8 km) of the trail, visibility of solar facilities within the SEZ would be limited to the upper portions of power towers, and expected visual contrast levels in these portions of the trail would likely be minimal or weak. Expected visual contrasts would include visibility of the receivers of operating power towers during the day, and, if power towers exceeded 200 ft (61 m) in height, visibility of hazard warning lights on the power towers at night. Hazard warning lighting could be flashing red lights or red or white strobe lights, both which could be visible for long distances.

[9] High-potential segments or sites provide an opportunity to interpret the historic significance of the trail. Criteria for selection of a high-potential segment or site include "historic significance, presence of visible historic remnants, scenic quality, and relative freedom from intrusion."

There could be intermittent visibility of solar facilities within the SEZ in a number of places, but the trail segment with full visibility of solar facilities within the SEZ would be a 5-mi (8-km) stretch roughly paralleling the SEZ's eastern boundary, 3 to 5 mi (5 to 8 km) east of the SEZ. For much of this segment, views of the SEZ would be partially screened by the Dry Lake Range, but some portions of the SEZ would be visible through gaps in the range and beyond the range's northern extent. Although in most locations expected contrasts would not exceed weak levels, in a few locations, moderate or even strong visual contrasts could be observed.

From the southwest, the trail enters the 25-mi (40-km) SEZ viewshed in the Dry Lake Range about 2.6 mi (4.2 km) southeast of the SEZ's southeast corner, as the centerline of the trail ascends a high ridge in the Dry Lake Range. Contrasts would quickly reach strong levels as trail user traveled northward along the ridge top. The trail in this area is in a high-potential segment.

Figure 11.3.14.2-5 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the Old Spanish National Historic Trail near the point of maximum potential visibility of solar facilities within the SEZ on the ridge just described, about 2.5 mi (4.0 km) from the closest point in the SEZ. The viewpoint is within the BLM VRM Program's foreground-middleground distance of 3-5 mi (5-8 km). The viewpoint is about 1,000 ft (300 m) higher in elevation than the SEZ.

The visualization suggests that from this elevated point on the trail, much of the SEZ would be visible over the tops of intervening ridges in the Dry Lake Range, although some of the easternmost portion of the SEZ would be screened. The view would be oblique to the long north-south axis of the SEZ, so that nearly the full north-south extent of the SEZ would be visible, and the SEZ would occupy nearly all of the horizontal field of view.

Because of the elevation difference between the viewpoint and the SEZ and the relatively short distance to the SEZ, the vertical angle of view would be high enough that the tops of collector/reflector arrays in the SEZ would be visible, which would make the large areal extent of the facilities and their strong regular geometry more apparent, tending to increase their visual contrast with the strongly horizontal and more natural appearing landscape setting. However, facilities at the northern end of the SEZ would have a more flattened appearance and reduced apparent size, which would make them blend into the landscape setting more readily.

Taller ancillary facilities, such as buildings, transmission structures, cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays. The structural details of at least nearby facilities could be evident. The ancillary facilities could create form and line contrasts

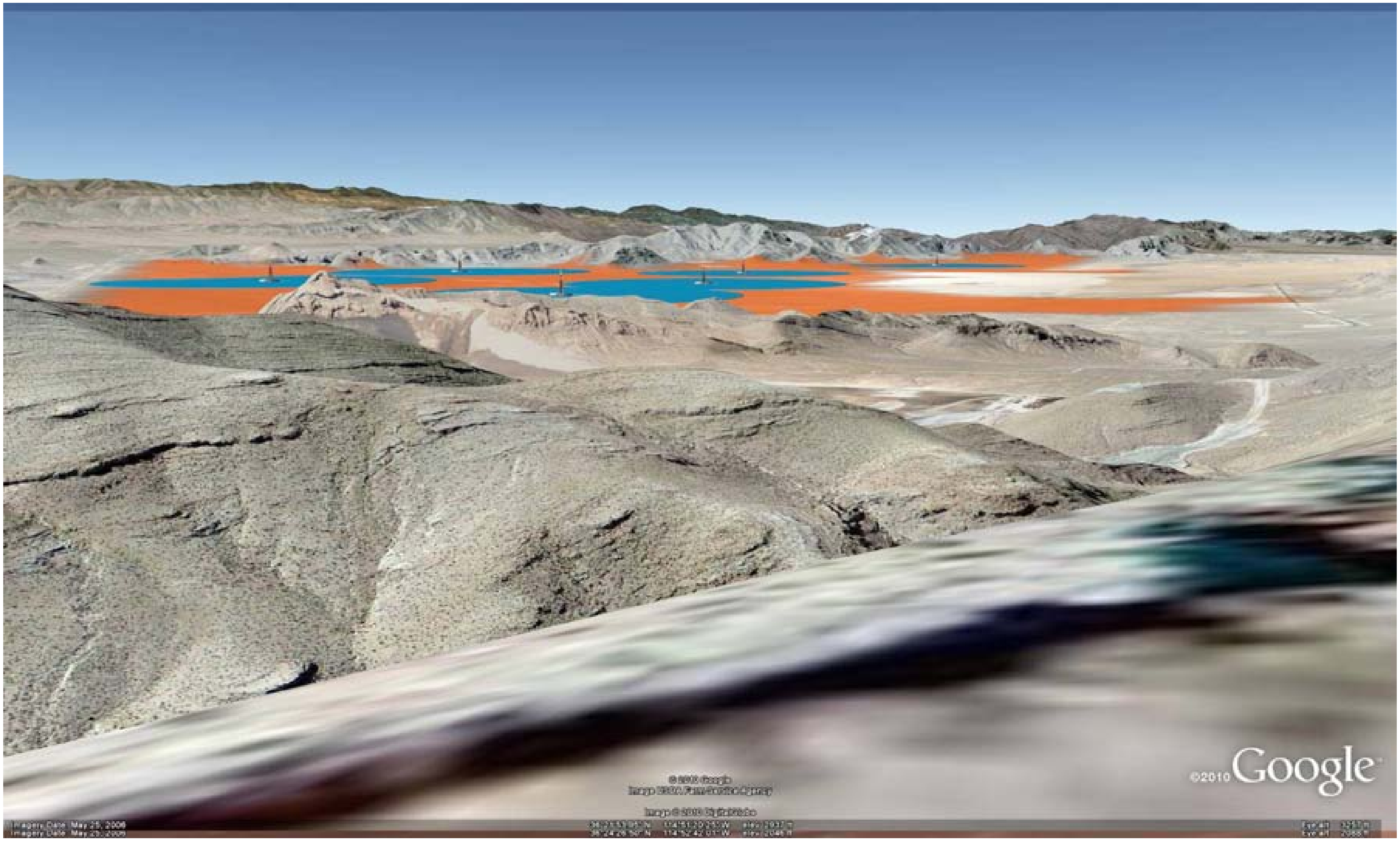

FIGURE 11.3.14.2-5 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the Old Spanish National Historic Trail 2.5 mi (4.0 km) from the SEZ

with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

The receivers of operating power towers in the closest parts of the SEZ would likely appear as brilliant white non-point light sources atop tower structures with clearly discernable structural details, while those farther from the viewpoint would have diminished brightness and less detail visible. Also, under certain viewing conditions, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). At night, sufficiently tall power towers could have flashing red or white hazard lighting that could be visible for long distances, and would likely be visually conspicuous from this viewpoint, although other lighting would be visible in the SEZ area. Other light sources associated with the solar facilities within the SEZ could be visible as well.

As noted above, numerous large-scale cultural disturbances already are visible in and near the SEZ, and the addition of solar facilities into the already visually complex and partially man-made appearing landscape would result in lower contrast levels than if the solar facilities were being placed in a visually pristine landscape. Under the 80% development scenario analyzed in the PEIS, the SEZ could contain numerous solar facilities utilizing differing solar technologies as well as a variety of roads and ancillary facilities. The addition of multiple solar facilities could add substantially to the existing visually complex landscape, to the extent that it would exceed the visual absorption capability of the valley in which the SEZ is located, leading to a perception of visual clutter that could be perceived negatively by viewers.

Because the SEZ would occupy most of the horizontal field of view, and because of the potentially very close proximity of solar facilities to this location, strong visual contrasts from solar energy development within the SEZ would be expected at this viewpoint. However, the actual contrast levels experienced would depend on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors.

About 0.4 mi (0.6 km) of the trail along the high ridge top would potentially be subject to strong contrasts from solar facilities within the SEZ. At the end of this segment, the trail passes to the east sides of the next several succeeding ridges and hills so that the SEZ is screened entirely from view of the trail centerline for the next 1.2 mi (1.9 km). At about 1.2 mi (1.9 km), there would be a short segment of the trail near a hill summit that could have views of a small portion of the SEZ, with contrasts levels not expected to exceed weak levels. Another hill with limited visibility of the SEZ would be reached at about 1.5 mi (2.4 km) beyond the end of the first high ridge, but the view from this hill would be through a gap in the Dry Lake Range through which a large transmission line with lattice towers would extend west down to the SEZ. After crossing the transmission ROW, the trail ascends to another high ridge with visibility of the SEZ. Figure 11.3.14.2-6 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the Old Spanish National Historic Trail from this second ridge, about 1.7 mi (2.7 km) from the closest point in the SEZ. The viewpoint is within the BLM VRM Program foreground-middleground distance of 3 to 5 mi (5 to 8 km). The viewpoint is about 850 ft (260 m) higher in elevation than the SEZ.

The visualization suggests that from this elevated point on the trail, much of the SEZ would be screened by intervening ridges in the Dry Lake Range, although a small area in the southernmost portion of the SEZ would be visible. Because of the extensive screening, the SEZ would occupy a moderate portion of the horizontal field of view. The aspect and appearance of solar facilities would be very similar to that described for the view shown in Figure 11.3.14.2-5, but the expected contrast levels would be moderate, because of the limited view of the SEZ.

After passing this second high ridge, the trail turns lightly eastward and eventually descends from the Dry Lake Range, with views of the SEZ largely screened by the Dry Lake Range during the descent, except for very limited potential views restricted to taller solar facility components through a gap in the Dry Lake Range. Expected contrast levels associated with views of solar facilities within the SEZ would be minimal.

About 3.8 mi (6.1 km) past the first high ridge, the trail turns almost directly east for a short distance before turning back northeast, but from this point forward (for northbound travelers) views of the SEZ would be very limited because of screening by the Dry Lake Range and/or very low angle views where the Dry Lake Range did not completely screen the SEZ from view. Furthermore, the direction of travel would be away from the SEZ, so that views of the SEZ would be behind northbound travelers. Therefore, views would be less frequent and likely of shorter duration. Finally, the distance from the SEZ would gradually increase as travelers moved north on the trail, and any visual contrasts would slowly decrease. For most locations north of the westward turn in the trail, if solar facilities within the SEZ were visible at all, expected contrast levels would be minimal, and nowhere would they be expected to exceed weak levels.

Southbound travelers on the Old Spanish Trail would experience the same visual contrasts as northbound travelers, but in reverse order. The overall experience would be somewhat different because southbound travelers would approach the SEZ more gradually than northbound travelers, with intermittent visibility for a much longer duration.

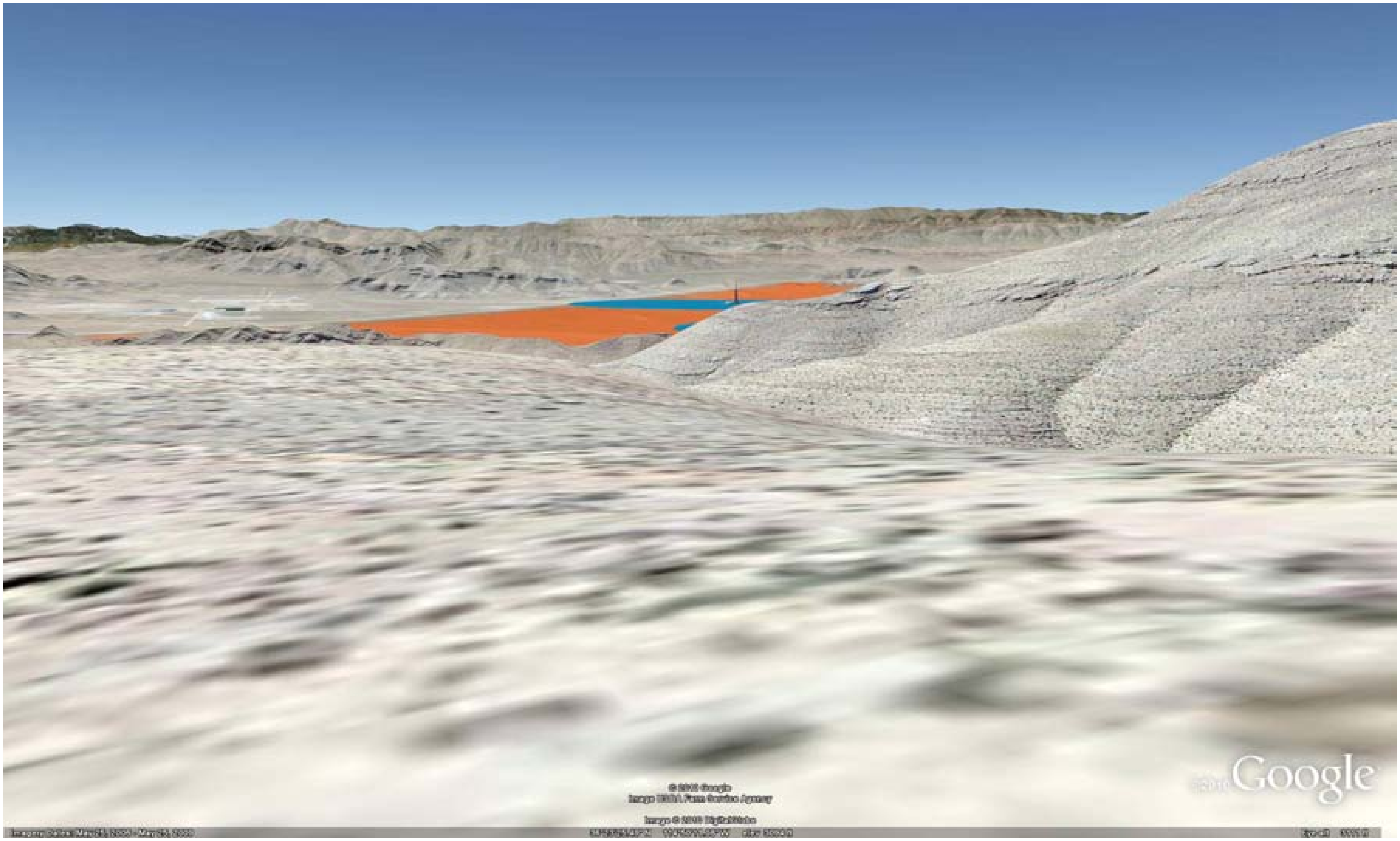

FIGURE 11.3.14.2-6 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the Old Spanish National Historic Trail 1.7 mi (2.7 km) from the SEZ

Although there could be very limited and brief views of solar facilities in the SEZ as far out as 25 mi (40 km) northeast of the SEZ or even farther, southbound trail users would likely only notice those views at around 22 mi (35 km) as the trail crossed a ridge where it crosses I-15 northeast of the State Route 169 interchange. At this viewpoint, the upper portions of power towers could be visible, and the receivers of operating power towers could appear as distant star-like points of light on the southwest horizon. They could also be visible at night if tall enough to require hazard warning lighting. Expected contrast levels would be minimal, and visibility would be intermittent.

Intermittent visibility of solar facilities would continue, with expected contrast levels generally minimal, but not exceeding weak levels until southbound travelers reached the high ridges discussed above, with the views shown in Figures 11.3.14.2-6 and 11.3.14.2-5. After reaching the viewpoint shown in Figure 11.3.14.2-5, the trail would descend from the Dry Lake Range and pass the southern end of the SEZ and pass out of the SEZ 25-mi (40-km) viewshed.

Wilderness Areas

- *Arrow Canyon.* Arrow Canyon is a 27,521-acre (111.37-km^2) congressionally designated WA 2.5 mi (4.0 km) north of the SEZ (Figure 11.3.14.2-2). The WA is known for its exceptional scenic values.

  Within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the southern portions of the WA (about 1,485 acres [6.010 km^2] in the 650-ft [198.1-m] viewshed, or 5% of the total WA acreage, and 1,129 acres [4.569 km^2] in the 25-ft [7.5-m] viewshed, or 4% of the total WA acreage). Within the WA, the areas with potential views of solar facilities in the SEZ extend to 9.1 mi (14.7 km) from the northern boundary of the SEZ.

  Mountains of the Arrow Canyon Range just south of the WA screen views of the SEZ from all but the highest elevations of the southern peaks in the WA. From a few of these peaks, nearly open views of the SEZ exist, looking down the long north-south axis of the SEZ, with moderate to strong contrast levels expected for these viewpoints.

  Figure 11.3.14.2-7 is a Google Earth visualization of the SEZ as seen from a high, unnamed peak in the far southern portion of the WA, about 2.9 mi (4.7 km) north of the SEZ, and within the BLM VRM program foreground-middleground distance of 3 to 5 mi (5 to 8 km), although the nearest parts of the SEZ are screened from view in the visualization. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

  The viewpoint in the visualization is about 1,900 ft (580 m) higher in elevation than the SEZ. Solar facilities within the SEZ would be partially

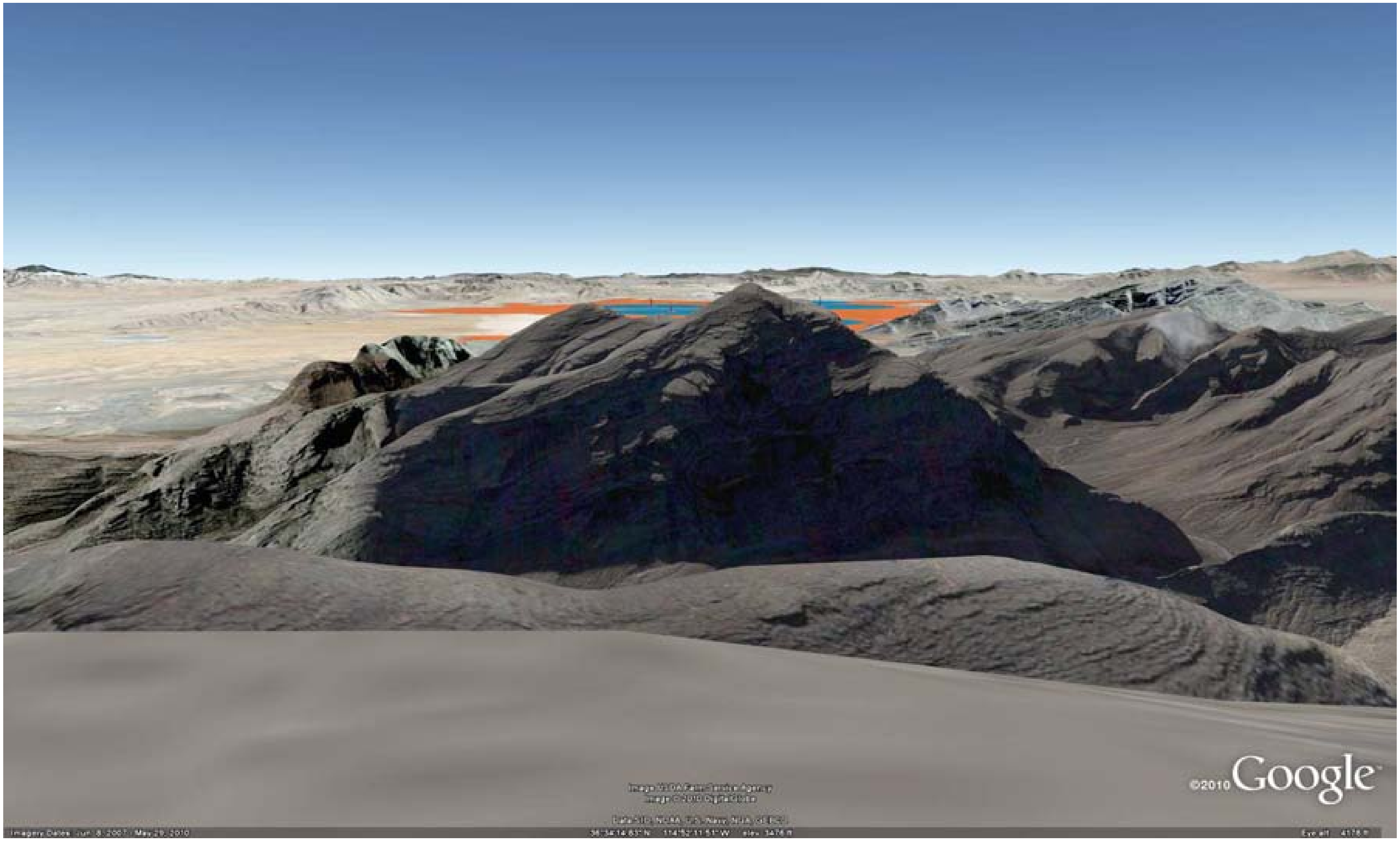

FIGURE 11.3.14.2-7 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Peak in the Far Southern Portion of Arrow Canyon WA

screened by mountains south of the WA in the Arrow Canyon Range. The view direction is along the long north-south axis of the SEZ, but the viewpoint is close enough to the SEZ that it would occupy a moderate amount of the horizontal field of view. The viewpoint is sufficiently elevated that the tops of collector/reflector arrays for solar facilities within the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase visual contrast with the more natural-appearing surroundings.

Ancillary facilities, such as buildings, cooling towers, and transmission towers, as well as any plumes, would likely be visible, and their forms, vertical lines, and movement (for plumes) projecting above the strong horizontal line of the collector/receiver arrays would add visual contrast.

Operating power tower receivers in the nearer portions of SEZ would likely appear as bright non-point light sources against the backdrop of the Dry Valley floor. At night, sufficiently tall power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location. The lighting could attract visual attention, although other lights would be visible in the vicinity of the SEZ, and beyond, in the direction of Las Vegas. Other lighting associated with solar facilities in the SEZ could be visible as well.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, under the 80% development scenario analyzed in the PEIS, moderate contrasts could be expected at this viewpoint.

Figure 11.3.14.2-8 is a Google Earth visualization of the SEZ as seen from a higher, unnamed peak farther north in the WA than the viewpoint just described. This viewpoint is about 4.4 mi (7.0 km) north of the SEZ and is still within the BLM VRM program foreground-middleground distance of 3 to 5 mi (5 to 8 km). In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 2,500 ft (580 m) higher in elevation than the SEZ. Because this viewpoint is higher than the mountains to the south, much more of the SEZ is in view than from the previous viewpoint. The view direction is along the long north-south axis of the SEZ, but the viewpoint is close enough to the SEZ that it would occupy a moderate amount of the horizontal field of view. From this higher-elevation viewpoint, more of the tops of collector/reflector arrays for solar facilities within the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase visual contrast with the more natural-appearing surroundings.

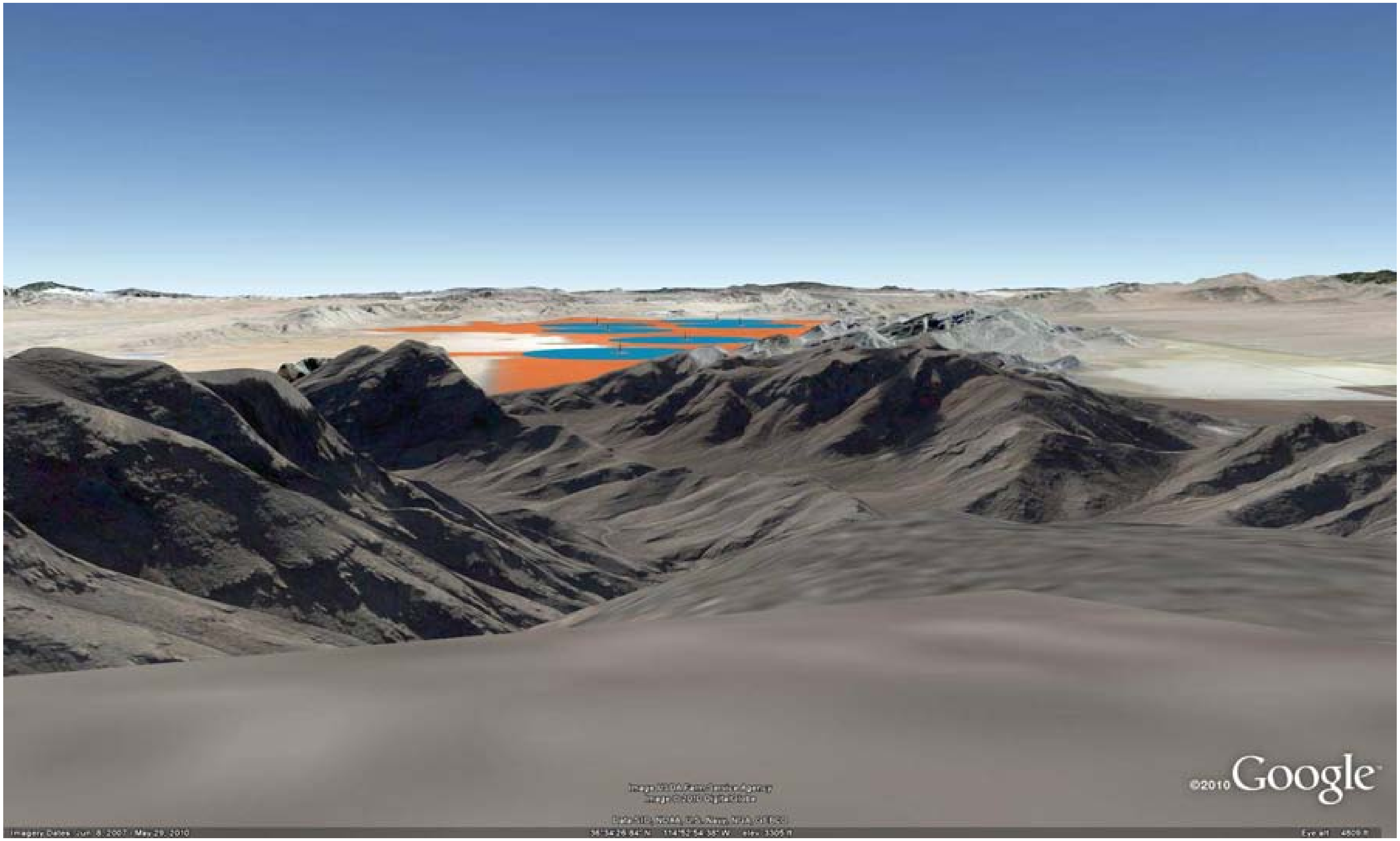

FIGURE 11.3.14.2-8 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Peak in the Southern Portion of Arrow Canyon WA

Ancillary facilities, such as buildings, cooling towers, and transmission towers, as well as any plumes, would likely be visible, and their forms, vertical lines, and movement (for plumes) projecting above the strong horizontal line of the collector/receiver arrays would add visual contrast.

Operating power tower receivers in the nearer portions of SEZ would likely appear as bright non-point light sources against the backdrop of the Dry Valley floor, but power towers at the far southern end of the SEZ would be far enough away that they would likely create substantially lower levels of visual contrast. At night, sufficiently tall power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location. The lighting could attract visual attention, although other lights would be visible within and in the vicinity of the SEZ and beyond, in the direction of Las Vegas.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, under the 80% development scenario analyzed in the PEIS, strong visual contrasts could be expected at this viewpoint.

Much lower levels of visual contrast would be expected at lower-elevation viewpoints within the WA in the SEZ viewshed, because of more extensive screening of the SEZ by intervening mountains south of the WA. The steepness of the mountains in the WA results in a rapid drop-off in elevation away from the peaks, so that viewpoints away from the mountain tops are nearly completely screened, resulting in much lower contrasts from solar facilities in the SEZ.

In general, under the 80% development scenario analyzed in the PEIS, moderate or even strong levels of visual contrast would be expected for high-elevation viewpoints in the WA, with weak levels of visual contrast expected for most lower-elevation viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.

- *Meadow Valley Range.* Meadow Valley Range is a 123,481-acre (499.710-km^2) congressionally designated WA located 19 mi (31 km) away at the point of closest approach north of the SEZ (Figure 11.3.14.2-2). The long ridgeline of the Meadow Valley Range includes many peaks, narrow canyons, and passes.

  Within 25 mi (40 km), solar energy facilities within the SEZ could be visible from areas in the far southern portion of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total about 133 acres (0.538 km^2) in the 650-ft (198.1-m) viewshed, or 0.1% of the total WA acreage. None of the WA is visible in the 24.6-ft (7.5-m) viewshed. The visible area of the WA extends to beyond 25 mi (40 km) from the northern boundary of the SEZ.

Within the SEZ 25-mi (40-km) viewshed in the WA, areas with potential visibility of solar facilities within the SEZ are scattered across a few peaks between Wildcat Wash and Dead Man Wash in the far southern end of the WA. Within this area, visibility of solar facilities within the SEZ would be limited to the upper portions of power towers. If visible, operating power towers in the SEZ would be seen as distant points of light on the southern horizon. At night, sufficiently tall power towers in the SEZ could have red or white flashing hazard navigation lighting that could potentially be visible from the WA. Other lighting associated with solar facilities could potentially be visible as well.

Because of the long distance to the SEZ and screening of much of the SEZ by intervening topography, under the 80% development scenario analyzed in the PEIS, visual contrast levels from solar energy development within the SEZ would be expected to be minimal for viewpoints within the Meadow Valley Range WA.

- *Mormon Mountains.* Mormon Mountains is a 157,645-acre (638 km^2) congressionally designated WA located 24 mi (39 km) away at the point of closest approach northeast of the SEZ (Figure 11.3.14.2-2). The WA's rocky cliffs, narrow drainages, and rolling bajadas provide numerous opportunities for solitude. Recreational opportunities include camping, hiking, backpacking, hunting, and horseback riding.

  Visible areas of the WA within the 25-mi (40-km) radius of analysis total about 1,501 acres (6.1 km^2) in the 650-ft (198.1-m) viewshed, or 0.7% of the total WA acreage, and 981 acres (4.0 km^2) in the 24.6-ft (7.5-m) viewshed, or 0.6% of the total WA acreage. Areas of the WA with potential visibility of solar facilities within the SEZ extend to beyond 25 mi (40 km) from the northeastern corner of the SEZ.

  Solar facilities within the SEZ would be in view of many of the west- and southwest-facing slopes of the Mormon Mountains, but most of these areas are beyond 25 mi (40 km) from the SEZ. Within the 25-mi (40-km) SEZ viewshed, areas in the WA with views of the SEZ occur on the lower portions of a bajada in the far southern end of the WA.

  Intervening terrain provides substantial partial screening of the SEZ for nearly all WA viewpoints within the 25-mi (40-km) SEZ viewshed. Views toward the SEZ would be at a very low vertical angle, and the SEZ would occupy a very small portion of the horizontal field of view. Both factors would substantially reduce visual contrast levels. Where visible, collector/reflector arrays for solar facilities within the SEZ would be seen edge on, which would reduce their apparent size and cause them to appear to repeat the line of the valley floor in which the SEZ is located. This would tend to reduce visual contrast. Operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located, or against the base of the Arrow Canyon Range. At night, sufficiently tall power towers in the SEZ could have red or white flashing hazard navigation lighting that could potentially be visible from the WA.

Because of the partial screening and the very long distance to the SEZ (24+ mi [39+ km]), expected visual contrast levels associated with solar energy development within the SEZ would be minimal for WA viewpoints within the 25-mi (40 km) SEZ viewshed.

- *Muddy Mountains.* Muddy Mountains is a 44,522-acre (180.2-km^2) congressionally designated WA located 6.6 mi (10.6 km) away at the point of closest approach southeast of the SEZ (Figure 11.3.14.2-2). Portions of the Muddy Mountains WA provide outstanding opportunities for solitude. The wilderness provides outstanding recreation opportunities for hiking on and off trail, scenic viewing, hunting, and exploration (BLM and NPS 2007).

  Visible areas of the WA within the 25-mi (40-km) radius of analysis total about 5,798 acres (23.5 km^2) in the 650-ft (198.1-m) viewshed, or 13% of the total WA acreage, and 3,940 acres (16.0 km^2) in the 24.6-ft (7.5-m) viewshed, or 9% of the total WA acreage. The visible area of the WA extends about 12 mi (19 km) from the southeastern boundary of the SEZ.

  Solar facilities could be visible from scattered areas throughout the peaks of the Muddy Mountains in much of the western half of the WA. The Dry Valley Range provides at least partial screening of the SEZ for lower elevation views within the WA, but for some of the higher peaks, a substantial portion of the SEZ would be in view over the mountains of the Dry Lake Range. For some of the very highest viewpoints within the WA, the SEZ would stretch across most of the horizontal field of view, and moderate visual contrasts would be expected as a result.

  Figure 11.3.14.2-9 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the northern portion of the SRMA, about 10 mi (16 km) southeast of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

  The viewpoint in the visualization is about 2,800 ft (850 m) higher in elevation than the SEZ. Solar facilities within the SEZ would be seen in a narrow band just above the Dry Lake Range and just under the Arrow Canyon Range. The view direction is offset 45 degrees to the long north-south axis of the SEZ, which would result in the SEZ occupying most of the horizontal field of view. The viewpoint is sufficiently elevated that the tops of collector/reflector arrays for solar facilities within the SEZ would be visible,

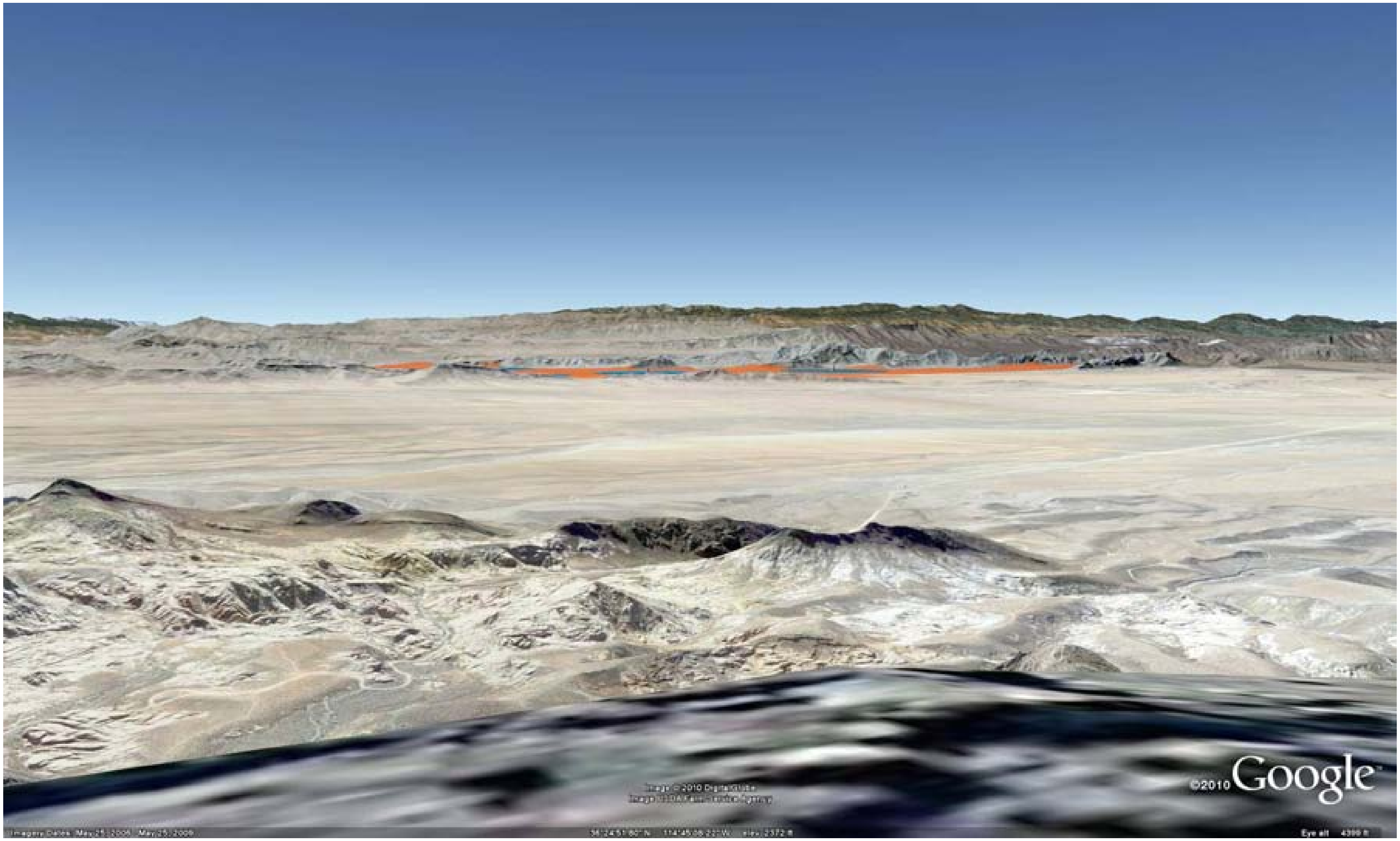

FIGURE 11.3.14.2-9 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Peak in Muddy Mountains WA

which would make their large areal extent and strong regular geometry more apparent, tending to increase visual contrast with the more natural-appearing surroundings.

Ancillary facilities, such as buildings, cooling towers, and transmission towers, as well as any plumes, would likely be visible, and their forms, vertical lines, and movement (for plumes) projecting above the strong horizontal line of the collector/receiver arrays would add visual contrast.

Operating power tower receivers within the SEZ would likely appear as points of light against the backdrop of the Arrow Canyon Range. At night, sufficiently tall power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location. The lighting could attract visual attention, although other lights would be visible within and in the vicinity of the SEZ.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, primarily because of the large amount of horizontal field of view that solar facilities in the SEZ would occupy under the 80% development scenario analyzed in the PEIS, moderate visual contrasts would be expected at this viewpoint.

For other high-elevation viewpoints in the WA, views of solar facilities within the SEZ and resulting expected contrast levels would be similar. At lower elevations throughout the WA, however, contrast levels would be lower, even for viewpoints closer to the SEZ because of more extensive screening of views to the SEZ by the intervening Dry Lake Range. In general, under the 80% development scenario analyzed in the PEIS, moderate levels of visual contrast would be expected for high-elevation viewpoints in the WA, with weak levels of visual contrast expected for most lower-elevation viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.

ACECs

- *Rainbow Gardens.* The 38,777-acre (156.9-km^2) Rainbow Gardens ACEC is 9.3 mi (15.0 km) south of the SEZ at the closest point of approach (Figure 11.3.14.2-2). The resource values under protection within the Rainbow Gardens ACEC include geological, scientific, scenic, cultural, and sensitive plants (BLM 1998).

  About 844 acres (3.42 km^2), or 2% of the ACEC, is within the 650-ft (198.1-m) viewshed of the SEZ, and 217 acres (0.9 km^2) is in the 24.6-ft (7.5-m) viewshed, or 0.6% of the total ACEC acreage. The visible area of the ACEC extends from about 10 to 16 mi (16 to 26 km) from the southern boundary of the SEZ.

Solar facilities within the SEZ could be visible from scattered areas in the northwestern portion of the WA, generally at the summits and on north-facing slopes of Sunrise and Frenchman Mountains, and from neighboring peaks and ridges. From these high-elevation viewpoints, views of the SEZ would be over the tops of mountains in the Dry Lake Range and hills more directly south of the SEZ. Although the viewpoints are 1,000 to 2,000 ft (300 to 600 m) above the elevation of the SEZ, the vertical angle of view is low, and the SEZ area is partially screened by intervening topography. In addition, the views are along the SEZs' relatively narrow north-south axis, so that the SEZ would occupy only a small portion of the horizontal field of view, with weak visual contrasts expected from solar facilities within the SEZ as a result.

Where visible within the SEZ, the collector/reflector arrays of solar facilities would be seen nearly edge-on, which would decrease their apparent size and tend to conceal the strong regular geometry of the arrays, tending to reduce visual contrasts. The solar arrays would appear as lines just over the Dry Lake Range and would be partially screened by mountains in the range. Where visible, the facilities' edge-on appearance would tend to replicate the line of the valley in which the SEZ is located, reducing visual contrast.

Where visible, operating power tower receivers within the SEZ would likely appear as points of light on the northern horizon. The tower structures underneath the receivers would likely be discernable. Power towers in the closest parts of the SEZ might attract the attention of casual viewers located in the closest parts of the ACEC. At night, sufficiently tall power towers in the SEZ could have red or white flashing hazard navigation lighting that could potentially be visible from the WA. Because of the extensive screening and the long distance to the SEZ (20+ mi [32+ km]), expected visual contrast levels associated with solar energy development within the SEZ would be minimal for ACEC viewpoints within the 25-mi (40 km) SEZ viewshed.

- *River Mountains.* The 10,950-acre (44.313-km^2) River Mountains ACEC is located about 20 mi (32 km) south of the SEZ at the closest point of approach. The resource values under protection within the River Mountains ACEC include bighorn sheep habitat and the scenic viewshed for Henderson and Boulder City (BLM 1998).

  About 1,962 acres (7.9 km^2), or 18% of the ACEC, is within the 650-ft (198.1-m) viewshed of the SEZ. None of the ACEC is within the 24.6-ft (7.5-m) viewshed. The visible area of the ACEC extends from the point of closest approach to beyond 25 mi (40 km) from the southern boundary of the SEZ.

  Solar facilities within the SEZ could be visible from scattered locations throughout the peaks and ridge tops within the WA. Views of the SEZ from the ACEC are largely screened by mountains in the Dry Lake Range, and visibility of solar facilities within the SEZ would be limited to the upper portions of power towers. In addition, the views are along the SEZ's relatively narrow north-south axis, so that the SEZ would occupy only a very small portion of the horizontal field of view.

Where visible, operating power tower receivers within the SEZ would likely appear as distant points of light on the northern horizon. Because of the extensive screening and the long distance to the SEZ (20+ mi [32+ km]), expected visual contrast levels associated with solar energy development within the SEZ would be minimal for ACEC viewpoints within the 25-mi (40 km) SEZ viewshed.

Scenic Byways

- *Bitter Springs Backcountry Byway*. The Bitter Springs Backcountry Byway is a 28-mi (45-km) BLM-designated scenic byway that passes within about 6.6 mi (10.6 km) of the SEZ; about 9.3 mi (15.0 km) of the byway are within the SEZ 650-ft (198.1-m) and 24.6-ft (7.5 m) viewsheds. The byway follows Bitter Springs Road, a single lane dirt road.

  The SEZ would be visible from the byway east of the Crystal exit on I-15 up to where the byway enters the Muddy Mountains. Maximum visibility of solar facilities within the SEZ would occur close to I-15; as the road passes southeast, the Dry Lake Range screens all but the northernmost portions of the SEZ from view. Because of screening by intervening topography, even near Crystal, contrast levels from solar facilities would be relatively low and would not be expected to rise above weak levels.

  Eastbound travelers would be in the SEZ viewshed at the beginning of the trail where it splits off from the Valley of Fire Highway. The SEZ would be directly west of the byway at this point; however, the direction of travel would be south-southeast, so that vehicle occupants would have to turn their heads to the right and slightly behind them to see solar facilities within the SEZ. If travelers looked toward the SEZ, the Dry Lake Range would screen most of the SEZ from view. Furthermore, the roadway is about 100 ft (30 m) lower in elevation than the SEZ, so visibility of solar facilities within the SEZ would be very limited. If power towers and other tall ancillary facility components, such as transmission towers or cooling towers, were located in the SEZ such that they were visible through one or more of several gaps in the Dry Lake Range, they could create visual contrasts for eastbound byway travelers, and at a distance of 8 mi (13 km), contrasts could be noticeable to casual viewers. However, the gaps are small so that views would be fleeting, and given the direction of travel away from the SEZ, expected impacts resulting from brief views of these visual contrasts from solar facilities in the SEZ would be minimal.

Westbound travelers on the byway would have a different visual experience than eastbound travelers because the view to the SEZ would be generally close to the direction of travel, so the number of views and the average view length would be greater.

From the east, the Bitter Springs Backcountry Byway enters the 25-mi (40-km) SEZ viewshed as it descends from the Muddy Mountains about 11 mi (18 km) east of the SEZ. In these hills, screening vegetation is largely absent, and there could be intermittent visibility of solar facilities in the SEZ because of screening by hills in the foreground between the byway and the SEZ. Solar facilities could be viewed only briefly as the road twists and turns among the hills, and would occupy a very small portion of the field of view. However, at about 10 mi (16 km [straight line distance]) from the SEZ, a larger portion of the SEZ would come into view and for a brief segment would be more or less directly in front of eastbound Bitter Springs Backcountry Byway travelers. A Google Earth visualization depicting the view from this location on the byway is shown in Figure 11.3.14.2-10. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in this visualization is about 10 mi (16 km) from the closest point in the SEZ, but the closest point in the SEZ visible in the visualization is about 14 mi (23 km) from the viewpoint. The viewpoint is about 1,000 ft (300 m) higher in elevation than the SEZ.

The visualization shows that the northern portion of the SEZ would be visible from the byway through a substantial gap in the Dry Lake Range. Despite the elevated viewpoint, at about 14 mi (23 km) the vertical angle of view would be very low. Because of screening by the Dry Lake Range, the visible portions of the SEZ would occupy a small portion of the horizontal field of view. The collector/reflector arrays of solar facilities within the SEZ would be seen nearly edge-on, which would make their large areal extent less apparent and conceal their strong regular geometry, as well as making them appear to repeat the strong horizontal line of the Dry Lake Valley floor.

If power towers were located in the SEZ, depending on their height and location within the SEZ, when operating the receivers could be visible over the tops of the mountains in the Dry Lake Range. The receivers would likely appear as points of light atop barely discernable tower structures against the backdrop of the Arrow Canyon Range. At night, sufficiently tall power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location.

Because of the partial screening of the SEZ, the low viewing angle, and the relatively long distance to the SEZ, under the 80% development scenario analyzed in the PEIS, weak levels of visual contrast from solar facilities in the SEZ would be expected for this viewpoint.

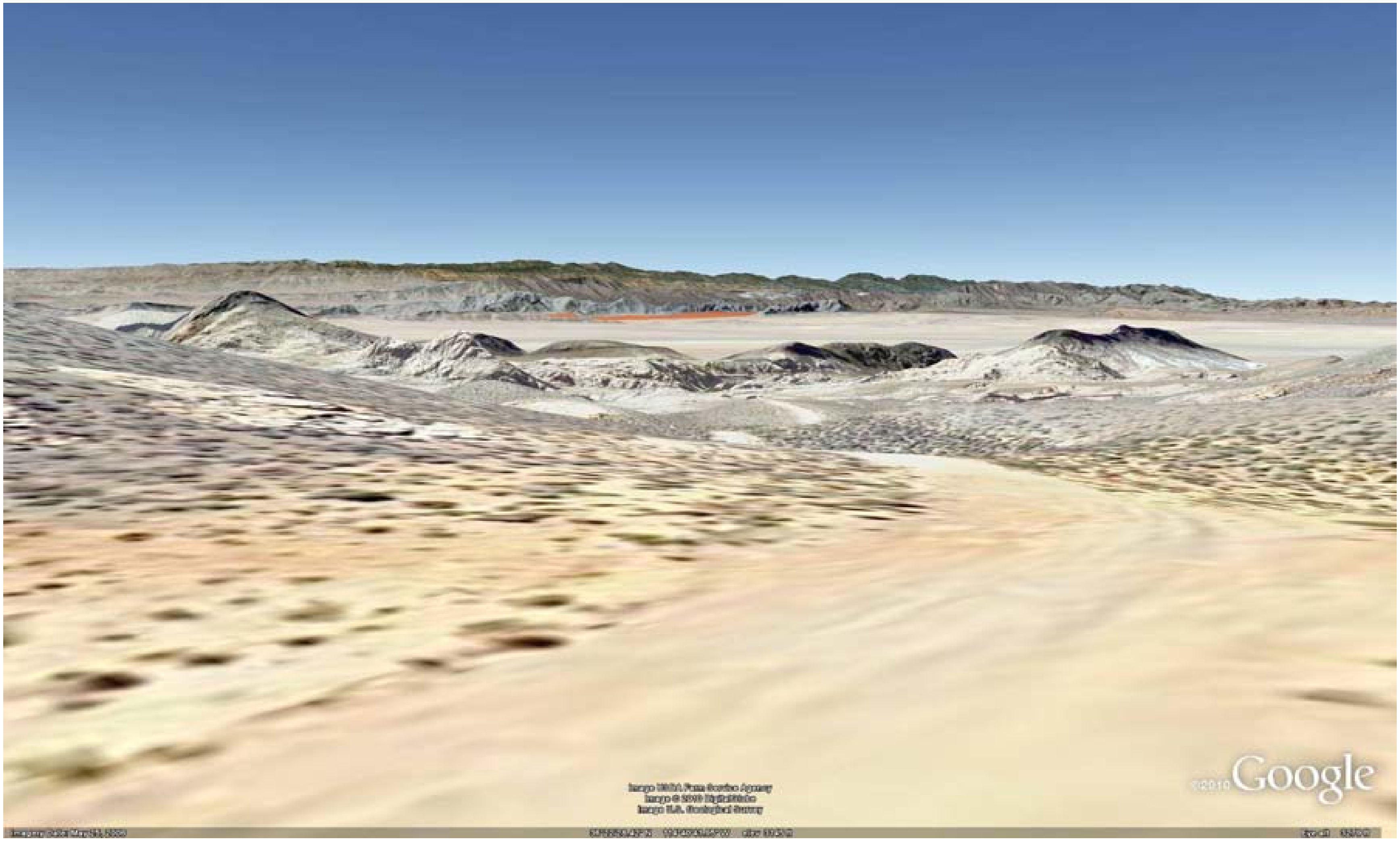

FIGURE 11.3.14.2-10 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the Bitter Springs Backcountry Byway in the Muddy Mountains

Beyond this section of the byway, the elevation drops rapidly, and views of the SEZ would be screened by canyon walls and hills until the byway leaves the Muddy Mountains about 8.6 mi (13.8 km) from the nearest point in the SEZ. Having lost several hundred feet of elevation, as the byway runs north-northwest toward I-15, the Dry Lake Range would continue to screen most of the SEZ from view. The lowered elevation would result in very low-angle views to solar facilities in the SEZ, and visual contrast levels would not be expected to rise above weak levels.

Contrast levels for westbound travelers would peak (still at weak levels) near the northern terminus of the Bitter Springs Backcountry Byway at Valley of Fire Highway. A Google Earth visualization depicting the view from this location on the byway is shown in Figure 11.3.14.2-11. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in this visualization is about 7 mi (11 km) from the closest point in the SEZ. The viewpoint is about 100 ft (30 m) lower in elevation than the SEZ.

The visualization shows that portions of the SEZ would be visible from the byway through two gaps in the Dry Lake Range. Because the viewpoint elevation is lower than the SEZ, the vertical angle of view would be extremely low. The visible portions of the SEZ would occupy a moderate portion of the horizontal field of view. The collector/reflector arrays of solar facilities within the SEZ would be seen edge-on, which would make their large areal extent much less apparent and conceal their strong regular geometry, as well as making them appear to repeat the strong horizontal line of the Dry Lake Valley floor. Ancillary facilities such as buildings, cooling towers, transmission structures, and plumes (if present) would likely be visible projecting above the collector/reflector arrays of solar facilities within the SEZ. This would result in form, line, and potentially color contrast with the strongly horizontal collector/reflector arrays and the more natural appearing surrounding landscape.

If power towers were located in the SEZ, depending on their height and location within the SEZ, the power tower receivers would likely appear as bright points of light atop discernable tower structures against the backdrop of the Arrow Canyon Range. At night, sufficiently tall power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location, and other lighting associated with solar facilities in the SEZ could be visible as well.

Because of the partial screening of the SEZ, the low viewing angle, and the relatively long distance to the SEZ, under the 80% development scenario analyzed in the PEIS, weak levels of visual contrast from solar facilities in the SEZ would be expected for this viewpoint.

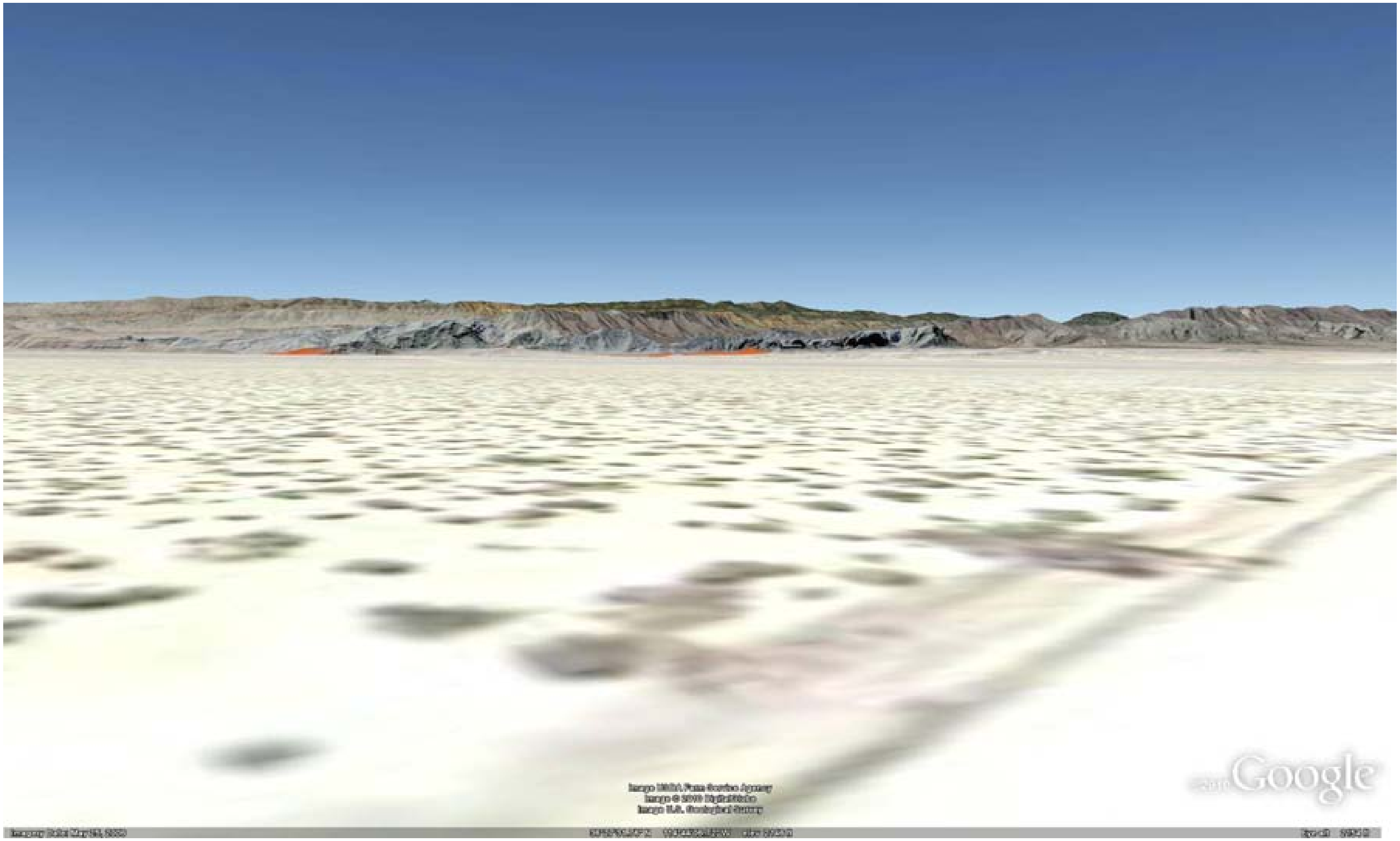

FIGURE 11.3.14.2-11 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the Bitter Springs Backcountry Byway near Valley of Fire Highway

In general, given the partial screening of much of the SEZ by the Dry Lake Range and the low vertical angle of view from the byway to the SEZ, under the 80% development scenario analyzed in the PEIS, weak levels of visual contrast would be expected for travelers on the Bitter Springs Backcountry Byway.

- *Las Vegas Strip*. The Las Vegas Strip is a 4.5-mi (7.2-km) All American Road (congressionally designated) and state-designated scenic boulevard that is located 19 mi (31 km) southwest of the SEZ. About 0.8 mi (1.3 km) of the scenic byway is within the SEZ 650-ft (198.1-m) viewshed.

  The Las Vegas Strip Scenic Byway is located in a highly developed urban center and is surrounded by buildings and other obstructions. Although indicated as falling within the 25-mi (40 km) viewshed of the SEZ, solar development within the SEZ would not be visible from the Las Vegas Strip, and no visual impacts would be expected.

Special Recreation Management Areas

- *Las Vegas Valley*—The Las Vegas Valley SRMA is a BLM-designated SRMA located 6.1 mi (9.8 km) southwest of the SEZ at the point of closest approach (Figure 11.3.14.2-2). It covers 447,244 acres (1,809.9 km^2). The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 18,166 acres (73.5 km^2), or 4% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes 9 acres (0.04 km^2), or 0.002% of the total SRMA acreage. The areas within the SRMA with potential views of solar facilities within the SEZ extend from about 11 mi (18 km) from the southern boundary of the SEZ to beyond 25 mi (40 km) into the SRMA; however, as noted, for all but 9 acres (0.04 km^2), visibility would be limited to the upper portions of sufficiently tall power towers within the SEZ.

  The viewshed analysis indicates that in the SRMA, potential visibility of solar facilities would be limited to two areas: about 1,600 acres (6.5 km^2) in the northeast portion of the SRMA and a much larger area within the heavily urbanized center of Las Vegas. Because of screening by buildings and other obstructions, and given the very long distance to the SEZ, in actuality it is expected that there would be no visibility of the solar facilities within the SEZ from the central area of Las Vegas. Solar facilities within the SEZ could, however, be visible from the smaller area in the northwest portion of the SEZ. The area is about 11 mi (18 km) south of the SEZ. Views toward the SEZ from this area would include a number of cultural disturbances–Nellis Air Force Base would be seen just north of the viewpoint, and closer to the SEZ I-15, a major transmission line, a railroad line, a mining facility, and various other facilities and roads would also be visible.

From about 9 acres (0.04 km^2) at the northern end of the ridge at the peak of Sunrise Mountain, low-height solar facilities within the SEZ could be visible, but most of the SEZ would be screened from view by hills south of the SEZ. Solar facilities within a very small portion of the SEZ could be visible, but the angle of view would be very low, and the visible portions of the SEZ would occupy a very small portion of the horizontal field of view.

Where visible within the SEZ, the collector/reflector arrays of solar facilities would be seen nearly edge-on, which would decrease their apparent size and tend to conceal the strong regular geometry of the arrays, thus reducing visual contrasts. The solar arrays would appear as lines just over the hills immediately south of the SEZ. Where visible, the facilities' edge-on appearance would tend to replicate the line of the valley in which the SEZ is located, thereby reducing visual contrast.

Where visible, operating power tower receivers within the SEZ would likely appear as points of light at the base of the Arrow Canyon Range north of the SEZ. The tower structures underneath the receivers would likely be discernable. Power towers in the closest parts of the SEZ might attract the attention of casual viewers located in the closest parts of the ACEC. At night, sufficiently tall power towers in the SEZ could have red or white flashing hazard navigation lighting that could potentially be visible from the SRMA. Other lighting associated with solar facilities could potentially be visible as well.

At lower elevations within the SEZ, contrasts from solar facilities within the SEZ would be less, because of nearly complete screening of views of the SEZ by the hills south of the SEZ. Because of the extensive screening of views of the SEZ from viewpoints within the SRMA, expected visual contrast levels associated with solar energy development within the SEZ would be weak for SRMA viewpoints within the 25-mi (40-km) SEZ viewshed.

- *Muddy Mountains.* The Muddy Mountains SRMA is a BLM-designated SRMA located 4.5 mi (7.2 km) southeast of the SEZ at the point of closest approach (see Figure 11.3.14.2-2). It covers 128,493 acres (520 km^2).

  The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 25,741 acres (104.2 km^2), or 20% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes 21,027 acres (85.1 km^2), or 16% of the total SRMA acreage. The visible area extends from the point of closest approach to 12 mi (19 km) into the SRMA from the southeast boundary of the SEZ.

  Solar facilities could be visible from scattered areas throughout the peaks of the Muddy Mountains in much of the western half of the SRMA, as well as the bajada at the base of the western slopes of the Muddy Mountains. The Dry

Valley Range provides at least partial screening of the SEZ for lower-elevation views within the SRMA, but for some of the higher peaks closer to the SEZ, a substantial portion of the SEZ would be in view over the mountains of the Dry Lake Range. For some of the very highest viewpoints within the SRMA, the SEZ would stretch across most of the horizontal field of view, and strong visual contrast would be expected as a result.

Figure 11.3.14.2-12 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the northern portion of the SRMA, about 11 mi (18 km) from the easternmost point of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 2,100 ft (640 m) higher in elevation than the SEZ. Solar facilities within the SEZ would be seen in a narrow band just above the Dry Lake Range and just under the Arrow Canyon Range. The view direction is nearly perpendicular to the long north-south axis of the SEZ, which would result in the SEZ's occupying most of the horizontal field of view. Despite the elevated viewpoint, collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge-on, which would reduce their apparent size and cause them to appear to repeat the line of the valley floor in which the SEZ is located, thus tending to reduce visual contrast.

Ancillary facilities, such as buildings, cooling towers, and transmission towers, as well as any plumes, would likely be visible, and their forms, vertical lines, and movement (for plumes) projecting above the strong horizontal line of the collector/receiver arrays would add visual contrast.

Operating power tower receivers within the SEZ would likely appear as points of light against the backdrop of the Arrow Canyon Range. At night, sufficiently tall power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location. Despite the distance, the lighting could attract visual attention, although other lights would be visible within and in the vicinity of the SEZ.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, primarily because of the large amount of horizontal field of view that solar facilities in the SEZ would occupy under the 80% development scenario analyzed in the PEIS, moderate visual contrasts could be expected at this viewpoint.

Farther south from this viewpoint within the SRMA, views of solar facilities within the SEZ and resulting expected contrast levels would be similar. At lower elevations throughout the SRMA, however, contrast levels would be lower, even for viewpoints closer to the SEZ because of more extensive

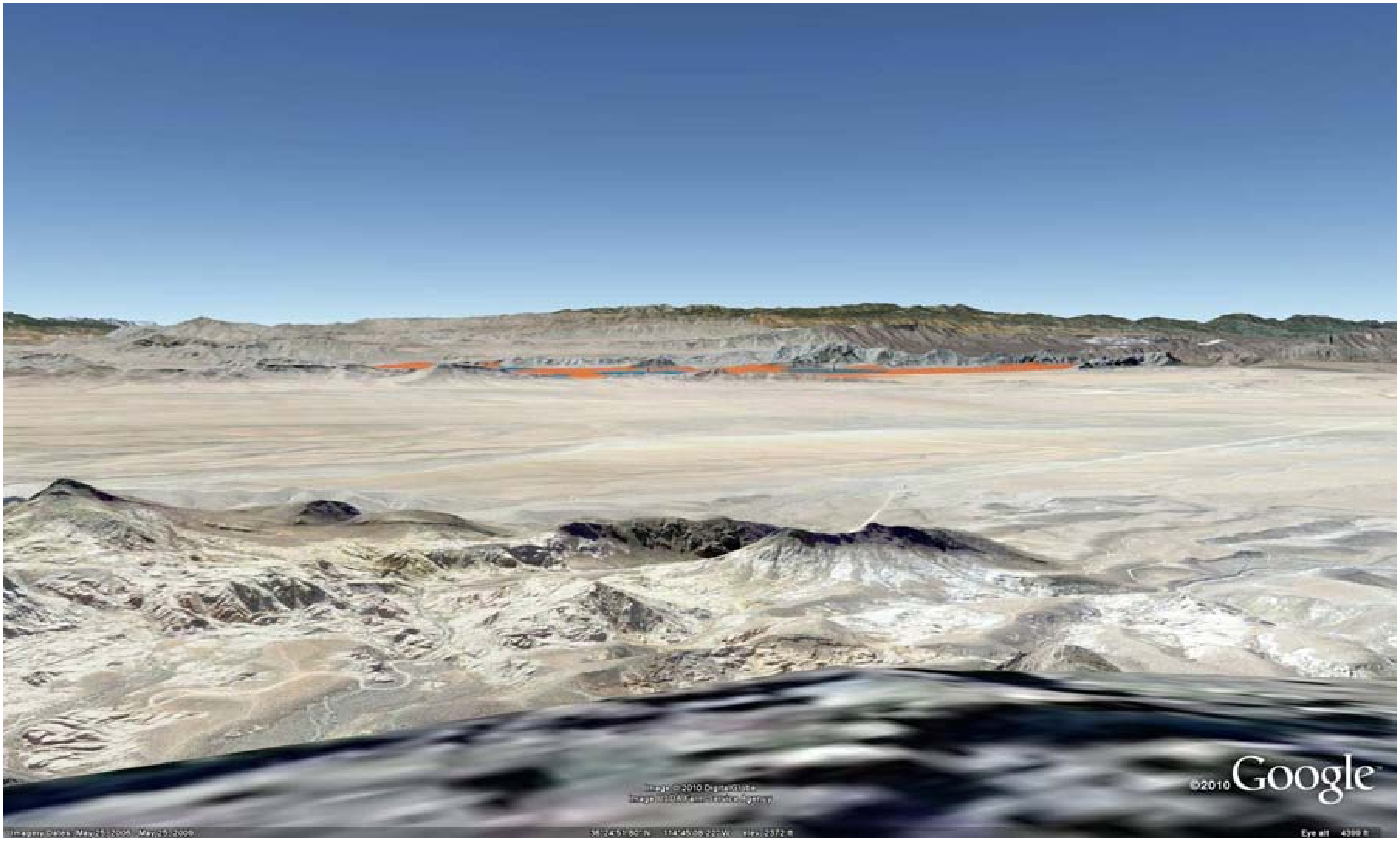

FIGURE 11.3.14.2-12 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Peak in Muddy Mountains SRMA

screening of views to the SEZ by the intervening Dry Lake Range. In general, under the 80% development scenario analyzed in the PEIS, moderate levels of visual contrast would be expected for high-elevation viewpoints in the SRMA, with weak levels of visual contrast expected for most lower-elevation viewpoints in the SRMA located within the SEZ 25-mi (40-km) viewshed.

- *Nellis Dunes.* The Nellis Dunes SRMA is a BLM-designated SRMA located 4.3 mi (6.9 km) south of the SEZ at the point of closest approach (Figure 11.3.14.2-2). It contains 8,921 acres (36.1 km^2). The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 448 acres (1.8 km^2), or 5% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes 310 acres (1.3 km^2), or 4% of the total SRMA acreage. The areas within the SRMA with potential views of low-height solar facilities in the SEZ extend from the point of closest approach at the northern boundary of the SRMA to 5.2 mi (8.4 km) into the SRMA. These areas are thus in the far northern portion of the SRMA. There is an area farther south in the SRMA where visibility of solar facilities would be limited to the upper portions of tall power towers because of screening from ridges in the northern portions of the SRMA. This small area is located about 7.1 mi (11.4 km) from the closest point in the SEZ.

  The northern portions of the Nellis Dunes SRMA include southwest–northeast trending ridges with peaks 500 to 600 ft (150 to 180 m) higher than the SEZ. From the tops of the highest ridges in the SRMA, visibility of the SEZ within the SRMA would be good, with solar development likely to be plainly visible despite partial screening of the SEZ by the Dry Lake Range and hills directly north of the SRMA. Views toward the SEZ would include a number of cultural disturbances, including I-15, a major transmission line, a railroad line, a mining facility, and various other facilities and roads. Currently existing transmission facilities in the SEZ could also be visible.

  Figure 11.3.14.2-13 is a Google Earth visualization of the SEZ as seen from the highest ridge in the SRMA, about 5.0 mi (8.0 km) from the SEZ. The viewpoint is just within the BLM VRM program foreground-middleground distance of 3 to 5 mi (5 to 8 km).

  The viewpoint in the visualization is about 600 ft (180 m) lower in elevation than the nearest point in the SEZ. The SEZ would be viewed along its long and narrow south-to-north axis, which would decrease the apparent width of the SEZ as seen from this viewpoint. The SEZ would occupy a moderate amount of the horizontal field of view. Solar facilities within the SEZ would be seen in a band along the horizon at the base of the Arrow Canyon Range.

  Because of the elevated viewpoint and relatively short distance to the SEZ, the vertical angle of view would be high enough that the tops of solar collector/ reflector arrays in the SEZ would be visible, which would make their large

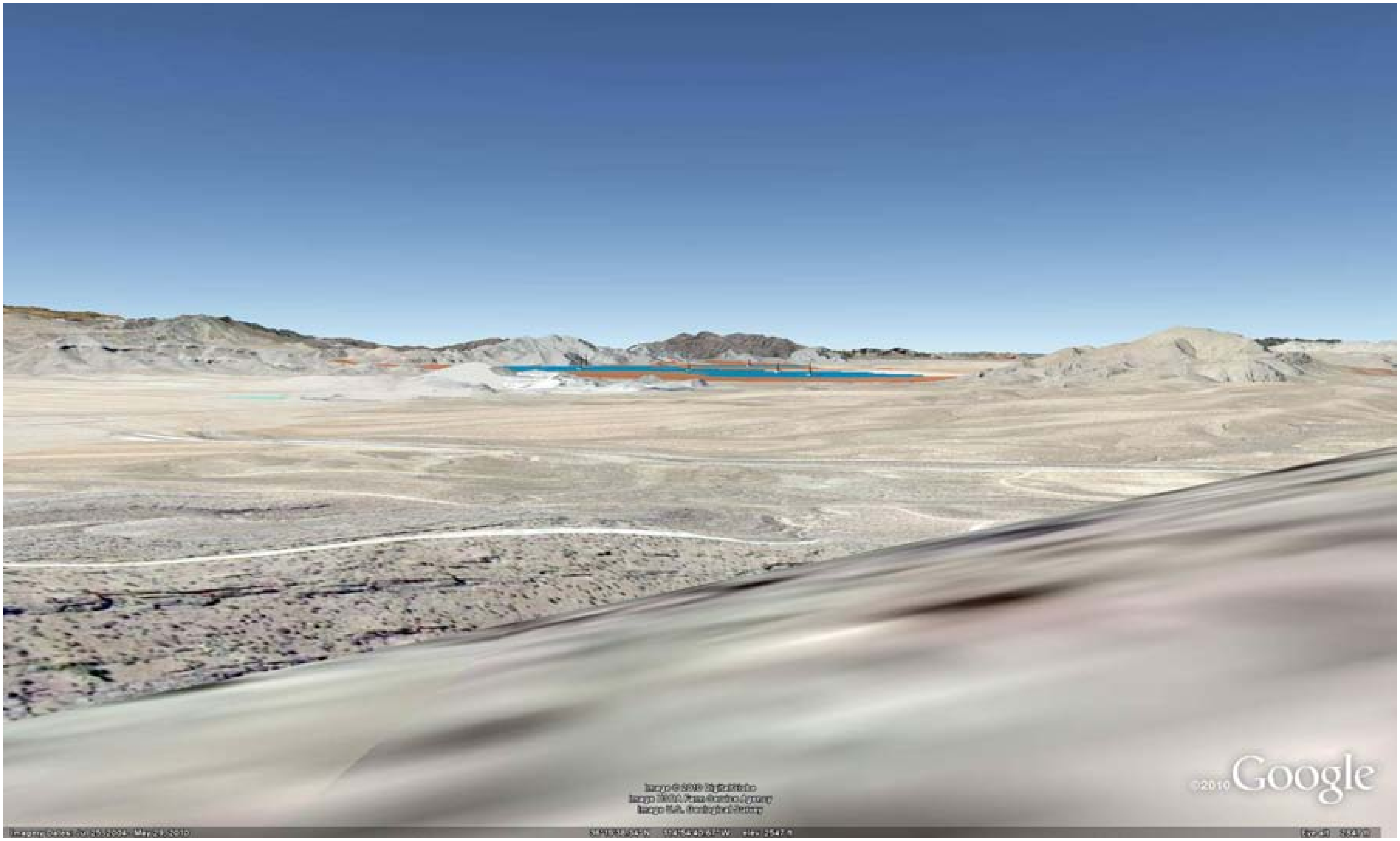

FIGURE 11.3.14.2-13 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a High Ridge in the Nellis Dunes SRMA

areal extent and strong regular geometry more apparent, tending to increase visual contrast with the surrounding natural-appearing landscape.

Ancillary facilities, such as buildings, cooling towers, and transmission towers, as well as any plumes, would likely be visible, and their forms, lines, and movement (for plumes) projecting above the strong horizontal line of the collector/receiver arrays could attract visual attention.

Operating power tower receivers within closer portions of the SEZ would likely appear as very bright, nonpoint light sources atop the tower structures, against a backdrop of the mountains, and could strongly attract visual attention. Power tower receivers in the more distant northern portion of the SEZ (up to 16 mi [26 km] from the viewpoint) would create substantially lower levels of contrast. At night, sufficiently tall towers could have red flashing lights, or white or red flashing strobe lights that could be visually conspicuous, although other lights would be visible within the SEZ and in surrounding areas.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, under the 80% development scenario analyzed in this PEIS, moderate visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. The presence within the viewshed of the existing major cultural disturbances described above would tend to reduce contrast from solar facilities in the SEZ, relative to contrast levels that would be observed in a more visually pristine setting.

At lower elevation viewpoints north of the ridges in the SRMA, the angle of view to the SEZ is much lower, increasing screening due to intervening terrain, but also reducing the apparent size of solar collector/reflector arrays in the SEZ and concealing their strong regular geometry, thereby reducing visual contrasts to weak levels. For the area farther south in the SRMA where visibility of solar facilities within the SEZ would be limited to the upper portions of tall power towers, expected visual contrast levels would also be weak, because of the partial screening and the increased distance to the SRMA.

In summary, the Nellis Dunes SRMA is sufficiently close to the SEZ that for some viewpoints within the SRMA, solar energy development within the SEZ would be expected to result in moderate visual contrast levels. Lower contrast levels would be expected for lower elevation viewpoints throughout the SRMA, and for higher elevation viewpoints farther south in the SRMA, farther from the SEZ.

- *Sunrise Mountain.* Sunrise Mountain SRMA is a 33,322-acre (134.9-km^2) BLM-designated SRMA located 9.3 mi (15.0 km) south of the SEZ at the point of closest approach (Figure 11.3.14.2-2).

  The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 891 acres (3.61 km^2), or 3% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes 218 acres (0.9 km^2), or 0.7% of the total SRMA acreage. The visible area extends from 11 mi (18 km) from the southern boundary of the SEZ to 17 mi (27 km) into the SRMA.

  The Sunrise Mountain SRMA is wholly contained within the Rainbow Gardens ACEC. Visual contrast levels associated with solar facilities in the SEZ as observed from the Sunrise Mountain SRAM would be identical to those observed from the Rainbow Gardens ACEC (see analysis above).

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by other facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. A 500-kV transmission line goes through the proposed SEZ, so no new construction would be required outside of the SEZ to connect to that line. Roads and transmission lines would be constructed within the SEZ as part of the development of the area. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 500-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. Depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.12.1. A detailed site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

Impacts on Selected Other Lands and Resources

Interstate 15. Almost 38 mi (61 km) of I-15 are within the proposed Dry Lake SEZ viewshed, and almost 3.7 mi (6.0 km) of I-15 pass along and through the southeasternmost portion of the SEZ. The AADT value for I-15 in the vicinity of the SEZ was about 24,000 vehicles in 2009 (NV DOT 2010). I-15 is the main travel route between Las Vegas and Salt Lake City.

For northbound travelers on I-15, solar facilities within the SEZ would first come into view about 1.0 mi (1.6 km) north of the I-15–State Route 604 interchange and about 5 mi (8 km) south of the SEZ itself. Hills immediately south of the SEZ would screen much of the SEZ from view from I-15 until about 3 mi (5 km) from the SEZ, as travelers approached a mining operation in hills just south of the SEZ and west of I-15. At this point, views of the southern portion of the SEZ would open up, and expected visual contrasts would quickly rise to strong levels. I-15 enters the SEZ at the SEZ's southeast corner, and for about the next 1.5 mi (2.4 km) passes along the SEZ's southeastern boundary, with potential views of solar facilities in the SEZ to the front and left side of northbound vehicles only. After 1.5 mi (2.4 km), the SEZ extends to the east of I-15, and solar facilities could be visible on all sides of north-bound vehicles, although the bulk of the SEZ would still be west of I-15. Throughout this section of the highway, strong visual contrasts from solar facilities within the SEZ would be expected.

Figure 11.3.14.2-14 is a Google Earth visualization of the SEZ as seen from I-15, about 1.9 mi (3.1 km) north of the U.S. 93 interchange, facing west toward a cluster of four power tower models northwest of the viewpoint. The center of the cluster is about 2.0 mi (3.2 km) from the viewpoint, and the closest tower is about 1.1 mi (1.8 km) from the viewpoint. The visualization suggests that from this location, solar facilities within the SEZ would be in full view. The SEZ would occupy more than the entire field of view, so travelers would have to turn their heads to scan across the full SEZ. Facilities located within the southern portion of the SEZ would strongly attract the eye and likely dominate views. Structural details of some facility components for nearby facilities would likely be visible. Buildings, transmission towers and other tall facility components, as well as plumes (if present) would be seen projecting above the collector/reflector arrays, and they could contrast noticeably with the strongly horizontal and regular geometry of the collector/reflector arrays. From this viewpoint, solar collector arrays would be seen nearly edge-on and would repeat the horizontal line of the plain in which the SEZ is situated, which would tend to reduce visual line contrast. For nearby facilities, the collector arrays could be of large enough apparent size that their individual forms could be seen, and they would no longer appear as horizontal lines.

If power towers were located within the SEZ close to this viewpoint, the receivers would likely appear as brilliant white non-point light sources atop towers with structural details clearly discernable. The towers and receivers would be viewed against either a sky backdrop or the darker hues of the Arrow Canyon Range and would strongly attract visual attention. Also, under certain viewing conditions, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s).

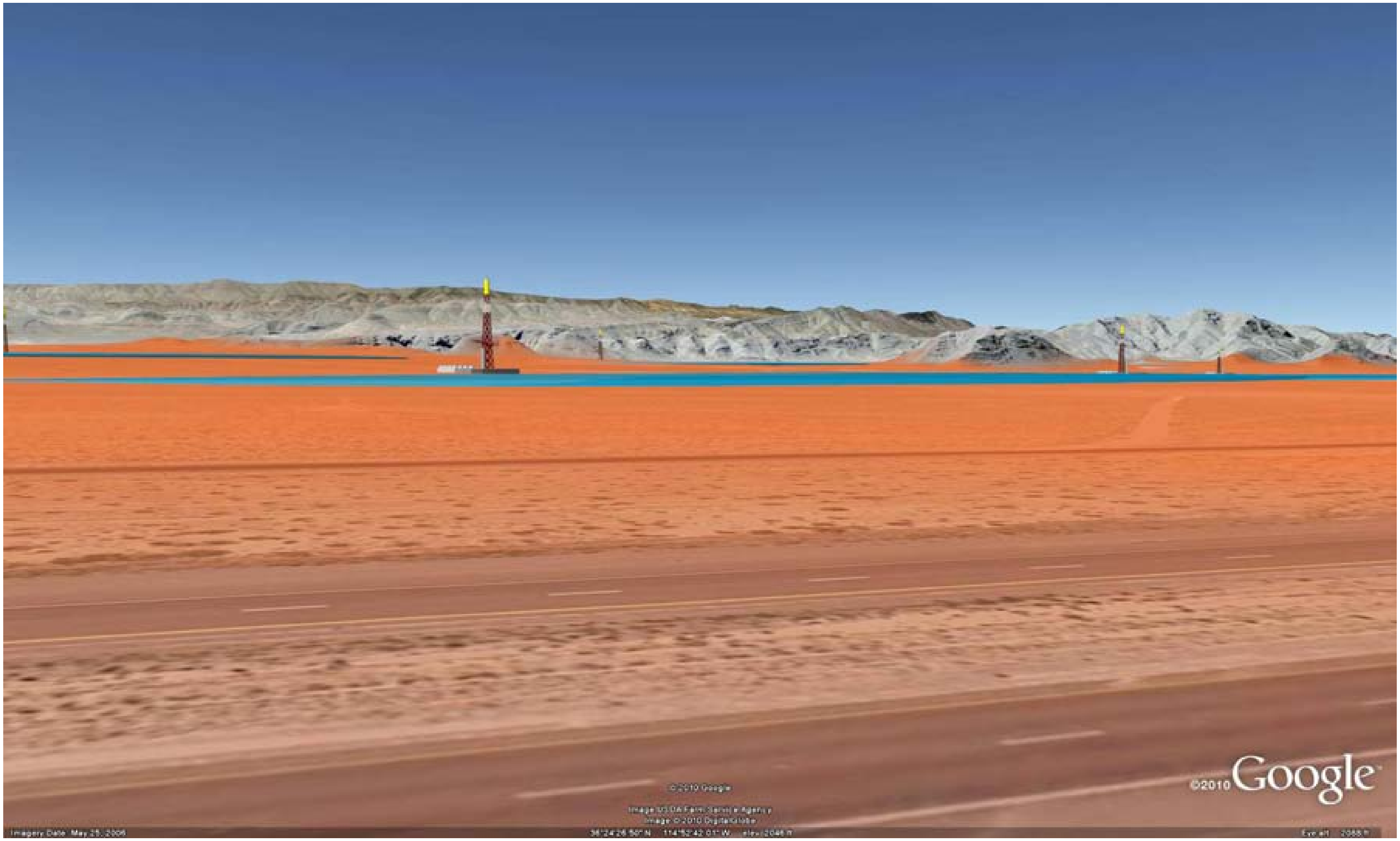

FIGURE 11.3.14.2-14 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from I-15 within the Proposed Dry Lake SEZ

At night, sufficiently tall visible power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that could be very conspicuous from this viewpoint. However, there would be other lights visible within and in the area of the SEZ, which could decrease the perception of visual impact created by the lights.

As noted above, there are numerous large-scale cultural disturbances already visible in and near the SEZ, and the addition of solar facilities into the already visually complex and partially man-made appearing landscape would result in lower contrast levels than if the solar facilities were being placed into a visually pristine landscape. However, under the 80% development scenario analyzed in the PEIS, the SEZ could contain numerous solar facilities utilizing differing solar technologies as well as a variety of roads and ancillary facilities. The addition of multiple solar facilities could add substantially to the existing visually complex landscape, to the extent that it would exceed the visual absorption capability of the valley in which the SEZ is located, leading to a perception of visual "clutter" that could be perceived negatively by viewers.

Because the SEZ would occupy more than the horizontal field of view and because of the potentially very close proximity of solar facilities to this location, although contrast levels would depend on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, strong visual contrasts from solar energy development within the SEZ would be expected at this viewpoint.

At highway speeds, travelers would pass through the 3.8 mi (6.1 km) segment of I-15 along and in the SEZ in about 3.5 minutes. Shortly after reaching the viewpoint just described, visual contrast for northbound I-15 travelers would begin to diminish, as the direction of travel would be toward the northeast, away from the SEZ. Views to the left of northbound vehicles, however, would still be subject to strong visual contrasts, as solar facilities within the SEZ could still stretch across the entire horizontal field of view and would still be relatively close to the viewers (less than 4 mi [6 km]). About 3.6 mi (5.8 km) north of the point where I-15 passes out of the SEZ, I-15 turns farther to the northeast, and contrast levels would drop more quickly after that point. Ridges immediately west of I-15 would cut off views of the SEZ intermittently as travelers proceeded north on I-15.

Southbound travelers on I-15 would see the same types and levels of visual contrasts from solar development within the proposed Dry Lake SEZ as northbound travelers, but in reverse order. The upper portions of tall power towers could potentially be seen briefly starting northeast of the SEZ, but glimpses would be fleeting and contrast levels generally minimal. After passing the Valley of Fire Highway, visual contrast levels would rise and then very quickly reach strong levels as travelers approached and passed through the SEZ after entering the Dry Lake Range. Contrasts would drop quickly after southbound travelers passed through the SEZ.

In summary, solar facilities within the SEZ could be in view from I-15 for about 35 minutes driving time at highway speeds, but most travelers' views would be much briefer. Facilities within the SEZ could be in view from about 38 mi (61 km) of the roadway, but contrast levels would generally be minimal or weak for I-15 except where the highway passes through the Dry Lake Range and especially the SEZ itself, where contrast levels would likely be strong.

U.S. Highway 93. Almost 13 mi (21 km) of U.S. 93 are within the SEZ viewshed, and about 4.5 mi (7.2 km) of U.S. 93 pass along the SEZ's southwestern boundary. The road then passes the southern end of the Arrow Canyon Range and turns north, paralleling the SEZ's western boundary, but largely screened from view of the SEZ by the Arrow Canyon Range. Strong visual contrast levels would be expected for those portions of the road that pass along the SEZ boundary and for about 2.1 mi (3.4 km) beyond, after which point contrast levels would drop greatly due to screening of the SEZ. On the western side of the Arrow Canyon Range, only the upper portions of sufficiently tall power towers might be visible through gaps in the Arrow Canyon Range, and only weak visual contrasts would be expected as a result. The AADT value for U.S. 93 in the vicinity of the SEZ was about 2,300 vehicles in 2009 (NV DOT 2010).

For northbound travelers, U.S. 93 begins at the junction with I-15, adjacent to the southwest corner of the SEZ. Because U.S. 93 borders the SEZ, expected visual contrast levels would start at strong levels and not drop to lower levels until northbound travelers passed the SEZ after about 4.5 mi (7.2 km), or about 4 minutes driving time at highway speeds. After passing the SEZ, visibility of solar facilities would be screened by the Arrow Canyon Range as U.S. 93 passed the southern end of the range.

Figure 11.3.14.2-15 is a Google Earth visualization of the SEZ as seen from U.S. 93, about 0.9 mi (1.5 km) west of the I-15 interchange, facing north toward a cluster of four power tower models. (Note because of the display properties of Google Earth, the SEZ is not shown directly adjacent to U.S. 93, but in fact U.S. 93 borders the SEZ.) The center of the cluster is about 2.5 mi (4.0 km) from the viewpoint, and the closest tower is about 1.8 mi (2.9 km) from the viewpoint. The visualization suggests that from this location, solar facilities within the SEZ would be in full view. The SEZ would occupy more than the entire field of view north of U.S. 93, so travelers would have to turn their heads to scan across the full SEZ. Facilities located within the southern portion of the SEZ would strongly attract the eye and likely dominate views from U.S. 93. Structural details of some facility components for nearby facilities would likely be visible. Steam plumes, transmission towers and other tall facility components would be seen against a sky backdrop, or could project above the mountains north of the SEZ. From this viewpoint, solar collector arrays would be seen nearly edge-on, and would repeat the horizontal line of the plain in which the SEZ is situated, which would tend to reduce visual line contrast. However, as the viewer approached closer to the collector arrays, they could increase in apparent size until their forms were visible, and they no longer appeared as horizontal lines.

If power towers were located within the SEZ close to this viewpoint, the receivers would likely appear as brilliant white non-point light sources atop towers with structural details clearly visible. The towers and receivers would strongly attract visual attention. Also, under certain viewing conditions, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s).

At night, sufficiently tall visible power towers in the SEZ would have red flashing lights or white or red flashing strobe lights that could be very conspicuous from this viewpoint, but there would be other lights visible within and in the area of the SEZ, which could decrease the perception of visual impact created by the lights.

FIGURE 11.3.14.2-15 Google Earth Visualization of the Proposed Dry Lake SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from U.S. 93 West of I-15 Interchange

As noted above, numerous large-scale cultural disturbances already are visible in and near the southern portion of the SEZ, and the addition of solar facilities into the already visually complex and partially man-made appearing landscape would result in lower contrast levels than if the solar facilities were being placed into a visually pristine landscape. However, under the 80% development scenario analyzed in the PEIS, the SEZ could contain numerous solar facilities utilizing differing solar technologies as well as a variety of roads and ancillary facilities. The array of facilities could add substantially to the existing visually complex landscape to the extent that it would exceed the visual absorption capability of the valley in which the SEZ is located, leading to a perception of visual "clutter" that could be perceived negatively by viewers.

Because the SEZ would occupy so much of the horizontal field of view, strong visual contrasts from solar energy development within the SEZ would be expected at this viewpoint, although contrast levels would depend on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors.

Immediately after passing the western boundary of the SEZ, westbound vehicles would pass the southern end of the Arrow Canyon Range, completely cutting off views of low-height facilities in the SEZ. U.S. 93 would then turn north and travel parallel to the Arrow Canyon Range until passing entirely out of the SEZ viewshed north of the SEZ. For the stretch of the roadway west of the Arrow Canyon Range (about 11 mi [18 km], or about 10 minutes driving time at highway speeds) intermittent visibility of the upper portions of power towers in particular locations within the SEZ would be possible, but if such views did occur, they would be fleeting and visual contrast levels would be expected to be minimal.

Southbound travelers on U.S. 93 would see the same types and levels of visual contrasts from solar development within the proposed Dry Lake SEZ as northbound travelers, but in reverse order. The upper portions of tall power towers could potentially be seen briefly starting just north of the SEZ, but glimpses would be fleeting and contrast levels minimal; however, after the southern end of the Arrow Canyon Range was passed, visual contrast levels would very quickly reach strong levels as travelers would immediately pass along the southern border of the SEZ.

In summary, solar facilities within the SEZ could be in view from U.S. 93 for about 15 minutes driving time at highway speeds, but most travelers' views would be much briefer. Facilities within the SEZ could be in view from about 13 mi (21 km) of the roadway. Northbound travelers on U.S. 93 would first see solar facilities within the SEZ at the I-15 interchange, with strong visual contrasts visible for several minutes until views of the SEZ would be screened by the Arrow Canyon Range. After that point, expected contrast levels would drop to minimal levels. Southbound travelers would see minimal contrast until they passed the Arrow Canyon Range, and they would likely see strong contrasts thereafter until they reached I-15.

Communities of Glendale, Moapa, Paradise, and Winchester. The viewshed analyses indicate potential visibility of the SEZ from the communities of Glendale (about 19 mi [31 km] northeast of the SEZ), Moapa (about 17 mi [27 km] northeast of the SEZ), Paradise (about 25 mi [40 km] southeast of the SEZ), and Winchester (about 22 mi [35 km] southeast of the SEZ). For all of these communities, the viewshed analysis indicates that visibility would be limited to the upper portions of tall power towers.

The communities of Paradise and Winchester are suburbs of Las Vegas and are located within the highly urbanized Las Vegas area. Because of screening by buildings and vegetation, solar facilities within the SEZ would not be visible, and no visual impacts would be expected.

The community of Moapa is 17 mi (27 km) northeast of the SEZ, and Glendale is close by at 19 mi (31 km). Within these communities, at least partial screening of ground-level views of the SEZ are likely, due either to slight variations in topography, structures, vegetation, or a combination of these screening types. A detailed future site-specific NEPA analysis is required to determine visibility precisely; however, expected visual contrast levels for these communities would be minimal.

Other Impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

11.3.14.2.3 Summary of Visual Resource Impacts for the Proposed Dry Lake SEZ

Under the 80% development scenario analyzed in the PEIS, the SEZ would contain multiple solar facilities utilizing differing solar technologies, as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal landscape of the flat valley in which the SEZ is located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development within the proposed Dry Lake SEZ because of major modification of the character of the existing landscape. The potential exists for additional impacts from construction and operation of transmission lines and access roads within and outside the SEZ.

The SEZ is in an area of low scenic quality, with major cultural disturbances already present in and around the SEZ. Visitors to the area, workers, and residents of nearby areas may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads.

Utility-scale solar energy development within the proposed Dry Lake SEZ is likely to result in strong visual contrasts for some high-elevation viewpoints in the Desert National Wildlife Range, which is 2.3 mi (3.7 km) west of the SEZ.

Strong visual contrasts would also be expected for some high-elevation viewpoints on the Old Spanish National Historic Trail, which passes within 1.3 mi (2.1 km) of the SEZ. The points of highest potential visual contrast are located within a high-potential segment of the trail.

Strong visual contrasts would also be expected for some high-elevation viewpoints in the Arrow Canyon WA, located 2.5 mi (4.0 km) north of the SEZ. Moderate to strong visual contrasts would be expected for some high-elevation viewpoints the Muddy Mountains WA, which is 6.6 mi (10.6 km) southeast of the SEZ, and strong contrast levels would be expected for viewpoints in the partially overlapping Muddy Mountains SRMA, located 4.5 mi (7.2 km) east of the SEZ. Moderate visual contrast levels would be expected for high-elevation viewpoints in the Nellis Dunes SRMA, 4.3 mi (6.9 km) south of the SEZ. Minimal to weak visual contrasts would be expected for some viewpoints within other sensitive visual resource areas within the SEZ 25-mi (40-km) viewshed.

Almost 38 mi (61 km) of I-15 are within the proposed Dry Lake SEZ viewshed, and almost 3.7 mi (6.0 km) of I-15 pass along and through the SEZ's southeasternmost portion. Travelers on I-15 would be likely to experience strong visual contrasts from solar energy development within the SEZ. Almost 13 mi (21 km) of U.S. 93 are within the SEZ viewshed, and about 4.5 mi (7.2 km) of U.S. 93 pass along the SEZ's southwestern boundary. Travelers on U.S. 93 would also be likely to experience strong visual contrasts from solar energy development within the SEZ.

11.3.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified to protect visual resources for the proposed Dry Lake SEZ. As noted in Section 5.12, the presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2, of this PEIS) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

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11.3.15 Acoustic Environment

11.3.15.1 Affected Environment

The proposed Dry Lake SEZ is located in the north-central portion of Clark County in southernmost Nevada. Neither the State of Nevada nor Clark County has established quantitative noise-limit regulations applicable to solar energy development.

The southern portion of Dry Lake SEZ is bordered or crossed by I-15, which runs northeast–southwest; it is also bordered by U.S. 93, which trends southeast–northwest. Several dirt roads through the SEZ are present. A railroad, paralleling a part of I-15, runs close to the southern SEZ boundary or crosses the SEZ. The nearest airport is Nellis Air Force Base, which is about 12 mi (19 km) southwest of the SEZ and is under military airspace. Other nearby airports include North Las Vegas Air Terminal, about 20 mi (32 km) southwest of the SEZ; Echo Bay Airport, about 23 mi (37 km) east-southeast; Overton Municipal Airport, about 24 mi (39 km) east-northeast; and Las Vegas McCarran International Airport, about 25 mi (40 km) southwest. There are no agricultural activities in and around the SEZ, but cattle grazing seems to occur within the SEZ. Henry Allen Generating Station, a large electric substation, and a natural gas compressor station exist within the SEZ. Several transmission lines and two natural gas pipelines run across the SEZ. Many industrial activities, including a quarry, lime and gypsum facilities, a waste management facility, several natural gas–fired power plants, and transmission lines, exist outside the southern SEZ boundary. Recreational land use such as OHV and shooting use occurs within the SEZ. No sensitive receptors (e.g., residences, hospitals, schools, or nursing homes) exist close to the proposed Dry Lake SEZ. The nearest residences lie about 12 mi (19 km) southwest of the SEZ, near Nellis Air Force Base in North Las Vegas. Other nearby residences and communities are located in the Moapa Valley, including Moapa, as close as 19 mi (31 km) northeast, and Overton, about 23 mi (37 km) east of the SEZ. Accordingly, noise sources around the SEZ include road traffic, railroad traffic, aircraft flyover, cattle grazing, industrial activities, and recreational activities. Other than in the southern portion, the proposed Dry Lake SEZ is mostly undeveloped and its overall character is considered to range from rural in the north to industrial to the south. Background noise levels in the southern portion of the SEZ would be higher, especially along I-15, while those in the northern portion of the SEZ would be lower. To date, no environmental noise survey has been conducted around the proposed Dry Lake SEZ. On the basis of the population density, the day–night average noise level (L_{dn} or DNL) is estimated to be 44 dBA for Clark County, near the upper end of the range of 33 to 47 dBA L_{dn} typical of a rural area (Eldred 1982; Miller 2002).[10]

[10] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, nighttime levels are 10 dBA lower than daytime levels, and they can be interpreted as 33 to 47 dBA (mean 40 dBA) during daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

11.3.15.2 Impacts

Potential noise impacts associated with solar projects in the Dry Lake SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts on the nearest residences (about 12 mi [19 km] to the southwest of the SEZ boundary) associated with operation of heavy equipment would be minimal due to considerable separation distance. During the operations phase, potential impacts on the nearest residences would be anticipated to be minimal as well. Even though the Dry Lake SEZ is fully developed, potential noise impacts on residences along the roads from commuter, visitor, support, and delivery vehicular traffic to and from the SEZ would be minimal, compared with current heavy traffic volume along I-15. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed Dry Lake SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2 and through any additional SEZ-specific design features applied (see Section 11.3.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

11.3.15.2.1 Construction

The proposed Dry Lake SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area, where key components (e.g., steam turbine/ generator) needed to generate electricity are located; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background levels. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment, and by temperature lapse conditions typical of daytime hours; thus, noise attenuation to a 40-dBA level would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the residences closest to the southern SEZ boundary, estimated noise levels at the nearest residences would be about 14 dBA, which is well below the typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn}[11] at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas.

It is assumed that a maximum of two projects at any one time would be developed for SEZs greater than 10,000 acres (40.5 km^2) but less than 30,000 acres (121.4 km^2), such as the Dry Lake SEZ. If two projects were to be built in the southern portion of the SEZ near the closest residences, noise levels would be about 17 dBA, 3 dBA higher than the value for a single project. These levels would be still well below the typical mean rural background level, and thus their contribution to the existing L_{dn} would be minimal.

In addition, noise levels are estimated at the specially designated areas within a 5-mi (8-km) range of the Dry Lake SEZ, which is the farthest distance that noise, except extremely loud noise, would be discernable. There are several specially designated areas within the range where noise might be an issue: Coyote Springs ACEC, about 0.25 mi (0.4 km) west of the SEZ; Old Spanish National Historic Trail, as close as about 1.3 mi (2.1 km) southeast; Desert NWR, about 2.2 mi (3.5 km) west of the SEZ; Arrow Canyon WA, about 2.5 mi (4.0 km) north; and Muddy Mountains WA, about 4.5 mi (7.2 km) southeast. For construction activities occurring near the SEZ boundary close to the specially designated areas, noise levels are estimated to be about 58 and 39 dBA at the boundaries of the Coyote Springs ACEC and Old Spanish National Historic Trail, respectively, which are much higher and comparable to the typical daytime mean rural background level of 40 dBA. As discussed in Section 5.10.2, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, construction noise from the SEZ is not likely to adversely affect wildlife at nearby specially designated areas. In addition, construction noise from the SEZ is not anticipated to affect any activities at the Old Spanish National Historic Trail.

Depending on soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet, in contrast to the impulsive impact pile drivers frequently used at large-scale construction sites. Potential impacts on the nearest residences would be anticipated to be negligible, considering the distance to the nearest residences (about 12 mi [19 km] from the southern SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction within the proposed Dry Lake SEZ would cause negligible unavoidable, but localized, short-term noise impacts on neighboring communities, even when construction activities occurred near the southern SEZ boundary, close to the nearest residences.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes

[11] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in a day-night average noise level (L_{dn}) of 40 dBA.

ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 500-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a minor component of construction impacts in comparison to solar facility construction, and would be temporary in nature.

11.3.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area; commuter/visitor/support/delivery traffic within and around the solar facility; and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and firewater pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southern SEZ boundary, the predicted noise level would be about 20 dBA at the nearest residences, located about 12 mi (19 km) from the SEZ boundary, which is well below the typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[12]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at

[12] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

about 1,370 ft (420 m) from the power block area, and thus, would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated. This is well below the EPA guideline of 55 dBA L_{dn} for residential areas. As for construction, if two parabolic trough and/or power tower facilities were operating close to the nearest residences, combined noise levels would be about 23 dBA, 3 dBA higher than the value for a single project. These levels are still well below the typical daytime mean background level of 40 dBA, and their contribution to existing L_{dn} levels would be minimal. However, day–night average noise levels higher than those estimated above by using simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Dry Lake SEZ setting, the air temperature would likely increase with height (temperature inversion), because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[13] within 1 or 2 mi (1.6 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are lowest. To estimate the day-night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residences (about 12 mi [19 km] from the southern SEZ boundary) would be 30 dBA, which is equivalent to the typical nighttime mean rural background level of 30 dBA. The day–night average noise level is estimated to be about 41 dBA L_{dn}, which is still well below the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 41 dBA L_{dn} at the nearest residences, even if TES were used at a solar facility. Consequently, operating parabolic trough or power tower facilities using TES and located near the southern SEZ boundary could result in minimal adverse noise impacts on the nearest residences, depending on background noise levels and meteorological conditions.

Associated with operation of solar facilities occurring near the western SEZ boundary and using TES, the estimated daytime level of 48 dBA at the boundary of the Coyote Springs ACEC is higher than the typical daytime mean rural background level of 40 dBA, while the estimated nighttime level of 58 dBA is much higher than the typical nighttime mean rural background level of 30 dBA. However, sound levels above 90 dB are likely to adversely affect wildlife; thus, operation noise from solar facilities with TES is not likely to adversely affect wildlife at the nearby specially designated areas (Manci et al. 1988). For a solar facility near the southern SEZ boundary, daytime and nighttime noise levels at the Old Spanish National Historic Trail are estimated to be 39 and 49 dBA, respectively. Operations noise from a solar facility with TES would not be anticipated to affect any daytime activities at the Old Spanish National Historic Trail, but could have adverse impacts on nighttime activities there. A considerable portion of the operation noise might be masked by nearby road traffic on I-15, railroad traffic, and industrial activities along I-15.

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13 A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

In the permitting process, refined noise propagation modeling might be warranted, along with measurement of background noise levels.

The solar dish engine is unique among CSP technologies, because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the proposed Dry Lake SEZ, on the basis of the assumption of dish engine facilities of up to 1,391-MW total capacity (covering 80% of the total area, or 12,519 acres [50.7 km^2]), up to 55,640 25-kW dish engines could be employed. For a large dish engine facility, about a thousand step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility. For example, they would be about 51 dBA at 1.0 mi (1.6 km) and 47 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field; both values are higher than the typical daytime mean rural background level of 40 dBA. However, these levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed dish engines were placed all over the Dry Lake SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residences, about 12 mi (19 km) southwest of the SEZ boundary, would be about 32 dBA, which is below the typical daytime mean rural background level of 40 dBA. On the basis of 12-hr daytime operation, the estimated 40 dBA L_{dn} at these residences (i.e., no contribution from dish engines) is well below the EPA guideline of 55 dBA L_{dn} for residential areas. On the basis of other noise attenuation mechanisms, noise levels at the nearest residences would be lower than the values estimated above. Accordingly, noise from dish engines is not anticipated to cause adverse impacts on the nearest residences, even assuming lower background noise levels and unfavorable meteorological conditions.

For dish engines placed all over the SEZ, estimated noise levels would be about 54 and 47 dBA at the boundaries of the Coyote Springs ACEC and Old Spanish National Historic Trail, respectively, which are higher than the typical daytime mean rural background level of 40 dBA. However, dish engine noise from the SEZ is not likely to adversely affect wildlife at the nearby specially designated areas (Manci et al. 1988). In addition, dish engine noise from the SEZ could have some adverse impacts on the Old Spanish National Historic Trail. A considerable portion of this dish engine noise might be masked by nearby road traffic on I-15, railroad traffic, and industrial activities along I-15.

Thus, consideration of minimizing noise impacts is very important when siting dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also be considered, depending on refined noise modeling in the permitting process.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the proposed Dry Lake SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be negligible.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and not be heard at the nearest residences, assuming a 12.5-mi (20-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 12 mi [19 km] to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be negligible.

For impacts from transmission line corona discharge noise during rainfall events (Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line tower would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. The noise levels at 65 ft (20 m) and 300 ft (91 m) from the center of 500-kV transmission line towers would be about 49 and 42 dBA, typical of high-end and mean, respectively, daytime background noise levels in rural environments. Corona noise includes high-frequency components, which may be judged to be more annoying than other environmental noises. However, corona noise would not likely cause impacts, unless a residence was located close to the source (e.g., within 500 ft [152 m] of a 230-kV transmission line or 0.5 mi [0.8 km] of a 500-kV transmission line). The proposed Dry Lake SEZ is located in an arid desert environment, and incidents of corona discharge would be infrequent. Therefore, potential impacts on nearby residents along the transmission line ROW would be negligible.

11.3.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction, but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minimal and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus negligible.

11.3.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. Due to the considerable separation distances, activities within the proposed Dry Lake SEZ during construction and operation would be anticipated to cause only minimal increases in noise levels at the nearest residences and to have minor impacts on nearby specially designated areas. Accordingly, no SEZ-specific design features are required.

11.3.16 Paleontological Resources

11.3.16.1 Affected Environment

The surface geology of the proposed Dry Lake SEZ is predominantly composed of thick alluvial deposits (more than 100-ft [30.5-m] thick), ranging in age from the Pliocene to Holocene, with some playa deposits of similar age in the east-central portion of the SEZ. The total acreage of the alluvial deposits within the SEZ is 14,063 acres (57 km^2), or nearly 90% of the SEZ; there are 980 acres (4 km^2) of playa deposits, or 6% of the SEZ. Portions of the western edge of the SEZ are composed of residual materials developed in carbonate rocks. These discontinuous residual deposits account for 648 acres (2.6 km^2), or slightly more than 4% of the SEZ. In the absence of a PFYC map for Nevada, a preliminary classification of PFYC Class 3b is assumed for the playa and residual deposits. Class 3b indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.8 for a discussion of the PFYC system). A preliminary classification of PFYC Class 2 is assumed for the young Quaternary alluvial deposits, similar to that assumed for the Amargosa Valley SEZ (Section 11.1.16). Class 2 indicates that the potential for the occurrence of significant fossil material is low.

11.3.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in 90% of the proposed Dry Lake SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above and are classified as PFYC Class 2, further assessment of paleontological resources in most of the SEZ is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. The potential for impacts on significant paleontological resources in the remaining 10% of the SEZ is unknown. A more detailed investigation of the playa and residual deposits is needed prior to project approval. A paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007a, 2008c). Section 5.14 discusses the types of impacts that could occur to any significant paleontological resources found to be present within the Dry Lake SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new roads or transmission lines are currently anticipated for the Dry lake SEZ, assuming existing corridors would be used; thus no impacts on paleontological resources are anticipated related to the creation of new access pathways. Impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing excavation of the resource, if warranted. Depending on the significance of the find, it could also result in some modification to the project footprint. Since the SEZ is located in an area partially classified as PFYC Class 3b, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources were uncovered during surface-disturbing activities.

11.3.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

If the geological deposits are determined to be as described above and are classified as PFYC Class 2, mitigation of paleontological resources within 90% of the Dry Lake SEZ is not likely to be necessary. The need for and nature of any SEZ-specific design features for the remaining 10% of the SEZ would depend on the results of future paleontological investigations.

11.3.17 Cultural Resources

Cultural resources present or adjacent to the Dry Lake SEZ include archaeological sites, landscapes, and features sacred to Native Americans; prehistoric and historic trails; historic railroad grades and associated sites; historic mining camps and associated artifacts and sites relating to the NTS and Nellis Air Force Base.

11.3.17.1 Affected Environment

11.3.17.1.1 Prehistory

The proposed Dry Lake SEZ is located in the eastern portion of the Mojave Desert, within the geographical area referred to as the Great Basin. The earliest known human use of the area was likely during the Paleoindian Period, sometime between 12,000 and 10,000 years B.P. Surface finds of Paleoindian fluted projectile points, the hallmark of the Clovis culture, have been found in the area, but no sites with any stratigraphic context have been excavated. The Clovis culture is characterized by the aforementioned fluted projectile point and a hunting and gathering subsistence economy that followed migrating herds of Pleistocene mega fauna. The ephemeral nature of Paleoindian sites in the southeastern Great Basin has given rise to speculation that the Paleoindians may have been inclined to subsist off of the lake and marsh habitats provided by the ancient Pleistocene pluvial lakes that occupied a large portion of the Great Basin, and consequently the sites are difficult to find because they have been buried by the ebb and flow of the pluvial lakes. This slightly later cultural material associated with the pluvial lake habitations is referred to as the Western Pluvial Lakes Tradition or Lake Mojave culture. The archaeological assemblage associated with this cultural tradition is characterized by stemmed projectile points, leaf-shaped bifaces, scrapers, crescents, and in some cases groundstone tools for milling plant material (Fowler and Madsen 1986).

The Early Archaic Period in the region began with the recession of most of the pluvial lakes in the area, about 8,000 to 6,000 B.P. and lasted until about 4,000 B.P. Archaic Period groups likely still congregated around marsh areas, but also used the vast caves that can be found in the mountains of the Great Basin. The settlement system in some areas was likely based around a central base camp, with temporary camps on the margins of their territory to exploit resources not in the immediate vicinity. Some of the key Archaic sites in the area near the proposed Dry Lake SEZ are Corn Creek Dunes and Tule Springs, both located north of Las Vegas and west of the proposed SEZ; Stuart Rockshelter to the north of the SEZ; and Gypsum Cave to the south. The Lake Lahontan Basin, a large Pleistocene pluvial lake north of the proposed Dry Lake SEZ, is also home to several early Archaic Period sites; the archaeological assemblages from these sites maintain some cultural continuity with the previous period, consisting of Pinto points, leaf-shaped bifaces, scrapers, drills, gravers, and manos and metates (Fowler and Madsen 1986).

The Middle Archaic Period, 4,000 to 1,500 B.P., saw the climactic shift known as the Little Pluvial, a wetter and cooler climate that caused some of the pluvial lakes to fill back up.

The cultural material of this time period is similar to that of the Early Archaic, with an increased concentration of millingstones, mortars, and pestles and the appearance of normally perishable items, such as wicker baskets, split-twig figurines, duck decoys, and woven sandals (Neusius and Gross 2007).

In the vicinity of the proposed Dry Lake SEZ, the Late Archaic Period began about 1,500 B.P. and extended until contact with the Europeans. This period saw major technological shifts, evidenced by smaller projectile points that were more useful because groups began using bow-and-arrow technology instead of the atlatl, and by changes in subsistence techniques in the use of horticulture. Most groups in the Muddy and Virgin River valleys were a part of the Virgin Anasazi cultural group, an extension of the Puebloan groups from the southwest into the Great Basin region. These groups brought with them the knowledge of horticulture, which they used on the floodplains of the river valleys which they inhabited. Pueblo Grande de Nevada, east of the proposed Dry Lake SEZ near Overton, Nevada, is a prime example of the Virgin Anasazi culture in the vicinity of the SEZ. Also characteristic of this period are grey-ware ceramics (sometimes decorated), rock art and intaglios, bedrock milling features, and turquoise mining. A site consisting of rock circles in association with Paiute ceramics has been documented in the central portion of the proposed Dry Lake SEZ. The following section describes the cultural history of the time period in greater detail.

11.3.17.1.2 Ethnohistory

The proposed Dry Lake SEZ is located within the traditional use area of the Southern Paiute. While Southern Paiute groups tended to be wide ranging and shared resources, the SEZ lies in the area most often attributed to the Moapa Band, whose core areas of settlements and activities were along the Moapa or Muddy River and the Virgin River (Kelly 1934; Kelly and Fowler 1986). The Moapa Valley was a central location where the western Southern Paiute bands gathered and traded (Stoffle and Dobyns 1983) and may have been associated with the ritually important Salt Song Trail (Laird 1976). Close to this important gathering place, the SEZ is likely to have been known to many of the Southern Paiute bands, including the neighboring Las Vegas Band, other bands traveling along the Moapa River to the Colorado River, and well-traveled groups of Chemehuevi.

Southern Paiute

The Southern Paiute appear to have moved into southern Nevada and southwestern Utah about 1150 (Euler 1964). Most of the territory occupied by the Southern Paiute lies within the Mojave Desert, stretching from the high Colorado Plateaus westward through canyon country and southwestward following the bend in the Colorado River through the Basin and Range geologic province into southeastern California. The territory includes several different vegetation zones, reflected in corresponding differences in subsistence practices. There is some evidence that before the arrival of Euro-American colonists, the Southern Paiute may have been organized on a tribal level under the ritual leadership of High Chiefs and that their territory was bound together by a network of trails used by specialist runners (Stoffle and Dobyns 1983). The proposed Dry Lake SEZ falls within *Paranayi*, the western subdivision of the Southern Paiute Nation (Stoffle et al. 1997). Situated in the Dry Lake Valley, it is directly adjacent to the Moapa River Reservation. It is bounded on the east and west by low but rugged mountains characteristic of Moapa Band territory (Kelly 1934). The culturally important Arrow Canyon Range is on the east and the Dry Lake Range on the west. The nearby ribbon oasis of the Virgin River and its tributaries was the single most important ribbon oasis in Southern Paiute Territory (Stoffle and Dobyns 1983).

When first described by ethnographers, Southern Paiute groups had survived a 75% reduction in population resulting from the spread of European diseases, Ute slave raids, and displacement from high-quality resource areas by Euro-American settlers. They did not maintain any overall tribal organization; territories were self-sufficient economically; and the only known organizations were kin-based bands, often no larger than that of a nuclear family (Kelly and Fowler 1986). The Southern Paiute practiced a mixed subsistence economy. They maintained floodplain and irrigated agricultural fields and husbanded wild plants through transplanting, pruning, burning, and irrigation. They supplemented their food supply by hunting and fishing (Stoffle and Dobyns 1983). The diet of the Southern Paiute was varied, but the harsh climate of the area at times made subsistence precarious. They made use of a wide variety of indigenous plants. Botanical knowledge was maintained primarily by the women, and this knowledge of seasonal plant exploitation meant that at times the agricultural fields would have been little maintained while groups were away from their base camp gathering resources (Stoffle et al. 1999). The Southern Paiute maintained dwellings to match the seasons. In the summer, they constructed sun shades and windbreaks. After the fall harvest, they resided in conical or subconical shaped houses or in caves. It was not until the late nineteenth century that teepees and sweathouses were adopted from the Utes. Basketry was one of the most important crafts practiced by the Southern Paiute. Conical burden baskets, fan-shaped trays for winnowing and parching, seed beaters, and water jugs were made from local plants. Pottery, usually unfired, was also made for daily use. The annual cycle of seasonal plant exploitation required great mobility on the part of the Southern Paiute, and consequently they often used the lightweight burden baskets (Kelly and Fowler 1986).

The Southern Paiute were not a war-like group, and consequently they were often the target of raids by their more aggressive neighbors. Despite the Ute aggression, the Southern Paiute were on friendly terms with most of the other groups north of the Colorado River and would visit, trade, hunt, or gather in each other’s territory and occasionally intermarry.

The arrival of Europeans in the New World had serious consequences for the Southern Paiute. Even before direct contact occurred, the spread of European diseases and the slave trade implemented by Utes and Navajo on horseback for the Spanish colonial markets in New Mexico, Sonora, and California resulted in significant depopulation. The Southern Paiutes retreated from areas where there was an increased presence of Euro-American travelers, such as along the Old Spanish Trail. They were further displaced by Euro-American settlers in Utah and Nevada, who sought the same limited water supplies used by the Southern Paiute. Dependence on wild plant resources increased during this time, as the Southern Paiute withdrew into more remote areas. As Euro-American settlements grew, the Southern Paiute were drawn into the new economy, often serving as transient wage labor. Settlements or colonies of laborers grew up around settlements, farms, and mines, often including individuals from across the Southern Paiute homeland (Kelly and Fowler 1986).

In 1865, an initial attempt by the U.S. Government to settle the Southern Paiutes in northeastern Utah with their traditional enemies, the Utes, failed. Mormon settlers began to arrive in the Moapa Valley the same year, but returned to Utah in 1871. The Moapa River Reservation was established in 1875, although the original reservation as authorized by President Ulysses S. Grant was severely reduced by Congress to 1,000 acres (4 km^2) of mostly unirrigable land. Nonetheless, limited commercial farming was established. Although plagued by disease and poor water, the reservation slowly became more prosperous. Capitalizing on its share of a judgment awarded by the Indian Claims Commission and on the 1980 restoration of part of their original reservation, Moapa River Reservation has continued to develop into a center of Southern Paiute activity (Stoffle and Dobyns 1983).

11.3.17.1.3 History

The earliest documented European presence in the Great Basin region was the Dominguez-Escalante Expedition, which began in July 1776.[14] Two Catholic priests, Fathers Francisco Atanasio Dominguez and Silvestre Velez de Escalante, were looking for a route from the Spanish capital city of Santa Fe to the Spanish settlement of Monterey on the California coast. The group did not initially complete the goal of reaching California—they turned back to Santa Fe when the weather got too bad; however, their maps and journals describing their travels and encounters would prove valuable to later expeditions that traversed the area, such as Spanish/New Mexican traders and Anglo-American fur trappers traveling the Old Spanish Trail in the 1820s and 1830s (BLM 1976).

The Old Spanish Trail was an evolving trail system generally established in the early nineteenth century, tending to follow previously established paths used by earlier explorers like Dominguez and Escalante, but also Native Americans. The trail is not a direct route due to a desire to avoid hostile Indian Tribes, as well as natural land formations such as the Grand Canyon. Several forks and cutoffs were established as more and more travelers made use of the trail system. The 2,700-mi (4,345-km) trail network crosses through six states with various paths between Santa Fe and Los Angeles. It was used primarily between 1829 and 1848 by New Mexican traders exchanging textiles for horses. In 1829 while following the Old Spanish Trail, Antonio Armijio found an oasis that served as a crucial stopping point along the trail. This oasis was named Las Vegas, Spanish for “The Meadows,” and in utilizing this oasis groups traveling on the trail were able to significantly shorten their trip through the harsh desert (Fehner and Gosling 2000). The Old Spanish National Historic Trail is a congressionally designated trail, and consequently, the trail, trail resources, and setting are required to be managed in accordance with the National Trail System Act. Within the eastern portion of the proposed Dry Lake SEZ, a site is identified as a portion of the Old Spanish Trail and is listed in the NRHP as part of a larger

[14] Although slavery was technically illegal, traders from New Spain (New Mexico) would travel north to acquire Native American slaves for New Mexican settlers from at least the mid 1700s.

Old Spanish Trail/Mormon Road District. However, this section of trail is not identified as part of the congressionally designated Old Spanish National Historic Trail, located farther to the east.

With the ratification of the Treaty of Guadalupe Hidalgo in 1848, which closed out the Mexican-American War, the area came under American control. In 1847, the first American settlers arrived in the Great Basin, among them Mormon immigrants under the leadership of Brigham Young, who settled in the Valley of the Great Salt Lake in Utah. They sought to bring the entire Great Basin under their control, establishing an independent State of Deseret. From its center in Salt Lake City, the church sent out colonizers to establish agricultural communities in surrounding valleys and missions to acquire natural resources such as minerals and timber. Relying on irrigation to support their farms, the Mormons often settled in the same places as the Fremont and Virgin Anasazi centuries before. The result was a scattering of planned agricultural communities from northern Arizona to southern Idaho and parts of Wyoming, Nevada, and southern California. In 1855 Brigham Young sent 30 men, led by William Bringhurst, to the Las Vegas valley, southwest of the proposed Dry Lake SEZ, in an effort to establish a mission in the southern portion of Nevada. They called their mission Las Vegas Fort, but stayed in the area for only a few years before abandoning the mission because of the harsh climate and the closing of the nearby Potosi mine that provided the majority of the income and patronage at the mission (Fehner and Gosling 2000).

Nevada's nickname is the "Silver State," so named for the 1859 Comstock Lode strike in Virginia City about 290 mi (467 km) north of the proposed Dry Lake SEZ. This was the first major silver discovery in the United States, and with the news of the strike hopeful prospectors flocked to the area in an effort to capitalize on the possible wealth under the surface of the earth. The discovery of the Comstock Lode led to the creation of Virginia City and other nearby towns that served the burgeoning population influx. The population increase was so dramatic that in 1850 there were less than a dozen non-native people in the state of Nevada; by 1860 there were 6,857; and by 1875 an estimated 75,000 people had migrated to the state. The Comstock Lode strike is important to the history of Nevada not only because of the population growth and significant amount of money that was consequently brought to the area, but also for technological innovations that were created and employed in the mines, namely, the use of square-set timbering. This technique kept loose soil from collapsing on miners, a concept that eventually was employed around the world in other mines (Paher 1970).

Mining for valuable deposits occurred in all regions of the state of Nevada, including in the vicinity of the proposed Dry Lake SEZ. Clark County is home to the earliest lode mine in the state at Potosi mine, about 65 mi (105 km) southwest of the proposed Dry Lake SEZ. Other notable mines were Goodspring Mine, near Jean, Nevada; Searchlight Mine, at the town of the same name; and El Dorado Canyon Mine, near Nelson, Nevada, all located about 15 to 20 mi (24 to 32 km) southwest of Las Vegas. There were also two smaller mines closer to the proposed Dry Lake SEZ: Key West, a copper mine near Glendale, Nevada, northwest of the SEZ; and Gold Butte, a short-lived gold mine east of the SEZ, on the eastern side of Lake Mead. Mining in the area was likely undertaken by the Native Americans in the area prior to the arrival of the Euro-Americans, mainly for copper deposits. Intensive mining by Euro-Americans began around 1865 at the Potosi mine by Mormons, and continued until the abandonment of the area by the Mormons about 1863.

The construction of railroads in Nevada was often directly related to the mining activities that occurred in the state, and the San Pedro, Salt Lake, and Los Angeles Railroad acted as a stimulant to the depraved mining economy with its construction in 1905. A portion of the still-used railroad runs through the extreme far eastern portion of the proposed Dry Lake SEZ. The construction of this railroad was one of the most significant factors in making Las Vegas the city that it has become. At the turn of the nineteenth century, no railroad existed that connected two of the largest towns in the western United States, Salt Lake City and Los Angeles. Fierce competition between U.S. Senator William Clark and UP owner Edward Harriman ensued, eventually resulting in Clark constructing the critical railroad, shortening the trip from Salt Lake City to Los Angeles to one day and making Las Vegas a critical railroad hub along the line. Several sites have been documented in the SEZ related to the railroad and its construction. The railroad itself has been designated as a site, although it is currently under the ownership of the UP Railroad. This railroad passes through the southeastern portion of the SEZ. Another recorded site is a railroad grade affiliated with the San Pedro, Salt Lake, and Los Angeles Railroad. Two railroad camps associated with the construction of the San Pedro, Salt Lake, and Los Angeles Railroad have been documented in the SEZ: one of the sites consists of 31 features, 28 of which are structures; and another consists of several structural features and artifact scatters—both sites are in the southeastern portion of the SEZ. In addition to the railroads and the Old Spanish Trail, the Old Arrowhead Highway passes through portions of the proposed Dry Lake SEZ. Currently a frontage road for I-15, this road was the earliest highway developed across southern Nevada, connecting Las Vegas and St. Thomas (a town now under Lake Mead, south of Overton). Completed in 1915, this road followed portions of earlier emigrant trails, and although it was renamed several times in its existence, it continued to provide a valuable transportation route for southern Nevada until the construction of I-15.

Several historic towns in the vicinity of the proposed Dry Lake SEZ were not related to mining activities but to Mormon settlement: West Point, Nevada (near present day Glendale); St. Joseph, Nevada; Junction City, Nevada; and St. Thomas, Nevada. Although all but West Point are now under Lake Mead, remnants of some of the foundations of some of the buildings can be seen when the lake levels are low. The Mormon presence in southern Nevada is further evidenced by the fact that the Old Spanish Trail is also sometimes referred to as the Mormon Road, because this route became a popular emigrant route for the Mormons to take from Salt Lake City to points south (Fehner and Gosling 2000; Paher 1970).

Nevada's desert-mountain landscape has made it a prime region for use by the U.S. military for several decades. Beginning in October 1940, President Franklin D. Roosevelt established the Las Vegas Bombing and Gunnery Range, a 3.5-million-acre (14,164-km^2) parcel of land northwest of Las Vegas, near Indian Springs, Nevada. The main purpose of the range was to serve as air-to-air gunnery practice, but at the end of World War II, the gunnery range was closed. It was reopened at the start of the Cold War in 1948, recommissioned as the Las Vegas Air Force Base, and later renamed Nellis Air Force Base in 1950 (Fehner and Gosling 2000).

Prior to the dropping of the atomic bomb on the Japanese cities of Nagasaki and Hiroshima, the only testing of nuclear weapons on U.S. soil was at the Trinity site, near Los Alamos Laboratory in Alamogordo, New Mexico. Tests of nuclear weapons had been conducted at the newly acquired Marshall Islands in the Pacific, but because of logistical constraints, financial expenditures, and security reasons, a test site for nuclear weapons was needed in a more convenient region. Project Nutmeg commenced in 1948 as a study to determine the feasibility and necessity of a test site in the continental United States. It was determined that because of public relations issues, radiological safety, and security issues, a continental test site should be pursued only in the event of a national emergency. In 1949 that emergency occurred when the Soviet Union conducted its first test of a nuclear weapon and the Korean War started in the summer of 1950. Five initial test sites were proposed: Alamogordo/White Sands Missile Range in New Mexico, Camp LeJeune in North Carolina, the Las Vegas–Tonopah Bombing and Gunnery Range in Nevada, a site in central Nevada near Eureka, and Utah's Dugway Proving Ground/Wendover Bombing Range. Several factors were considered in making the final decision, such as fallout patterns, prevailing winds and predictability of weather, terrain, downwind populations, security, and public awareness and relations. The Las Vegas–Tonopah Bombing and Gunnery Range was chosen as the NTS by President Truman in December 1950.

Covering 879,997 acres (3,561 km^2), the NTS was a part of the Las Vegas–Tonopah Bombing and Gunnery Range, stretching from Mercury, Nevada in the southeast to Pahute Mesa in the northwest. The first set of nuclear tests was conducted in January 1951, originally named FAUST (First American Drop United States Test) and later renamed Ranger; these bombs were detonated over Frenchman Flat, an area about 70 mi (113 km) west of the proposed Dry Lake SEZ. Tests were later conducted at Yucca Flat, an area northwest of Frenchman Flat, in an effort to minimize the effect of the blasts on the population in Las Vegas, which reported some disturbances (nonradiological in nature) from the series of tests conducted at Frenchman Flat. Tests were also conducted at Jackass Flats, west of the proposed Dry Lake SEZ, and Pahute Mesa, north and west of the proposed Dry Lake SEZ. Nuclear tests were conducted in an effort to verify new weapons concepts, proof test existing weapons, test the impact of nuclear weapons on man-made structures and the physical environment, and conduct experimental testing in search of possible peaceful uses, namely, the Pluto ramjet, Plowshare, and Rover rocket programs. The Pluto ramjet project was funded by the Air Force to design a system that could propel a vehicle at supersonic speeds and low altitudes, while the Rover rocket was a design for a nuclear-powered rocket for space travel. The Plowshare project was an attempt to show that nuclear weapons could be effective in moving large amounts of earth for canal and harbor construction. None of these three projects resulted in any sustained results in terms of their goals, yet they were important in their contribution to the overall work done at the NTS. In the fall of 1958, President Dwight Eisenhower declared a moratorium on nuclear testing, with the Soviet Union following suit, until 1961 when testing resumed. However, this testing was performed mostly underground at the NTS, and most atmospheric tests were conducted in the Pacific. The last atmospheric test at the NTS was on July 17, 1962, with the Limited Test Ban Treaty being signed by the United States and the Soviet Union on August 5, 1963, ending nuclear testing in the atmosphere, ocean, and space. The last underground nuclear detonation at the NTS was on September 23, 1992, after which Congress declared a moratorium on nuclear testing. In 1996 a Comprehensive Test Ban Treaty was proposed by an international organization. It has yet to be ratified by the U.S. Senate, but nuclear tests have not been conducted since then. In total, 1,021 of the 1,149 nuclear detonations by the United States during the Cold War were conducted at the NTS (Fehner and Gosling 2000).

11.3.17.1.4 Traditional Cultural Properties—Landscape

The Southern Paiutes have traditionally taken a holistic view of the world, in which the sacred and profane are inextricably intertwined. According to their traditions, they were created in their traditional use territory and have a divine right to the land along with a responsibility to manage and protect it. Landscapes as a whole are often culturally important. Adverse effects on one part damage the whole (Stoffle 2001). From their perspective, landscapes include places of power. Among the most important such places are sources of water; peaks, mountains, and elevated features; caves; distinctive rock formations; and panels of rock art. Places of power are important to the religious beliefs of the Southern Paiute. They may be sought out for individual vision quests or healing and may likewise be associated with culturally important plant and animal species. The view from such a point of power or the ability to see from one important place to another can be an important element of its integrity (Stoffle and Zedeño 2001b). Landscapes as a whole are tied together by a network of culturally important trails (Stoffle and Dobyns 1983; Stoffle and Zedeño 2001a).

The proposed Dry Lake SEZ is close to the core traditional Southern Paiute use area formed by the Virgin River and its tributaries. The Virgin River lies 26 mi (42 km) to the east. Its major tributary, the Moapa River, which runs through the culturally important Arrow Canyon, is 14 mi (23 km) to the north–northeast. Euro-American travelers passing through the area in the mid-nineteenth century described well-developed Native American agriculture along the Moapa River. Arrow Canyon connected the Moapa River villages with summer villages to the northwest in Pahrangat Valley and was a source of game and important wild plants. The SEZ lies at the southern end of the Arrow Canyon Range, identified by Southern Paiutes from across their traditional range as culturally important, but of particular importance to the Moapa Band. The bajada at the northern end of this range traditionally was a culturally important meeting ground—the site of ceremonial gatherings and trade. The mountains themselves provided habitat for bighorn sheep an important game animal. Members of the Moapa Band also consider the Dry Lake Range to be culturally important, but somewhat less so than the Arrow Canyon Range (Stoffle and Dobyns 1983).

The southern Paiutes consider the visible remains of traditional foot paths, which have been identified by Southern Paiute informants, as a culturally significant part of the landscape (Stoffle and Dobyns 1983). Such trails tied villages and camps with important resources. Some trails have a ritual as well as a physical component. The Salt Song Trail, both a physical and spiritual trail, important in Southern Paiute mortuary rituals appears to cross the Moapa River in this area and proceeds to the southwest to the Las Vegas area, coming close to or through the SEZ (Laird 1976).

11.3.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources

With respect to the proposed Dry Lake SEZ, 58 cultural resource surveys have been conducted in the SEZ, covering about 9,446 acres (38 km^2), 60.2% of the total SEZ area. Within 5 mi (8 km) of the proposed Dry Lake SEZ, another 125 surveys have been conducted. These surveys have resulted in the recording of 22 sites in the SEZ and at least 229 sites within 5 mi

(8 km) of the SEZ. Of the 22 sites in the SEZ, 7 are prehistoric; 15 are historic. Six of the sites in the SEZ have been determined to be eligible for inclusion in the NRHP (de Dufour 2009). The Old Spanish Trail/Mormon Road intersects the southeastern portion of the proposed Dry Lake SEZ. A railroad grade associated with the San Pedro, Salt Lake, and Los Angeles Railroad is also in the southeastern portion of the SEZ. The railroad itself and two camps affiliated with the construction of the railroad are also present within the SEZ boundaries. The Old Arrowhead Highway intersects portions of the proposed Dry Lake SEZ as well.

Of the 229 sites that have been documented within 5 mi (8 km) of the SEZ, 171 are prehistoric in nature, 56 are historic, and 2 are multicomponent. Fifteen of these sites have been determined to be NRHP-eligible. Nine of these sites are rockshelters and are located in the mountains surrounding the Dry Lake SEZ. Other prehistoric NRHP-eligible sites include a camp with fire-affected rock and metates and two lithic scatters likely dating to the Late Archaic Period. The NRHP-eligible sites from the historic period are all related to the railroad and its construction, including a campsite associated with the railroad and the historic trails that pass through the area, a railroad siding and a construction camp, and an historic camp associated with the railroad as well.

The BLM has designated several ACECs in the vicinity of the proposed Dry Lake SEZ to protect the cultural resources contained within these areas. The Hidden Valley ACEC is about 9 mi (14 km) east of the SEZ; the Rainbow Gardens ACEC is 10 mi (16 km) south; and the Arrow Canyon ACEC is about 13 mi (21 km) south. The Arden ACEC, Sloan Rock ACEC, and Virgin River ACEC are protected for their cultural resources but are located farther than 25 mi (40 km) from the SEZ.

Other known cultural resources near the Dry Lake SEZ are the congressionally designated Old Spanish National Historic Trail, including a high-potential segment; the San Pedro, Salt Lake, and Los Angeles Railroad (now the UP line); and the Old Arrowhead Highway. Additionally, the NTS and Nellis Air Force Base are located just west of the SEZ, adding to the rich cultural heritage of the region.

National Register of Historic Places

There is one property listed in the NRHP that falls within the boundaries of the SEZ, the Old Spanish Trail/Mormon Road. Six additional sites in the SEZ have been determined to be NRHP-eligible. Within 5 mi (8 km) of the SEZ there are no sites listed in the NRHP, however, 15 of these sites that have been documented have been determined to be NRHP-eligible.

In Clark County, 53 properties are listed in the NRHP, 32 of which are in Las Vegas or the vicinity of Las Vegas, about 17 mi (27 km) southwest of the proposed Dry Lake SEZ. Other NRHP sites are located in Overton (5 sites), 23 mi (37 km) east of the SEZ, and in Indian Springs (1 site), 25 mi (40 km) west of the SEZ. The remaining NRHP sites are further than 25 mi (40 km) from the SEZ: 6 in Boulder City, 4 in Mesquite and Bunkerville, 1 in Goodsprings, 2 in Laughlin, and 2 in Searchlight.

11.3.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Dry Lake SEZ; however, further investigation is needed. At least 22 sites have been recorded within the SEZ, one of which is listed in the NRHP, the Old Spanish Trail/Mormon Road, and 6 additional sites that have been determined to be NRHP-eligible. Consistent with findings at other SEZs, dune areas continue to have potential to contain significant sites within the valley floors suitable for solar development. A cultural resource survey of the entire area of potential effects, including consultation with affected Native American Tribes, would need to be conducted first to identify archaeological sites, historic structures and features, and traditional cultural properties, and then an evaluation would follow to determine whether any are eligible for listing in the NRHP as historic properties. Section 5.15 discusses the types of effects that could occur on the seven known sites and any additional significant cultural resources found within the proposed Dry Lake SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Section A.2.2 of Appendix A. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur. No traditional cultural properties have been identified to date within the vicinity of the SEZ.

Indirect impacts on cultural resources that result from erosion outside of the SEZ boundary (including along ROWs) are unlikely, assuming programmatic design features to reduce water runoff and sedimentation are implemented (as described in Appendix A, Section A.2.2).

Visual impacts on the Old Spanish National Historic Trail are possible, but depending on the exact location of the high potential segment near the proposed SEZ, it would appear that intervening topography may alleviate the potential impact. Verification of the location of the trail would be needed to assess impact. GIS data for the congressionally designated National Historic Trail location and the site location of the NRHP-listed Old Spanish Trail/Mormon Road appear to be in conflict. If portions of the Old Spanish Trail National Register District go through the proposed SEZ, direct impacts could occur on the trail during construction.

No needs for new transmission or access corridors have currently been identified, assuming existing corridors would be used; therefore, no new areas of cultural concern would be made accessible as a result of development within the proposed Dry Lake SEZ, so indirect impacts resulting from vandalism or theft of cultural resources are not anticipated. However, impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

11.3.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features, cultural awareness training for the workforce, and measures for addressing possible looting/vandalism issues through formalized agreement documents, are provided in Appendix A, Section A.2.2.

. SEZ-specific design features would be determined in consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

- Coordination with the Trail Administration for the Old Spanish Trail and Old Spanish Trail Association is recommended for identifying potential mitigation strategies for avoiding or minimizing potential impacts on the congressionally designated Old Spanish National Historic Trail, and also to any remnants of the NRHP-listed site associated with the Old Spanish Trail/Mormon Road that may be located within the SEZ. Avoidance of the Old Spanish Trail NRHP-listed site within the southeastern portion of the proposed SEZ is recommended.

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11.3.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns that are specific to Native Americans or to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Dry Lake SEZ, Section 11.3.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 11.3.8 discusses mineral resources; Section 11.3.9.1.3 discusses water rights and water use; Section 11.3.10 discusses plant species; 11.3.11 discusses wildlife species, including wildlife migration patterns; Section 11.3.13 discusses air quality; Section 11.3.14 discusses visual resources; Sections 11.3.19 and 11.3.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21.

11.3.18.1 Affected Environment

The proposed Dry Lake SEZ falls within the Tribal traditional use area generally attributed to the Southern Paiute (Kelly and Fowler 1986). All federally recognized Tribes with Southern Paiute roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 11.3.18.1-1. Details of government-to-government consultation efforts are presented in Chapter 14; a listing of all federally recognized Tribes contacted for this PEIS is found in Appendix K.

TABLE 11.3.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed Dry Lake SEZ

Tribe	Location	State
Chemehuevi Indian Tribe	Lake Havasu	California
Kaibab Paiute Tribe	Fredonia	Arizona
Las Vegas Paiute Tribe	Las Vegas	Nevada
Moapa Band of Paiutes	Moapa	Nevada
Pahrump Paiute Tribe	Pahrump	Nevada
Paiute Indian Tribe of Utah	Cedar City	Utah
Cedar Band	Cedar City	Utah
Indian Peak Band	Cedar City	Utah
Kanosh Band	Kanosh	Utah
Koosharem Band	Cedar City	Utah
Shivwits Band	Ivins	Utah
San Juan Southern Paiute Tribe	Tuba City	Arizona

11.3.18.1.1 Territorial Boundaries

Southern Paiutes

The traditional territory of the Southern Paiute lies mainly in the Mojave Desert, stretching from California to the Colorado Plateau. It generally follows the right bank of the Colorado River, including its tributary streams and canyons in southern Nevada and Utah; this includes most of Clark and Lincoln Counties in Nevada and extends as far north as Beaver County in Utah (Kelly and Fowler 1986). This area has been judicially recognized as the traditional use area of the Southern Paiute by the Indian Claims Commission (Royster 2008).

11.3.18.1.2 Plant Resources

The Southern Paiutes continue to make use of a wide range of indigenous plants for food, medicine, construction material, and other uses. The vegetation present at the proposed Dry Lake SEZ is described in Section 11.3.10. The cover type present at the SEZ is predominantly Sonora–Mojave Creosotebush–White Bursage Desert Shrub, with smaller areas of North American Warm Desert Playa, and small patches of Sonora-Mojave Mixed Salt Desert Scrub, and North American Warm Desert Wash (USGS 2005a). The SEZ is sparsely vegetated and crisscrossed with dirt roads and power lines. It includes part of a dry lake or playa. Creosotebush and white bursage are the dominant species, with some mesquite and yucca appearing in swale and wash environments. Of these, creosotebush has Native American medicinal uses, while mesquite and yucca were food sources. As shown in Table 11.3.18.1-2, there are likely to be some plants used by Native Americans for food in the SEZ (Stoffle et al. 1999; Stoffle and Dobyns 1983). Project-specific analyses will be needed to determine their presence at any proposed building site. Traditional plant knowledge is found most abundantly among Tribal elders, especially female elders (Stoffle et al. 1999).

11.3.18.1.3 Other Resources

Members of the Moapa Band rate springs as the most important cultural resource in their cultural landscape (Stoffle and Dobyns 1983). Water is an essential prerequisite for life in the arid areas of the Great Basin. As a result, water is a keystone of many desert cultures' religion. They tend to consider all water sacred and a purifying agent. Water sources are often associated with rock art. Springs are often associated with powerful beings, and hot springs in particular figure in Southern Paiute creation stories. Water sources are seen as connected, so damage to one damages all (Fowler 1991; Stoffle and Zedeño 2001a). Tribes are also sensitive regarding the use of scarce local water supplies for the benefit of far-distant communities and recommend determination of adequate water supplies be a primary consideration in determining whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

TABLE 11.3.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Dry Lake SEZ

Common Name	Scientific Name	Status
Food		
Beavertail Prickly Pear	*Opuntia basilaris*	Observed
Desert Trumpet (Buckwheat)	*Eriogonum inflatum*	Observed
Cat Claw	*Acacia greggii*	Possible
Cholla Cactus	*Cylindropuntia* spp.	Observed
Dropseed	*Sporobolus* spp.	Possible
Greasewood	*Sarcobatus vermiculatus*	Observed
Indian Rice Grass	*Oryzopsis hymenoides*	Possible
Iodine Bush	*Allenrolfea occidentalis*	Possible
Honey Mesquite	*Prosopis Glandolosa*	Observed
Wolfberry	*Lycium andersonii*	Possible
Yucca	*Yucca* spp.	Observed
Medicine		
Burro Bush	*Hymenoclea salsola*	Possible
Creosotebush	*Larrea tridentata*	Observed
Greasewood	*Sacarbatus vermiculatus*	Possible
Mormon Tea	*Ephedra* sp.	Observed
Palmer's Phacelia	*Phacelia palermi*	Possible
Saltbush	*Atriplex* spp.	Observed

Sources: Field visit; USGS (2005a); Stoffle and Dobyns (1983); Stoffle et al. (1999).

Wildlife likely to be found in the proposed Dry Lake SEZ is described in Section 11.3.11. Bighorn sheep are the animals of greatest concern to local Native Americans. They recognize two varieties: a smaller version inhabiting the Arrow Canyon Range and a larger, preferred variety found farther east in the Sheep Range. Although now restricted, in the past, the hunting of sheep was an important part of Southern Paiute culture with religious significance, as reflected in the many panels of sheep petroglyphs found throughout Southern Paiute territory. The desert tortoise is often mentioned by the Moapa Band as a species that should be protected, and was once a food source (Stoffle and Dobyns 1983). Although generally arid, the SEZ is within the range of some game species traditionally important to Native Americans (see Table 11.3.18.1-3). The most important is the black-tailed jackrabbit (*Lepus californicus*) (Stoffle and Dobyns 1983; Kelly and Fowler 1986). Large game species possible in the SEZ include mule deer (*Odocoileus hemionus*), and bighorn sheep (*Ovis Canadensis*) are likely present in the neighboring mountains. Smaller game species important to Native Americans that can be found in the SEZ include desert cottontails (*Sylvilagus audubonii*) and woodrats (*Neotoma lepida*).

TABLE 11.3.18.1-3 Animal Species Used by Native Americans as Food whose Range Includes the Proposed Dry Lake SEZ

Common Name	Scientific Name	Status
Mammals		
Badger	*Taxidea taxus*	All year
Black-tailed jackrabbit	*Lepus californicus*	All year
Bobcat	*Lynx rufus*	All year
Desert cottontail	*Silvilagusaudubonii*	All year
Kangaroo rats	*Dipodomys* spp.	All year
Kit fox	*Vulpes macotis*	All year
Mule deer	*Odocoileus hemionus*	All year
Pocket gopher	*Thomomys bottae*	All year
Porcupine	*Erethizon dorsatum*	All year
Red fox	*Vulpes vulpes*	All year
Rock squirrel	*Spermophilus variegates*	All year
Birds		
Golden eagle	*Aquila chrysaetos*	All year
Greater roadrunner	*Geococcyx californianus*	All year
Mourning dove	*Zenaida macroura*	All year
Reptiles		
Large lizards	Various species	All year

Sources: USGS (2005b); Fowler (1986); Stoffle and Dobyns (1983).

Other animals traditionally important to the Southern Paiute include lizards, which are likely to occur in the SEZ, and the golden eagle (*Aquila chrysaetos*). The SEZ falls within the range of the wide-ranging eagle.

Other natural resources traditionally important to Native Americans include clay for pottery, salt, and naturally occurring mineral pigments for the decoration and protection of the skin (Stoffle and Dobyns 1983). Of these, clay beds are possible in the dry lake within the SEZ (see Section 11.3.7).

11.3.18.2 Impacts

During past project-related consultation, the Southern Paiutes have expressed concerns over project impacts on a variety of resources. From their holistic perspective, cultural and natural features are inextricably bound together. Effects on one part have ripple effects on the whole. Western distinctions between the sacred and the secular have no meaning in their traditional worldview (Stoffle and Dobyns 1983). While no comments specific to the proposed Dry Lake SEZ have been received from Native American Tribes to date, the Paiute

Indian Tribe of Utah has asked to be kept informed of PEIS developments. During energy development projects in adjacent areas, the Southern Paiute have expressed concern over adverse effects on a wide range of resources. Geophysical features and physical cultural remains are discussed in Section 11.3.17.1.4. These sites and features are often seen as important because they are the location of or have ready access to a range of plant, animal, and mineral resources (Stoffle et al. 1997). Resources considered important include food plants, medicinal plants, plants used in basketry, plants used in construction, large game animals, small game animals, birds, and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those likely to be found within the proposed Dry Lake SEZ are discussed in Section 3.1.18.1.2.

The Moapa River Valley is a core area of Southern Paiute population and culture. Dry Lake Valley is adjacent to the valley and may lie on a communication corridor leading from the Moapa River towards Las Vegas. Although the SEZ is sparsely vegetated, its proximity to a traditionally settled area and a modern reservation suggests that the area is likely well known to modern Southern Paiutes, and that the resources that do exist there are likely to be exploited by them. That said, other nearby areas, such as Arrow Canyon and the Arrow Canyon Range, are likely to be more important sources of plant and animal resources. This should be confirmed during consultation with the Tribes.

The culturally important Salt Song Trail approaches or passes through the SEZ and could experience visual and noise impacts from the development of utility-scale solar energy facilities within the proposed SEZ.

The development of utility-scale solar power facilities within the SEZ would most likely result in the removal of some culturally important plants and result in the loss of some habitat for culturally important wildlife species. Impacts to vegetation are expected to be moderate to small (Section 11.3.10) because similar vegetation is widespread in the area. Likewise there is abundant similar habitat and impacts to wildlife are expected to be small (Section 11.3.11). These expected impacts should be confirmed through government-to-government consultation. As consultation with the Tribes continues and project-specific analyses are undertaken, it is also possible that there will be Native American concerns expressed over potential visual and other effects on specific resources and any culturally important landscapes within or adjacent to the SEZ.

Implementation of programmatic design features, as presented in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

11.3.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to address impacts of potential concern to Native Americans, such as avoidance of sacred sites, water resources, and tribally important plant and animal species are provided in Appendix A, Section A.2.2. Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 11.3.17.3, in addition to design features for historic properties discussed in Section A.2.2 in Appendix A.

The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with the affected Tribes listed in Table 11.3.18.1-1.

11.3.19 Socioeconomics

11.3.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Dry Lake SEZ. The ROI, which consists solely of Clark County, Nevada, encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and non-payroll expenditures from the construction, operation, and decommissioning phases of solar facilities in the proposed SEZ is expected to take place.

11.3.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 922,878 (Table 11.3.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was 3.2% in Clark County, which was higher than the average rate for Nevada as a whole (2.7%). In 2006, the services sector provided the highest percentage of employment in the ROI at 59.6%, followed by wholesale and retail trade at 14.8%, with a smaller employment share held by construction (11.6%) (Table 11.3.19.1-2).

11.3.19.1.2 ROI Unemployment

Over the period 1999 to 2008, the average unemployment rate in Clark County was 5.0%, the same as the average rate for the state as a whole (Table 11.3.19.1-3). Unemployment rates for the first 11 months of 2009 contrast with rates for 2008 as a whole. The average rates for the ROI (11.8%) and for Nevada as a whole (11.7%) were also higher during this period than the corresponding average rates for 2008.

11.3.19.1.3 ROI Urban Population

The population of the ROI in 2008 was 57% urban. The largest city, Las Vegas, had an estimated 2008 population of 562,849; other large cities in Clark County include Henderson (253,693) and North Las Vegas (217,975) (Table 11.3.19.1-4). The county also has two smaller cities—Mesquite (16,528) and Boulder City (14,954). A number of unincorporated urban areas in Clark County are not included in the urban population, meaning that the percentage of the county population not living in urban areas is overstated.

Population growth rates in the ROI have varied over the period 2000 to 2008 (Table 11.3.19.1-4). North Las Vegas grew at an annual rate of 8.3% during this period, with higher than average growth also experienced in Mesquite (7.3%) and Henderson (4.7%). Las Vegas (2.1%) experienced a lower growth rate between 2000 and 2008, while Boulder City (0.0%), experienced static growth during this period.

TABLE 11.3.19.1-1 Employment in the ROI for the Proposed Dry Lake SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Clark County	675,693	922,878	3.2
Nevada	978,969	1,282,012	2.7

Sources: U.S. Department of Labor (2009a,b).

TABLE 11.3.19.1-2 Employment in the ROI for the Proposed Dry Lake SEZ by Sector, 2006

Industry	Clark County	Percentage of Total
Agriculture[a]	213	0.0
Mining	522	0.1
Construction	100,817	11.6
Manufacturing	25,268	2.9
Transportation and public utilities	38,529	4.4
Wholesale and retail trade	128,498	14.8
Finance, insurance, and real estate	56,347	6.5
Services	516,056	59.6
Other	105	0.0
Total	866,093	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009).

11.3.19.1.4 ROI Urban Income

Median household incomes vary across cities in the ROI. Two cities for which data are available for 2006 to 2008—Henderson ($67,886), North Las Vegas ($60,506)—had median incomes in 2006 to 2008 that were higher than the state average ($56,348), while median incomes in Las Vegas ($55,113) were slightly lower than the state average (Table 11.3.19.1-4).

Income growth rates between 1999 and 2006 to 2008 were small in North Las Vegas (0.2%), and negative in Henderson (–0.7%) and Las Vegas (–0.3%). The average median household income growth rate for the state as a whole over this period was 0.2%.

TABLE 11.3.19.1-3 Unemployment Rates (%) in the ROI for the Proposed Dry Lake SEZ

Location	1999–2008	2008	2009[a]
Clark County	5.0	6.6	11.8
Nevada	5.0	6.7	11.7

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

TABLE 11.3.19.1-4 Urban Population and Income in the ROI for the Proposed Dry Lake SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Boulder City	14,966	14,954	0.0	65,049	NA[b]	NA
Henderson	175,381	253,693	4.7	72,035	67,886	–0.7
Las Vegas	478,434	562,849	2.1	56,739	55,113	–0.3
Mesquite	9,389	16,528	7.3	52,005	NA	NA
North Las Vegas	115,488	217,975	8.3	56,299	60,506	0.2

[a] Data are averages for the period 2006 to 2008.

[b] NA = data not available.

Source: U.S. Bureau of the Census (2009b-d).

11.3.19.1.5 ROI Population

Table 11.3.19.1-5 presents recent and projected populations in the ROI and state as a whole. Population in the ROI stood at 1,879,093 in 2008, having grown at an average annual rate of 4.0% since 2000. Growth rates for ROI were higher than the state rate for Nevada (3.4%) over the same period. The ROI population is expected to increase to 2,710,303 by 2021 and to 2,791,161 by 2023.

11.3.19.1.6 ROI Income

Total personal income in Clark County stood at $74.1 billion in 2007, having grown at an annual average rate of 5.0% for the period 1998 to 2007 (Table 11.3.19.1-6). Per-capita income

TABLE 11.3.19.1-5 Population of the ROI for the Proposed Dry Lake SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Clark County	1,375,765	1,879,093	4.0	2,710,303	2,791,161
Nevada	1,998,257	2,615,772	3.4	3,675,890	3,779,745

Sources: U.S. Bureau of the Census (2009e,f); Nevada State Demographers Office (2008).

TABLE 11.3.19.1-6 Personal Income in the ROI for the Proposed Dry Lake SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Clark County			
Total income[a]	45.7	74.1	5.0
Per-capita income ($)	36,509	40,307	1.0
Nevada			
Total income[a]	68.9	105.3	4.3
Per-capita income ($)	37,188	41,022	1.0

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of Census (2009e,f).

also rose over the same period at an annual rate of 1.0%, increasing from $36,509 to $40,307. Personal income growth rates in the ROI were higher than the state rate (4.3%), but per-capita income growth rates in Clark County was the same as in Nevada as a whole (0.8%).

Median household income in the ROI in 2006 to 2008 stood at $49,615 (U.S. Bureau of the Census 2009d).

11.3.19.1.7 ROI Housing

In 2007, more than 754,000 housing units were located in Clark County (Table 11.3.19.1-7). Owner-occupied units composed about 59% of the occupied units, with rental housing making up 41% of the total. Vacancy rates in 2007 were 12.2% in Clark County. There were 92,144 vacant housing units in the ROI in 2007, of which 37,381 are estimated to be rental units that would be available to construction workers. There were 8,416 units in seasonal, recreational, or occasional use in the ROI at the time of the 2000 Census, with 1.5% of housing units in Clark County used for seasonal or recreational purposes.

Housing stock in the ROI as a whole grew at an annual rate of 4.3% over the period 2000 to 2007, with 194,370 new units added (Table 11.3.19.1-7). The median value of owner-occupied housing in Clark County in 2008 was $243,150 (U.S. Bureau of the Census 2009c,d).

The median value of owner-occupied housing in 2006 to 2008 was $299,200 in Clark County (U.S. Bureau of the Census 2009g).

11.3.19.1.8 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 11.3.19.1-8. In addition, two Tribal governments are located in the ROI. Members of other Tribal groups also are located in the state, but their Tribal governments are located in adjacent states.

11.3.19.1.9 ROI Community and Social Services

This section describes educational, health-care, law enforcement, and firefighting resources in the ROI.

TABLE 11.3.19.1-7 Housing Characteristics in the ROI for the Proposed Dry Lake SEZ

Parameter	2000	2007[a]
Clark County		
Owner-occupied	302,834	393,453
Rental	209,419	268,572
Vacant units	47,546	92,144
Seasonal and recreational use	8,416	NA
Total units	559,799	754,169

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h-j).

TABLE 11.3.19.1-8 Local Government Organizations and Social Institutions in the ROI for the Proposed Dry Lake SEZ

Governments	
City	
Boulder City	Mesquite
Henderson	North Las Vegas
Las Vegas	
County	
Clark County	
Tribal	
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada	
Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

Schools

In 2007, the ROI had 344 public and private elementary, middle, and high schools (NCES 2009). Table 11.3.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Clark County schools was 19.0, while the level of service was 8.7.

Health Care

The total number of physicians in Clark County was 4,220, and the level of service was 2.3 physicians per 1,000 population (Table 11.3.19.1-10).

TABLE 11.3.19.1-9 School District Data for the Proposed Dry Lake SEZ ROI, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Clark County	303,448	15,930	19.0	8.7

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

TABLE 11.3.19.1-10 Physicians in the Proposed Dry Lake SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Clark County	4,220	2.3

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 11.3.19.1-11). Clark County has 3,214 officers and would provide law enforcement services to the SEZ. The level of service of police protection in Clark County is 1.7 officers per 1,000 population. Currently, there are 991 professional firefighters in the ROI (Table 11.3.19.1-11).

11.3.19.1.10 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and, consequently, the susceptibility of local communities to various forms of social disruption and social change.

TABLE 11.3.19.1-11 Public Safety Employment in the Proposed Dry Lake SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Clark County	3,214	1.7	991	0.5

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase, and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism and illicit drug use, mental health, and divorce, which might be used as indicators of social change, are presented in Tables 11.3.19.1-12 and 11.3.2.19.1-13. Violent crime in Clark County in 2007 stood at 8.0 crimes per 1,000 population (Table 11.3.19.1-12), while property-related crime rates was 34.5 per 1,000 people, producing an overall crime rate of 42.5 per 1,000. Data on other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located (Table 11.3.19.1-13).

TABLE 11.3.19.1-12 Crime Rates[a] for the Proposed Dry Lake SEZ ROI

	Violent Crime[b]		Property Crime[c]		All Crime	
Location	Offenses	Rate	Offenses	Rate	Offenses	Rate
Clark County	15,505	8.0	66,905	34.5	82,410	42.5

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 11.3.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Dry Lake SEZ ROI

Location	Alcoholism[a]	Illicit Drug Use[a]	Mental Health[b]	Divorce[c]
Nevada Clark	8.2	2.7	10.5	NA[d]
Nevada				6.5

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol or illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] NA = data not available.

Sources: SAMHSA (2009); CDC (2009).

11.3.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational activities, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of recreation, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 11.3.5.

Because data on the number of visitors using state and federal lands for recreational activities are not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 241,376 people were employed in the ROI in the various sectors identified as recreational, constituting 26.8% of total ROI employment (Table 11.3.19.1-14). Recreation spending also produced more than $9,421 million in income in the ROI in 2007. The primary sources of recreation-related employment were hotels and lodging places and eating and drinking places.

TABLE 11.3.19.1-14 Recreation Sector Activity in the Proposed Dry Lake SEZ ROI, 2007

Sector	Employment (No. People)	Income ($ million)
Amusement and recreation services	4,614	143.7
Automotive rental	2,902	118.0
Eating and drinking places	107,014	3,209.6
Hotels and lodging places	116,510	5,615.4
Museums and historic sites,	285	17.8
Recreational vehicle parks and campsites	331	9.9
Scenic tours	5,424	220.3
Sporting goods retailers	4,296	86.4
Total ROI	241,376	9,421.1

Source: MIG, Inc. (2010).

11.3.19.2 Impacts

The following analysis of potential socioeconomic impacts from development of solar energy facilities in the proposed SEZ begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of developments employing various solar energy technologies are analyzed in detail in subsequent sections.

11.3.19.2.1 Common Impacts

Construction and operation of solar energy facilities at the proposed SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy developments are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the proposed SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar development in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodations otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy developments in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures and a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 0.1% in county population during construction of the solar trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers would choose to locate in communities closer to the SEZ, the lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families and the insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar developments on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar developments are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

11.3.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales), BLM acreage rental and capacity payments, population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are provided in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies, and 5 acres/MW (0.02 km^2/MW) would be required for the solar trough technology. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of two projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 6,000 acres (24 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower, 2022 for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 5,842 jobs (Table 11.3.19.2-1). Construction activities would constitute 0.4% of total ROI employment. A solar facility would also produce $361.5 million in income. Direct sales taxes would be $2.4 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 1,486 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) in the ROI mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 743 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 13 new teachers, 3 physicians, and 3 public safety employee (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 822 jobs (Table 11.3.19.2-1). Such a solar facility would also produce $31.1 million in income. Direct sales taxes would be $0.3 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $2.9 million, and solar generating capacity payments would total at least $16.5 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 70 persons in-migrating into the ROI. Although

TABLE 11.3.19.2-1 Socioeconomic Impacts in the ROI Assuming Full Build-out of the Proposed Dry Lake SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	3,488	547
Total	5,842	822
Income[b]		
Total	361.5	31.1
Direct state taxes[b]		
Sales	2.4	0.3
BLM payments[b]		
Rental	NA[c]	2.9
Capacity[d]	NA	16.5
In-migrants (no.)	1,486	70
Vacant housing[e] (no.)	743	63
Local community service employment		
Teachers (no.)	13	1
Physicians (no.)	3	0
Public safety (no.)	3	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,200 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,510 MW..

b Unless otherwise indicated, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

c NA = not applicable.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

e Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 63 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 2,327 jobs (Table 11.3.19.2-2). Construction activities would constitute 0.2% of total ROI employment. Such a solar facility would also produce $144.0 million in income. Direct sales taxes would be $0.9 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 592 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 296 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.5% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, five new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 376 jobs (Table 11.3.19.2-2). Such a solar facility would also produce $13.0 million in income. Direct sales taxes would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $2.9 million, and solar generating capacity payments would total at least $9.2 million.

TABLE 11.3.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Dry Lake SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	1,389	282
Total	2,327	376
Income[b]		
Total	144.0	13.0
Direct state taxes[b]		
Sales	0.9	<0.1
BLM payments[b]		
Rental	NA[c]	2.9
Capacity[d]	NA	9.2
In-migrants (no.)	592	36
Vacant housing[e] (no.)	296	32
Local community service employment		
Teachers (no.)	5	0
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,395 MW.

[b] Unless otherwise indicated, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 36 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 32 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 946 jobs (Table 11.3.19.2-3). Construction activities would provide 0.1% of total ROI employment. Such a solar facility would also produce $58.5 million in income. Direct sales taxes would be $0.4 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 241 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 120 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.2% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 366 jobs (Table 11.3.19.2-3). Such a solar facility would also produce $12.6 million in income. Direct sales taxes would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $2.9 million, and solar generating capacity payments would total at least $9.2 million.

TABLE 11.3.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Dry Lake SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	565	274
Total	946	366
Income[b]		
Total	58.5	12.6
Direct state taxes[b]		
Sales	0.4	<0.1
BLM payments[b]		
Rental	NA[c]	2.9
Capacity[d]	NA	9.2
In-migrants (no.)	241	35
Vacant housing[e] (no.)	120	31
Local community service employment		
Teachers (no.)	2	0
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,395 MW.

[b] Unless otherwise indicated, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 35 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 31 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 441 jobs (Table 11.3.19.2-4). Construction activities would constitute less than 0.1 % of total ROI employment. Such a solar development would also produce $27.3 million in income. Direct sales taxes would be $0.2 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 112 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 56 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 36 jobs (Table 11.3.19.2-4). Such a solar facility would also produce $1.3 million in income. Direct sales taxes would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $2.9 million, and solar generating capacity payments would total at least $7.3 million.

TABLE 11.3.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Dry Lake SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	263	27
Total	441	36
Income[b]		
Total	27.3	1.3
Direct state taxes[b]		
Sales	0.2	<0.1
BLM payments[b]		
Rental	NA[c]	2.9
Capacity[d]	NA	7.3
In-migrants (no.)	112	3
Vacant housing[e] (no.)	56	3
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,395 MW.

[b] Unless otherwise indicated, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 3 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with three owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

11.3.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the Dry Lake SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would reduce the potential for socioeconomic impacts during all project phases.

11.3.20 Environmental Justice

11.3.20.1 Affected Environment

On February 11, 1994, the President signed Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register*, Volume 59, page 7629, Feb. 11, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description is undertaken of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and within a 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons who identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origin may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income.** Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 11.3.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Arizona, 13.4% of the population is classified as minority, while 13.9% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the Arizona portion of the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the Arizona portion of the SEZ.

In the Nevada portion of the 50-mi (80-km) radius, 39.8% of the population is classified as minority, while 10.8% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more. Thus, in aggregate, there is no minority population in the Nevada portion of the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by

TABLE 11.3.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Dry Lake SEZ

Parameter	Arizona	Nevada
Total population	6,138	1,370,970
White, non-Hispanic	5,315	824,859
Hispanic or Latino	588	301,519
Non-Hispanic or Latino minorities	235	244,592
One race	165	207,962
Black or African American	35	121,226
American Indian or Alaskan Native	82	7,766
Asian	25	71,078
Native Hawaiian or Other Pacific Islander	12	5,855
Some other race	11	2,037
Two or more races	70	36,630
Total minority	823	546,111
Low-income	987	145,576
Percentage minority	13.4	39.8
State percentage minority	36.2	34.8
Percentage low-income	16.1	10.8
State percentage low-income	13.9	10.5

Source: U.S. Bureau of the Census (2009k,l).

20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the Nevada portion of the SEZ.

Figures 11.3.20.1-1 and 11.3.20.1-2 show the locations of minority and low-income population groups, respectively, within the 50-mi (80-km) radius around the boundary of the SEZ.

Within the 50-mi (80-km) radius around the SEZ, more than 50% of the population is classified as minority in block groups located in the city of Las Vegas, in the downtown area, and east of downtown. Block groups with minority populations more than 20 percentage points higher than the state average located in the city of Las Vegas, to the west of the downtown area, and in one block group to the northeast of the city, associated with the Moapa River Indian Reservation.

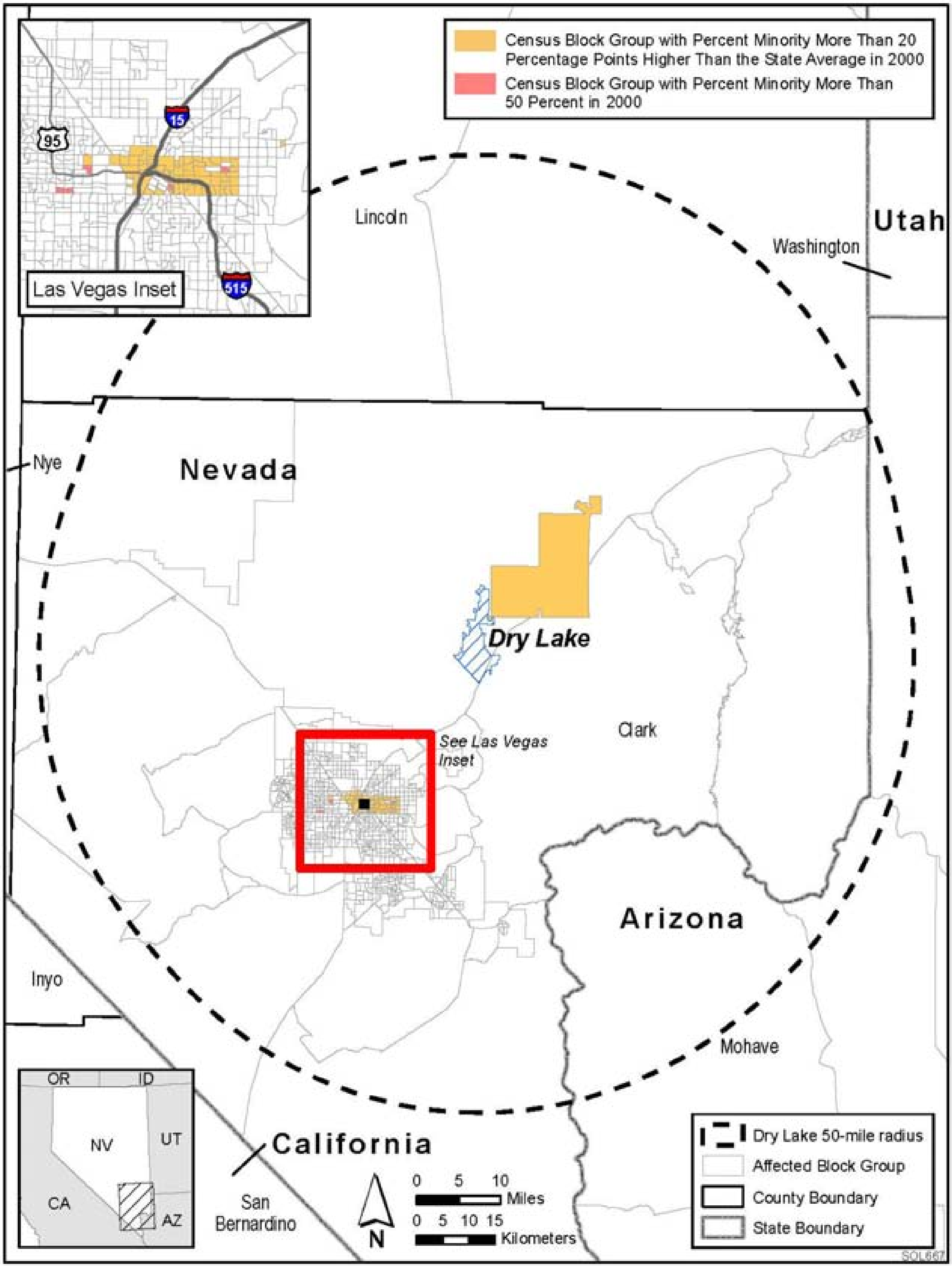

FIGURE 11.3.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Dry Lake SEZ

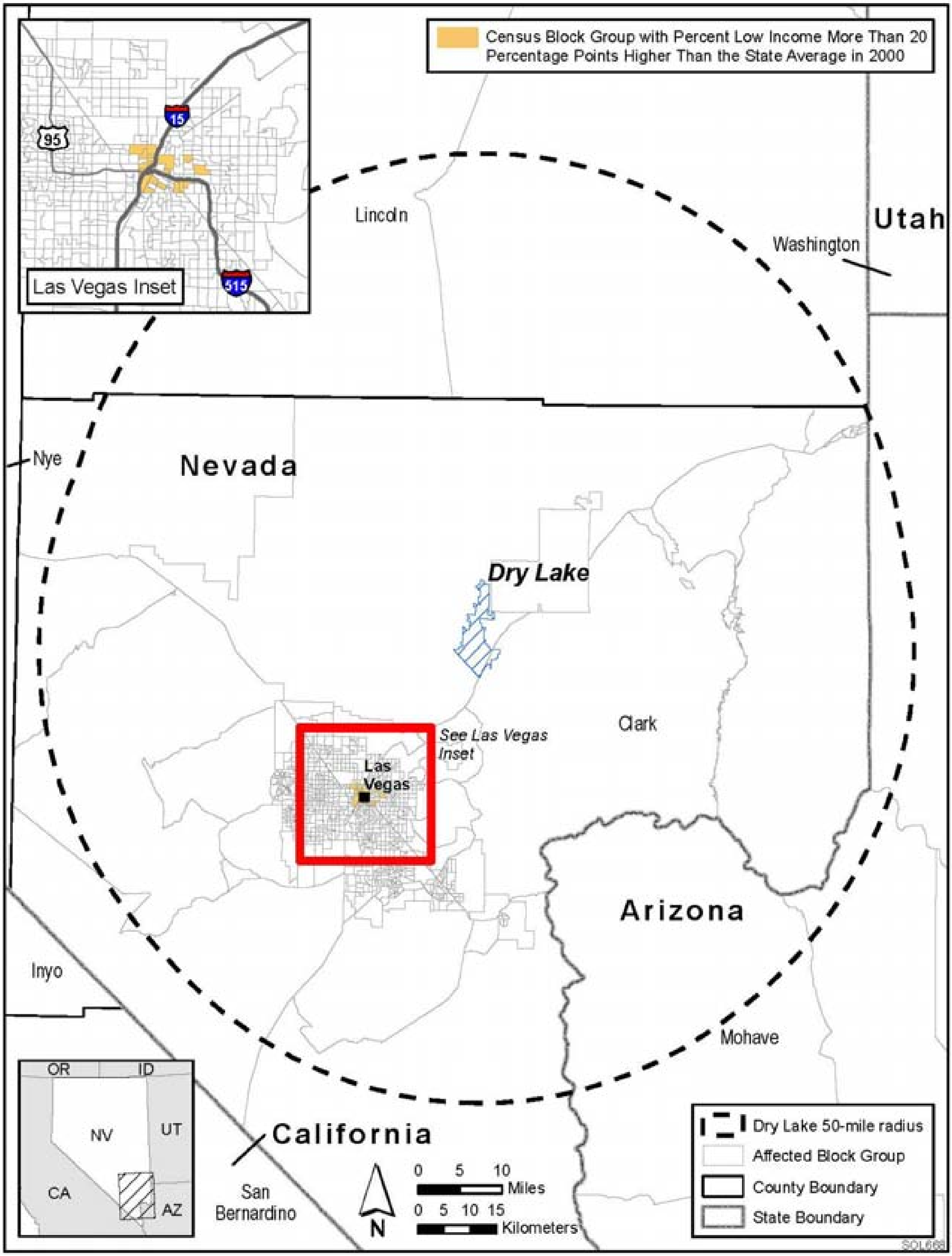

FIGURE 11.3.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Dry Lake SEZ

Census block groups within the 50-mi (80-km) radius where the low-income population is more than 20 percentage points higher than the state average are located in the city of Las Vegas, in the downtown area.

11.3.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of the programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed Dry Lake SEZ include noise and dust during the construction; noise and EMF effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (Section 11.3.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects could disproportionately affect minority populations. Because there are low-income populations within the 50-mi (80-km) radius, there could also be impacts on low-income populations.

11.3.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Dry Lake SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would reduce the potential for environmental justice impacts during all project phases.

11.3.21 Transportation

The proposed Dry Lake SEZ is accessible by road and by rail. One interstate highway and one U.S. highway serve the immediate area, as does a major railroad. A major airport also serves the area, along with several smaller airports. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

11.3.21.1 Affected Environment

Interstate 15 (I-15) passes through the southeastern portion of the proposed Dry Lake SEZ, running southwest–northeast, as shown in Figure 11.3.21.1-1. The Las Vegas metropolitan area is approximately 15 mi (24 km) southwest of the SEZ along I-15. In the opposite direction, Salt Lake City is approximately 400 mi (644 km) away along I-15. State Route 604 (North Las Vegas Boulevard) runs parallel to I-15 along the southeast edge of the SEZ. Going south, U.S. 93 joins I-15 at the southern tip of the proposed Dry Lake SEZ. Traveling to the northwest from I-15, U.S. 93 borders the southwestern edge of the SEZ before it heads in a more northerly direction after passing the SEZ. Several local unimproved dirt roads cross the SEZ. OHV use in the SEZ and surrounding area has been designated as “Limited to existing roads, trails, and dry washes” (BLM 2010b). As listed in Table 11.3.21.1-1, I-15 and U.S. 93 carry average traffic volumes of about 20,000 and 1,900 vehicles per day, respectively, in the vicinity of the Dry Lake SEZ (NV DOT 2010).

The UP Railroad serves the region. The main line passes through Las Vegas on its way from Los Angeles to Salt Lake City. The railroad passes the southeastern border of the Dry Lake SEZ about 15 mi (24 km) northeast of Las Vegas. The nearest rail access is in Las Vegas, and additional access is available in Moapa, approximately 24 mi (39 km) to the northeast of the SEZ.

Nellis Air Force Base, available only to military aircraft, is the nearest airport. It is located approximately 13 mi (21 km) southwest of the proposed Dry Lake SEZ. Nellis Air Force Base is one of the largest fighter bases in the world and is involved in conducting advanced fighter training. Operations occur over the Nevada Test and Training Range, which offers 3 million acres (12,173 km^2) of restricted land, more than 50 mi (80 km) northwest of the SEZ (U.S. Air Force 2010).

The nearest public airport is the North Las Vegas Airport, a regional airport about a 21 mi (34 km) drive southwest of the SEZ. The airport does not have scheduled commercial passenger service, but caters to smaller private and business aircraft (Clark County Department of Aviation 2010a). In 2008, 22,643 and 23,950 passengers arrived at and departed from North Las Vegas Airport, respectively (BTS 2009). Farther to the south, in Las Vegas, McCarran International Airport is served by all major U.S. airlines. In 2008, 20.43 million and 20.48 million passengers arrived at and departed from McCarran International Airport, respectively (BTS 2009). About 83.2 million lb (37.7 million kg) of freight departed and 117 million lb (53.2 million kg) arrived at McCarran in 2008 (BTS 2009).

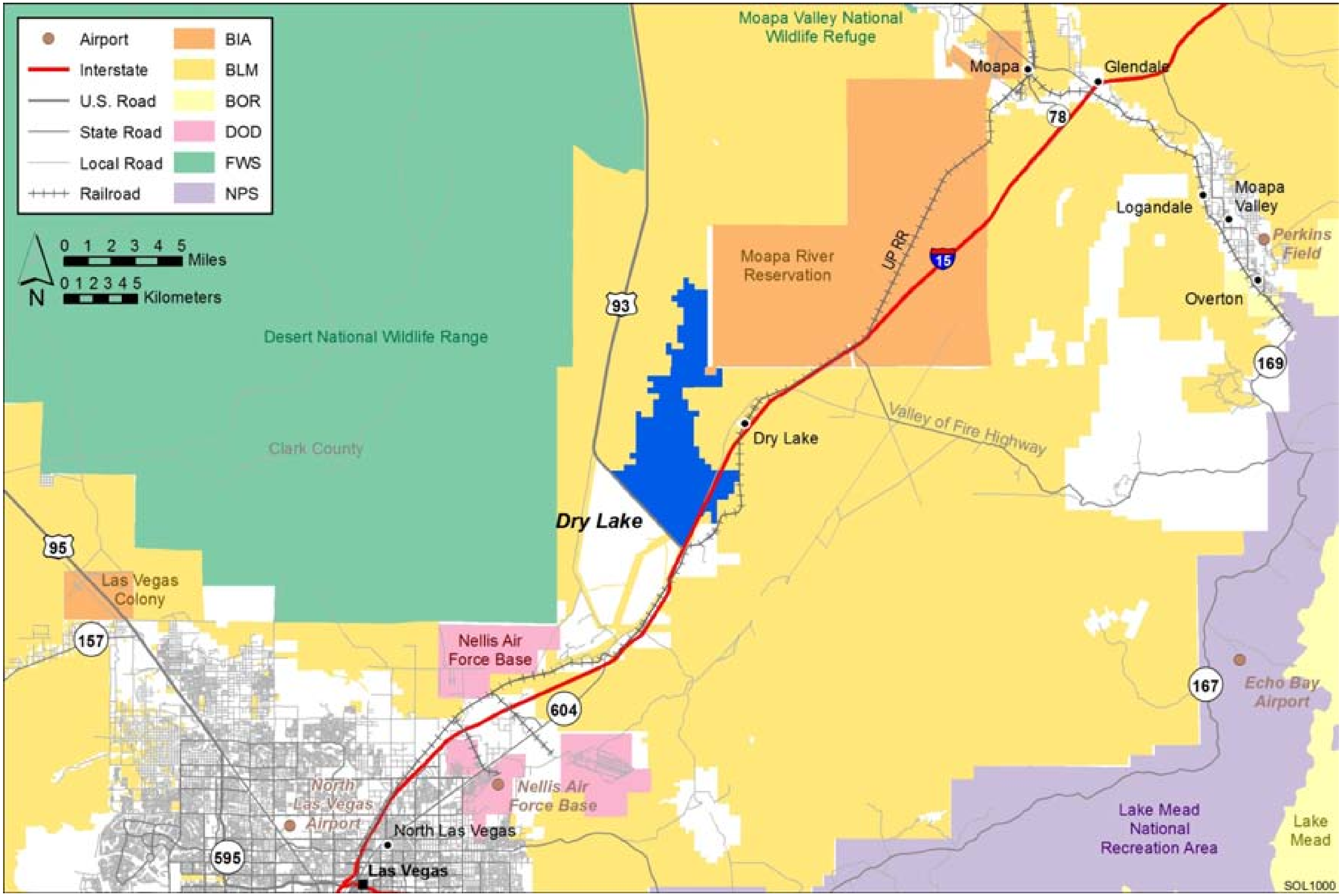

FIGURE 11.3.21.1-1 Local Transportation Serving the Proposed Dry Lake SEZ

TABLE 11.3.21.1-1 AADT on Major Roads near the Proposed Dry Lake SEZ for 2009

Road	General Direction	Location	AADT
I-15	Southwest–northeast	North of Speedway Blvd. (exit 54)	20,000
		North of State Route 604 (exit 58)	24,000
		Between Valley of Fire Highway (exit 75) and Ute interchange (exit 80)	18,000
U.S. 93	North–south	North of I-15 junction (I-15 exit 64)	2,300
State Route 604	Southwest–northeast	North of Nellis Air Force Base Main Gate	14,000
		South of I-15 interchange	2,000
Valley of Fire Highway	East–west	5 mi (8 km) east of I-15 junction (I-15 exit 75)	510

Source: NV DOT (2010).

In addition to the North Las Vegas and McCarran International Airports, there are five small airports in the region, all within approximately a 55 mi (89 km) drive of the proposed Dry Lake SEZ, as listed in Table 11.3.21.1-2. None of these airports have scheduled commercial passenger service. Similarly to North Las Vegas Airport, Henderson Executive Airport caters to smaller private and business aircraft (Clark County Department of Aviation 2010b) as Clark County works to reduce congestion at McCarran International Airport. Boulder City Municipal Airport, southeast of Las Vegas, is home to planes that provide sightseeing air tours of the Grand Canyon and nearby areas (City of Boulder 2010).

11.3.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum) or possibly 4,000 vehicle trips per day if two large projects were developed at the same time. The volume of traffic on I-15 would represent an increase in traffic of about 10 or 20% in the area of the SEZ for one or two projects, respectively. Such traffic levels would represent a 100 to 200% increase of the traffic level experienced on U.S. 93 north of its junction with I-15 if all project traffic were routed through U.S. 93. Because higher traffic volumes would be experienced during shift changes, traffic on I-15 could experience minor slowdowns during these time periods near exits in the vicinity of the SEZ where projects are located. Local road improvements would be necessary in the vicinity of exits off I-15 or on any portion of U.S. 93 that might be developed so as not to overwhelm the local access roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any designated as open within the proposed SEZ, open routes crossing areas issued ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

11.3.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed Dry Lake SEZ. The programmatic design features described in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

TABLE 11.3.21.1-2 Airports Open to the Public in the Vicinity of the Proposed Dry Lake SEZ

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Boulder City Municipal	Southeast of Las Vegas, near U.S. 93, approximately a 47-mi (76-km) drive from the SEZ	Boulder City	3,850 (1,173)	Asphalt	Good	4,800 (1,463)	Asphalt	Good
Echo Bay	South–southeast of the SEZ by Lake Mead, a 50-mi (80-km) drive, northeast on I-15 to Valley of Fire Highway (State Route 169), south on State Route 167	Lake Mead National Recreational Area	3,400 (1,036)	Asphalt	Good	–[b]	–	–
Henderson Executive	South of Las Vegas, about a 40-mi (64-km) drive from the SEZ	Clark County	5,001 (1,524)	Asphalt	Excellent	6,501 (1,982)	Asphalt	Excellent
North Las Vegas	Near I-15 in North Las Vegas, a 21-mi (34-km) drive from the SEZ	Clark County	4,202 (1,281)	Asphalt	Good	5,000 (1,524)	Asphalt	Good
			5,004 (1,525)	Asphalt	Good	–	–	–
McCarran International	Off I-15 in Las Vegas, about 29 mi (47 km)	Clark County	8,985 (2,739)	Concrete	Good	9,775 (2,979)	Concrete	Good
			10,526 (3,208)	Asphalt	Good	14,510 (4,423)	Asphalt	Good
			6,196 (1,889)	Asphalt	Good	7,161 (2,183)	Asphalt	Good
Mesquite	Near I-15, 55 mi (88 km) northeast on I-15	City of Mesquite	5,121 (1,561)	Asphalt	Good	–	–	–

TABLE 11.3.21.1-2 (Cont.)

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Perkins Field	I-15 northeast to State Route 169, south on State Route 169, 36 mi (58 km)	Clark County	4,800 (1,463)	Asphalt	Good	–	–	–

[a] Source: FAA (2010).

[b] A dash indicates not applicable.

11.3.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Dry Lake SEZ in Clark County, Nevada. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur farther than 5 to 10 years in the future.

The Dry Lake SEZ is located 20 mi (32 km) northeast of downtown Las Vegas, Nevada, and north of the intersection of I-15 and U.S. 93. The Apex Industrial Park, which already contains two electric generating stations, is located here. The Moapa Valley National Wildlife Refuge is located 10 mi (16 km) north of the SEZ; the Desert National Wildlife Range is located 2 mi (3 km) west of the SEZ; the Lake Mead National Recreation Area is about 25 mi (40 km) to the east and south of the SEZ; Valley of Fire State Park is located 15 mi (24 km) east of the SEZ; Grand Canyon–Parashant National Monument in Arizona is 45 mi (72 km) east of the SEZ; and Red Rock Canyon National Conservation Area is 30 mi (48 km) west of the SEZ. The Arrow Canyon WA is located just north of the SEZ. Three other WAs are within 50 mi (80 km) of the SEZ. The BLM administers approximately 68% of the lands in the Southern Nevada District that contains the Dry Lake SEZ. In addition, the Delamar Valley SEZ is located about 51 mi (82 km) north of the Dry Lake SEZ and the proposed East Mormon Mountain SEZ is located about 40 mi (64 km) northeast; for some resources, the geographic extents of impacts from multiple SEZs overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the Dry Lake SEZ is identified in Section 11.3.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 11.3.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 11.3.22.3. Cumulative impacts for each resource area are discussed in Section 11.3.22.4.

11.3.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Dry Lake SEZ is provided in Table 11.3.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than visual resources). The BLM, the USFWS, the NPS, and the Department of Defense administer most of the land around the SEZ; there are also some nearby Tribal lands at the Moapa River Reservation adjacent to the northeast boundary of the SEZ. The BLM administers approximately 45.4% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 11.3.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Dry Lake SEZ

Resource Area	Geographic Extent
Land Use	North Central Clark County
Specially Designated Areas and Lands with Wilderness Characteristics	Within a 25-mi (40-km) radius of the Dry Lake SEZ
Rangeland Resources	North Central Clark County
Grazing	Grazing allotments within 5 mi (8 km) of the Dry Lake SEZ
Wild Horses and Burros	A 50-mi (80-km) radius from the Center of the Dry Lake SEZ
Recreation	North Central Clark County
Military and Civilian Aviation	North Clark County, southwest Lincoln County, and central Nye County
Soil Resources	Areas within and adjacent to the Dry Lake SEZ
Minerals	North Central Clark County
Water Resources	
Surface Water	Dry Lake and ephemeral wash tributaries to Dry Lake
Groundwater	Garnet Valley, Hidden Valley, and Coyote Spring Valley groundwater basins; central and lower portions of the regional groundwater flow system
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Dry Lake SEZ
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Dry Lake SEZ, including portions of Clark and Lincoln Counties in Nevada, Washington County in Utah, and Mohave County in Arizona
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Dry Lake SEZ
Acoustic Environment (noise)	Areas adjacent to the Dry Lake SEZ
Paleontological Resources	Areas within and adjacent to the Dry Lake SEZ
Cultural Resources	Areas within and adjacent to the Dry Lake SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Dry Lake SEZ for other properties, such as traditional cultural properties
Native American Concerns	Areas within and adjacent to the Dry Lake SEZ; viewshed within a 25-mi (40-km) radius of the Dry Lake SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the Dry Lake SEZ
Environmental Justice	A 50-mi (80-km) radius from the center of the Dry Lake SEZ
Transportation	I-15, U.S. 93

11.3.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable;" that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;

- Proposals in a detailed design phase;

- Proposals listed in formal NOIs published in the *Federal Register* or state publications;

- Proposals for which enabling legislations has been passed; and

- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 11.3.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to electric power generation, water management, natural gas and petroleum distribution, communication systems, residential development, and mining (Section 11.3.22.2.2). Together, these actions and trends have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

11.3.22.2.1 Energy Production and Distribution

On February 16, 2007, Governor Gibbons signed an Executive Order to encourage the development of renewable energy resources in Nevada (Gibbons 2007a). The Executive Order requires all relevant state agencies to review their permitting processes to ensure the timely and expeditious permitting of renewable energy projects. On May 9, 2007, and June 12, 2008, the Governor signed Executive Orders creating the Nevada Renewable Energy Transmission Access Advisory Committee Phase I and Phase II that will propose recommendations for improved access to the grid system for renewable energy industries (Gibbons 2007b, 2008). In May 28, 2009, the Nevada legislature passed a bill modifying the Renewable Energy Portfolio Standards (Nevada State Senate Bill 358, 2009). The bill requires that 25% of the electricity sold be produced by renewable energy sources by 2025.

Reasonably foreseeable future actions related to renewable energy production and energy distribution within 50 mi (80 km) of the proposed Dry Lake SEZ are identified in

Table 11.3.22.2-1 and described in the following sections. Renewable energy project applications on public lands are shown in Figure 11.3.22.2-1 by application serial number.

Renewable Energy Development

Renewable energy applications on public lands are considered in two categories, fast-track and regular-track applications. Fast-track applications, which apply principally to solar and wind energy facilities, are those applications on public lands for which the environmental review and public participation process is under way and applications could be approved by December 2010. A fast-track project would be considered foreseeable, because the permitting and environmental review processes would be under way. Regular-track proposals are considered potential future projects, but not necessarily foreseeable projects, since not all applications would be expected to be carried to completion. These proposals are considered together as a general level of interest in development of renewable energy in the region. Foreseeable projects on private land are also considered.

Table 11.3.22.2-1 lists one foreseeable wind energy project and four foreseeable solar energy projects; the solar projects are located on private land. Foreseeable renewable energy projects are described in the following paragraphs.

Mohave County Wind Farm (AZA 032315). BP Wind Energy proposes to build the 500-MW Mohave County Wind Farm, comprising 335 wind turbine generators. Construction would include access roads, ancillary facilities, meteorological towers, and transmission lines to connect to the grid. The site would require 41,577 acres (198 km^2) of public land, located 20 mi (32 km) southeast of the Hoover Dam and 40 mi (64 km) southeast of the SEZ. It is estimated that 169 acres (0.68 km^2) would be permanently disturbed and 507 acres (2.05 km^2) temporarily disturbed. The expected date for commercial operation is 2012. The facility would be built in several phases. Phase I would produce 350 MW from up to 235 turbines. Subsequent phases would produce an additional 150 MW from 50 to 100 turbines. Construction would require about 100 to 200 workers, operations would require about 10 to 20 employees (BLM 2010d).

Boulder City Solar. NextLight Renewable Power intends to build the Boulder City Solar Plant, a 150-MW PV generating facility. The facility will be located on 1,100 acres (4.45 km^2) of private land about 12 mi (19 km) southwest of Boulder City, Nevada, and 40 mi (64 km) south of the SEZ. Water use is projected to be less than 20 acre-ft/year (24,600 m^3/yr) during operation, which is expected to begin in 2010 (First Solar, Inc. 2009).

El Dorado Solar Expansion. Sempra Energy intends to expand its 10-MW El Dorado Solar Plant, utilizing thin-film solar cell panels, to 58 MW. The facility will be located on 80 acres (0.32-km^2) of private land, which is adjacent to the El Dorado Energy Generating Station, 17 mi (27 km) southwest of downtown Boulder City, Nevada, and about 45 mi (72 km) south of the SEZ. The expansion could be operational in 2010 (BRW 2009).

TABLE 11.3.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Dry Lake SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Projects			
Mohave County Wind Farm (AZA 32315), 500 MW, 41,577 acres	NOI Nov. 20, 2009	Terrestrial habitats, wildlife cultural resources, land use	40 mi (64 km) southeast of the SEZ in Arizona
Renewable Energy Projects on Private Lands			
Boulder City Solar, 150 MW, PV, 1100 acres	Construction stage	Terrestrial habitats, wildlife, cultural resources, land use	40 mi (64 km) south of the SEZ
El Dorado Solar Expansion, 10 MW, PV, 80 acres	Construction stage	Terrestrial habitats, wildlife, cultural resources, land use	45 mi (72 km) south of the SEZ
BrightSource Coyote Springs Project, 960 MW, solar tower, 7,680 acres	Planning stage	Terrestrial habitats, vegetation, wildlife, soil, water, visual, cultural	15 mi (24 km) north of the SEZ
BrightSource Overton Project, 400 MW, solar tower	Planning stage	Terrestrial habitats, vegetation, wildlife, soil, water, visual, cultural	30 mi (48 km) northeast of the SEZ
Transmission and Distribution Systems			
One Nevada Transmission Line Project	Draft Supplemental EIS Nov. 30, 2009	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes through the SEZ
Southwest Intertie Project	FONSI issued July 30, 2008 In-service in 2010	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes through the SEZ
TransWest Transmission Project	Permit Application Nov. 2009	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes through the SEZ
Zephyr and Chinook Transmission Line Project	Permit Applications in 2011/2012	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes near or through the SEZ

[a] Projects in later stages of agency environmental review and project development.

BrightSource Energy Coyote Springs Project. BrightSource Energy is planning to build a 960-MW solar thermal-powered facility on private land at the Coyote Springs Investment Planned Development Project at the junction of U.S. 93 and State Route 168. The facility would utilize the Luz Power Tower, which consists of thousands of mirrors that reflect sunlight onto a boiler filled with water sitting on top of a tower. The high-temperature steam produced would be piped to a conventional turbine that generates electricity. The station would utilize a dry-cooling system. The site, approximately 7,680 acres (31 km^2), would be 15 mi (24 km) north of the SEZ (BrightSource Energy 2009).

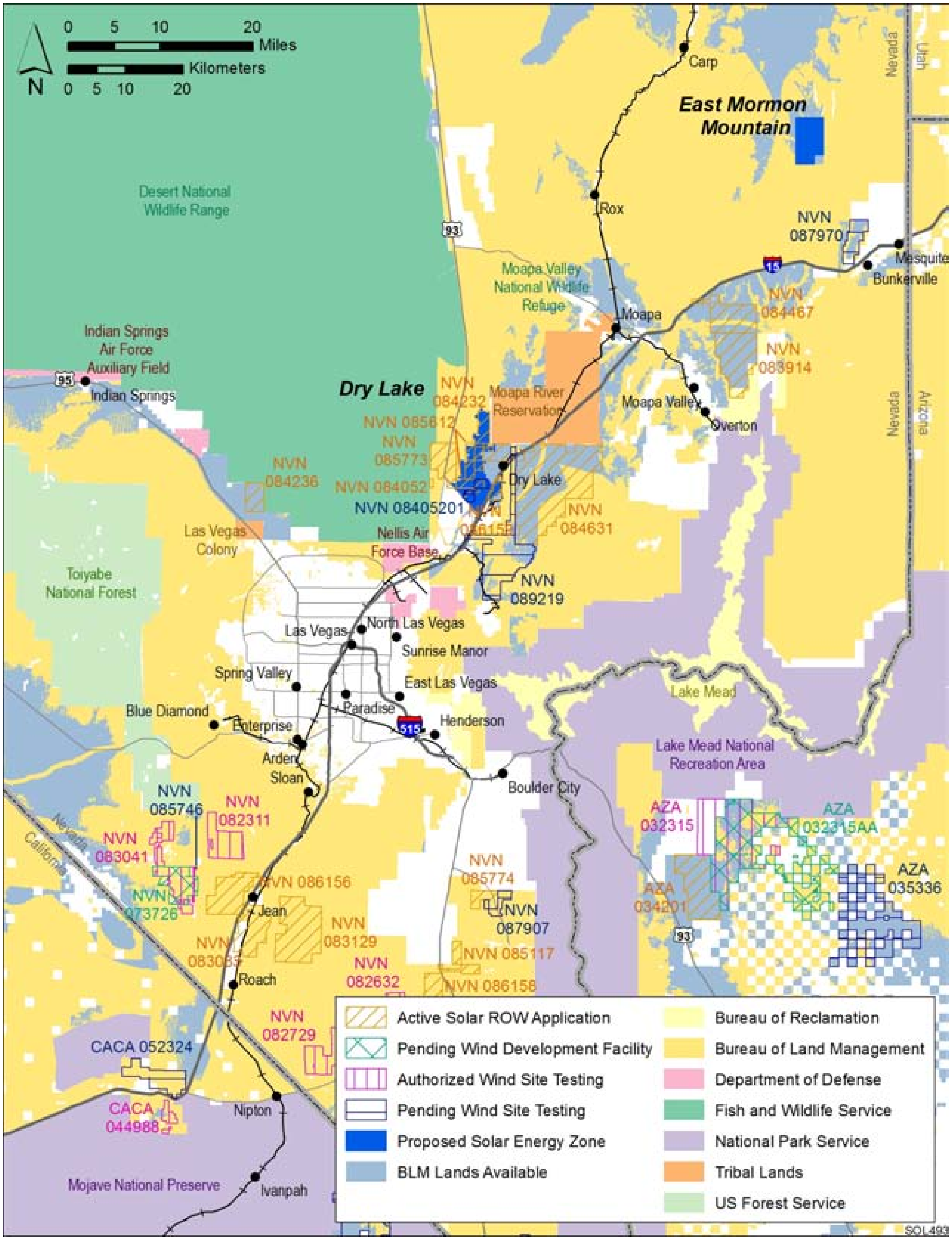

FIGURE 11.3.22.2-1 Locations of Renewable Energy Project ROW Applications on Public Land within a 50-mi (80-km) Radius of the Proposed Dry Lake SEZ

BrightSource Energy Overton Project. BrightSource Energy is planning to build three 400-MW solar thermal power facilities on private land east of the airport at Overton, Nevada. The facility would utilize the Luz Power Tower, which consists of thousands of mirrors that reflect sunlight onto a boiler filled with water sitting on top of a tower. The high temperature steam produced would be piped to a conventional turbine that generates electricity. The station would utilize a dry-cooling system. The site would be 30 mi (48 km) northeast of the SEZ. The plan is for initial operation in 2012 (Cleantech 2008).

Pending Solar ROW Applications on BLM-Administered Lands. Applications for ROW grants that have been submitted to the BLM include 16 pending solar projects, 4 pending authorizations for wind site testing, 3 authorized projects for wind testing, and 2 pending authorizations for development of wind facilities that would be located either within Dry Lake SEZ or within 50 mi (80 km) of the SEZ (BLM 2009a,b). No applications for geothermal projects have been submitted. Table 11.3.22.2-2 lists these applications and Figure 11.3.22.2-1 shows their locations.

The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The projects, listed in Table 11.3.22.2-2 for completeness, are an indication of the level of interest in development of renewable energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

Wind testing would involve some relatively minor activities that could have some environmental effects, mainly the erection of meteorological towers and monitoring of wind conditions. These towers may or may not employ guy wires and may be 200 ft (60 m) high.

Transmission and Distribution Systems

Table 11.3.22.2-1 identifies four major new transmission projects, which are described below.

One Nevada Transmission Line Project. NV Energy proposes to construct and operate a 236-mi (382-km) long, single-circuit, 500-kV transmission line with fiber-optic telecommunication and appurtenant facilities in White Pine, Nye, Lincoln, and Clark counties. It will consist of self-supporting, steel-lattice and steel-pole H-frame structures, placed 900 to 1,600 ft (274 to 488 m) apart. The width of the right-of-way is 200 ft (61 m). New 500-kV electrical facilities would be installed inside the existing footprint of the Harry Allen Substation. The proposed action includes new substations outside the ROI of the Dry Lake SEZ. The transmission line would be within the SWIP utility corridor that passes through the SEZ. Construction could have potential impacts on the Mojave Desert Tortoise (BLM 2009c).

1

TABLE 11.3.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Dry Lake SEZ[a,b]

Serial Number	Applicant	Application Received	Size (acres)[c]	MW	Technology	Status	Field Office
Solar Applications							
NVN 83083	Cogentrix Solar Services, LLC	Jan. 18, 2007	9,760	1,000	CSP	Pending	Las Vegas
NVN 83129	Cogentrix Solar Services, LLC	Jan. 18, 2007	19,840	1,000	CSP	Pending	Las Vegas
NVN 83914	Bright Source Energy Solar	–[d]	10,000	500	CSP	Pending	Las Vegas
NVN 84052	NV Power Co.	Aug. 14, 2007	1,775	120	CSP	Pending	Las Vegas
NVN 84232	First Solar	Oct. 22, 2007	5,500	400	PV	Pending	Las Vegas
NVN 84236	First Solar	Oct. 22, 2007	3,800	400	PV	Pending	Las Vegas
NVN 84467	Pacific Solar Investments, Inc.	Dec. 7, 2007	11,000	1,000	Parabolic Trough	Pending	Las Vegas
NVN 84631	Bright Source Energy Solar	Jan. 28, 2008	2,000	1,200	CSP	Pending	Las Vegas
NVN 85117	Bull Frog Green Energy	March 18, 2008	3,639	500	PV	Pending	Las Vegas
NVN 85612	Cogentrix Solar Services, LLC	July 11, 2008	2,012	240	CSP	Pending	Las Vegas
NVN 85773	Cogentrix Solar Services, LLC	July 11, 2008	11,584	1,000	CSP	Pending	Las Vegas
NVN 85774	Bull Frog Green Energy	Aug. 14, 2008	3,177	500	PV	Pending	Las Vegas
NVN 86156	Power Partners Southwest, LLC	–	10,815	250	CSP	Pending	Las Vegas
NVN 86158	Power Partners Southwest, LLC	Sept. 18, 2008	3,885	250	CSP	Pending	Las Vegas
NVN 86159	Power Partners Southwest, LLC	Sept. 19, 2008	1,751	250	CSP	Pending	Las Vegas
AZA 34201	Boulevard Assoc., LLC	June 22, 2007	15,634	250	Parabolic Trough	Pending	Kingman
Wind Applications							
NVN 85746	Desert Research Institute	Aug. 1, 2008	28,428	–	Wind	Pending wind site testing	Las Vegas
NVN 87907	Pacific Wind Development	–	2,200	–	Wind	Pending wind site testing	Las Vegas
NVN 87970	Pacific Wind Development	Sept. 29, 2009	5,089	–	Wind	Pending wind site testing	Las Vegas
NVN 89219	Pioneer Green Energy		20,680	–	Wind	Pending wind site testing	Las Vegas
NVN 82311	Competitive Power Vent	July 3, 2006	8,944	–	Wind	Authorized wind site testing	Las Vegas

TABLE 11.3.22.2-2 (Cont.)

Serial Number	Applicant	Application Received	Size (acres)[c]	MW	Technology	Status	Field Office
Wind Applications (Cont.)							
NVN 83041	Table Mtn Wind	Jan. 31, 2006	11,570	–	Wind	Authorized wind site testing	Las Vegas
AZA 32315	BP Wind Energy	–	31,338	–	Wind	Authorized wind site testing	Kingman
NVN 73726	Table Mtn Wind	May 5, 2000	8,320	–	Wind	Pending wind facilities development	Las Vegas
AZA 32315AA	BP Wind Energy	–	44,860	–	Wind	Pending wind facilities development	Kingman

[a] Sources: BLM (2009a,b).

[b] Information for pending solar and wind (BLM and USFS 2010b) energy projects downloaded from GeoCommunicator.

[c] To convert acres to km^2, multiply by 0.004047.

[d] A dash indicates data not available.

Southwest Intertie Project (SWIP). The SWIP is a 520-mi (830-km) long, single-circuit, overhead 500-kV transmission line project. The first phase, the Southern Portion, is a 264-mi (422-km) long transmission line that begins at the existing Harry Allen Substation in Dry Lake, Nevada, and runs north to a proposed substation approximately 18 mi (29 km) northwest of Ely, Nevada. The transmission line will pass through the SEZ. It will consist of self-supporting, steel-lattice and steel-pole H-frame structures, placed 1,200 to 1,500 ft (366 to 457 m) apart. The SWIP proposed completion date is 2012. Construction could have potential impacts on the Mojave Desert Tortoise (BLM 2007b).

TransWest Transmission Project. TransWest Express proposes to construct a high-voltage electric utility transmission line. The single-circuit 600-kV direct current transmission line would extend from south central Wyoming to Southern Nevada, a distance of 765 mi (1,224 km). It will consist of self-supporting steel-lattice and steel-pole structures. A terminal/converter station would be located near Boulder City, Nevada. A communication system for command and control will require a fiber-optic network and periodic regenerative sites. The proposed routes have been sited to parallel existing facilities and occupy designated utility corridors to the extent practicable, and will pass the southern boundary of the SEZ (TransWest Express 2009).

Zephyr and Chinook Transmission Line Project. TransCanada is proposing the construction of two 500-kV high-voltage DC transmission lines. The Zephyr project would originate in southeastern Wyoming. The Chinook project would originate in south-central Montana. Both would travel along the same corridor from northern Nevada, passing near or through the SEZ, and terminate in the El Dorado Valley south of Las Vegas. Construction is expected to be complete in 2015 or 2016 (TransCanada 2010).

11.3.22.2.2 Other Actions

There are a number of energy production facilities within a 50-mi (80-km) radius from the center of the Dry Lake SEZ, which includes portions of Clark and Lincoln Counties in Nevada, Washington County in Utah, and Mohave County in Arizona. Other major ongoing and foreseeable actions within 50 mi (80 km) of the proposed Dry Lake are listed in Table 11.3.22.2-3 and described in the following sections.

Ongoing Renewable Energy Projects

El Dorado Solar. Sempra Energy operates the 10-MW El Dorado Solar Plant, utilizing more than 167,000 thin-film, solar cell panels. The 80-acre (0.32-km^2) site is adjacent to the El Dorado Energy Generating Station, 17 mi (27 km) southwest of downtown Boulder City, Nevada, and about 45 mi (72 km) south of the SEZ (Sempra Generation 2010).

TABLE 11.3.22.2-3 Other Ongoing and Foreseeable Actions near the Proposed Dry Lake SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Projects			
El Dorado Solar	Operating since 2009	Terrestrial habitats, wildlife, visual	45 mi (72 km) south of the SEZ
Nellis Air Force Base Solar	Operating since 2007	Terrestrial habitats, wildlife, visual	10 mi (16 km) south of the SEZ
Nevada Solar One	Operating since 2007	Terrestrial habitats, wildlife, water, cultural, visual	40 mi (64 km) south of the SEZ
Sithe Global Flat Top Mesa Solar	Proposed	Terrestrial habitats, wildlife, cultural, visual	42 mi (67 km) northeast of the SEZ
Other Energy Projects			
Apex Generating Station	Operating since 2003	Terrestrial habitats, wildlife, water, air, cultural, visual	Adjacent to the SEZ
Chuck Lenzie Generating Station	Operating since 2006	Terrestrial habitats, wildlife, water, air, cultural, visual	Adjacent to the SEZ
Edward W. Clark Generating Station	Operating since 1973	Terrestrial habitats, wildlife, water, air, cultural, visual	25 mi (40 km) southwest of the SEZ
El Dorado Energy Generating Station	Operating since 2000	Terrestrial habitats, wildlife, water, air, cultural, visual	45 mi (72 km) south of the SEZ
Goodsprings Waste Heat Recovery Facility	EA and FONSI Sept. 2009	T&E species, air, visual	50 mi (80 km) southwest of the SEZ
Harry Allen Generating Station	Operating since early 1980s	Terrestrial habitats, wildlife, water, air, cultural, visual	Within the SEZ
Harry Allen Expansion	Under construction	Terrestrial habitats, wildlife, water, air, cultural, visual	Within the SEZ
Reid Gardner Generating Station	Operating since 1965	Terrestrial habitats, wildlife, water, air, cultural, visual	20 mi (32 km) northeast of the SEZ
Reid Gardner Expansion	EA and FONSI March 2008	Terrestrial habitats, wildlife, soil, air, water	20 mi (32 km) northeast of the SEZ
Saguaro Power Company	Operating since 2000	Terrestrial habitats, wildlife, water, air, cultural, visual	20 mi (32 km) south of the SEZ
Silverhawk Generating Station	Operating since 2004	Terrestrial habitats, wildlife, water, air, cultural, visual	Adjacent to the SEZ

TABLE 11.3.22.2-3 (Cont.)

Description	Status	Resources Affected	Primary Impact Location
Other Energy Projects (Cont.)			
Sunrise Generating Station	Operating since 1964	Terrestrial habitats, wildlife, water, air, cultural, visual	20 mi (32 km) south of the SEZ
Toquop Energy Project	Coal-fired plant FEIS 2009, changed to natural gas in 2010	Terrestrial habitats, wildlife, soil, water, air, cultural, visual	50 mi (80 km) northeast of the SEZ
Distribution Systems			
Kern River Gas Transmission System	Operating since 1992	Disturbed areas, terrestrial habitats along pipeline ROW	Corridor passes through the SEZ
UNEV Pipeline Project	FEIS April 2010	Disturbed areas, terrestrial habitats along pipeline ROW	Corridor passes through the SEZ
Other Projects			
Arizona Nevada Tower Corporation Communication Sites	EA issued April 2007	Terrestrial habitats, wildlife, cultural resources	West and north of the SEZ
Clark, Lincoln, and White Pine Counties Groundwater Development Project	DEIS expected in 2011	Terrestrial habitats, wildlife, groundwater	Within the SEZ
Coyote Springs Investment Planned Development Project	FEIS issued Sept. 2008, ROD issued Oct. 2008	Terrestrial habitats, wildlife, water, socioeconomics	15 mi (24 km) north of the SEZ
Dry Lake Groundwater Testing/Monitoring Wells	EA and FONSI issued Sept. 2009	Terrestrial habitats, wildlife cultural resources	Within the SEZ
Lincoln County Land Act Groundwater Development and Utility ROW	FEIS issued May 2009 ROD Jan. 2010	Terrestrial habitats, wildlife, groundwater	45 mi (72 km) northeast of the SEZ
Meadow Valley Gypsum Project	EA and FONSI issued 2008	Terrestrial habitats, wildlife, soils, socioeconomics	35 mi (56 km) northeast of the SEZ
Mesquite Nevada General Aviation Replacement Airport	DEIS April 2008	Land use, terrestrial habitats, wildlife, soil, water, air, cultural, visual	40 mi (64 km) northeast of SEZ
NV Energy Microwave and Mobile Radio Project	Preliminary EA March 2010	Terrestrial habitats, wildlife, cultural resources	Two sites within the SEZ, one site 45 mi (72 km) north of SEZ

[a] Projects ongoing or in later stages of agency environmental review and project development.

Nellis Air Force Base Solar. Nellis Air Force Base operates a 13.5-MW solar PV plant consisting of about 72,000 solar panels, using a single-axis solar tracking system that follows the sun throughout the day. The power produced is 400 volts DC, and transformers step up the voltage to 12,470 volts, compatible with the Nellis Air Force Base system. All power is to be used by the Base; it provides up to 30% of the Base requirements. The 140-acre (0.57-km^2) site is located in Area III on the northwest portion of the Base. Nellis Air Force Base is just northeast of Las Vegas, Nevada, and 10 mi (16 km) south of the SEZ. No federal or state threatened or endangered species, protected species, or rare plants exist on the site (U.S. Air Force 2006).

Nevada Solar One. Acciona's Nevada Solar One is a 64-MW thermal-electric plant consisting of 760 parabolic concentrators with more than 182,000 mirrors that raise a heat transfer fluid to 735°F; it is then used to produce steam that drives a conventional turbine. The facility is located on a 280-acre (1.1-km^2) site about 12 mi (19 km) southwest of Boulder City, Nevada, and 40 mi (64 km) south of the SEZ. The plant began operating in 2007 (Acciona 2009).

Sithe Global Flat Top Mesa Solar. Sithe Global is planning to build a 50-MW solar photovoltaic power plant. The 450-acre (1.8-km^2) site is located on private land 5 mi (8 km) west of Mesquite Nevada and 42 mi (67 km) northeast of the SEZ. Approximately 200 workers would be required during the 15-month construction period (Sithe Global 2010a).

Other Ongoing and Foreseeable Energy Projects

Apex Generating Station. The Apex Generating Station is a 600-MW, combined cycle, natural gas–fired power plant, consisting of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator. The plant is located within the Apex Industrial Park near the intersection of I-15 and State Route 93. The site is within the SEZ (Mirant Las Vegas 2007).

Chuck Lenzie Generating Station. The Chuck Lenzie Generating Station is a 1,102-MW, combined cycle, natural gas–fired power plant located within the SEZ; it consists of four combustion turbines, four heat recovery steam generators, and two steam turbines. The plant, owned by NV Energy, has been operating at full power since 2006. The station utilizes a dry-cooling system. Approximately 30 workers are required to operate the facility (NVE 2009a).

El Dorado Energy Generating Station. The El Dorado Energy Generating Station is a 480-MW, combined cycle, natural gas–fired power plant. The 138-acre (0.56-km^2) site is 17 mi (27 km) southwest of downtown Boulder City, Nevada, and about 45 mi (72 km) south of the SEZ (Sempra Generation 2010).

Edward W. Clark Generating Station. The Edward W. Clark Generating Station is a 1,102-MW natural gas–fired power plant, which includes a total of 19 generating units with in-service dates ranging from 1973 to 2008. Four are combined cycle turbine generators and 12 are peaking units with capacity of 600 MW. The site is located a few miles south of the Las Vegas Strip and about 25 mi (40 km) southwest of the SEZ. The plant includes a 75-kW high-concentration PV system. Approximately 30 workers are required to operate the facility (NVE 2009d).

Goodsprings Waste Heat Recovery Generation Facility. NV Energy proposes to construct and operate a 6-MW waste heat recovery generation facility near Goodsprings, Nevada. The source of the waste heat would be three Kern River Station gas compressor turbines' exhaust. The 5-acre (0.02-km^2) site is located 50 mi (80 km) southwest of the SEZ (BLM 2009d).

Harry Allen Generating Station. The Harry Allen Generating Station is a two-unit, 144-MW, combined cycle gas-fired power plant. It was originally built as a "simple" cycle plant operating only during the hot summer months. The first combined cycle unit (60 MW) began operating in 1995 and the second unit (84 MW) went online in 2006. The plant is located north of the intersection of I-15 and U.S. 93. The site is within the SEZ. Approximately 30 workers are required to operate the facility (NVE 2009c).

Harry Allen Generating Station Expansion. The Harry Allen Generating Station is a 484-MW, combined cycle, natural gas–fired power plant that consists of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator. The heat rejection system will utilize a cooling system comprised of natural draft dry-cooling towers. The plant is located on the site of the existing plant north of I-15 and State Route 93, within the SEZ (NVE 2009c).

Reid Gardner Generating Station. The Reid Gardner Generating Station is a four-unit, 557-MW, coal-fired electric generation facility owned by NV Energy. The first unit went online in 1965. All four units have been operating since 1983. The 480-acre (1.9-km^2) site is located near the town of Moapa, about 20 mi (32 km) northeast of the SEZ. The facility includes evaporation ponds and fly ash, bottom ash, and solids landfills. Pollution control includes wet scrubbers. The heat rejection system consists of wet-cooling towers. Coal is delivered by rail (BLM 2008a).

Reid Gardner Expansion Project. The Reid Gardner Expansion Project will consist of the construction of a 240-acre (0.97-km^2) fly ash landfill and a 315-acre (1.27-km^2) evaporation pond to support the existing Reid Gardner Power Plant. The proposed expansion is adjacent to the southern boundary of the existing site near the town of Moapa, about 20 mi (32 km) southeast of the SEZ (BLM 2008a).

Saguaro Power Company. Saguaro Power Company operates two 35-MW natural gas combustion turbine generators with heat recovery steam generators, a 23.1-MW extraction/condensing steam turbine generator, and two waste heat recovery steam generators. There are two auxiliary boilers that provide steam to manufacturing facilities. The power plant, located 20 mi (32 km) south of the SEZ, is cooled by a wet mechanical draft cooling tower. (Saguaro Power Company 2009).

Silverhawk Generating Station. The Silverhawk Generating Station is a 520-MW, combined cycle, natural gas–fired power plant, consisting of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator. The plant is located within the Apex Industrial Park near the intersection of I-15 and State Route 93. The site is within the SEZ. The station utilizes a dry-cooling system. The plant began operating in 2004. Approximately 30 workers are required to operate the facility (NVE 2009b).

Sunrise Generating Station. Sunrise Generating Station is a 150-MW natural gas–fired power plant. One unit is a steam boiler and the other is a combustion turbine. The plant also has three peaking units with a capacity of 73 MW. The site is about 20 mi (32 km) southwest of the SEZ (NVE 2009e).

Toquop Energy Project. The Toquop Energy Project, originally proposed as a 750-MW coal-fired electric generation facility, is now planned as a 1,100-MW natural gas-fired combined-cycle power plant, located on a 640-acre (2.6-km^2) site 12 mi (19 km) northwest of the town of Mesquite, Nevada, 50 mi (80 km) northeast of the SEZ. The project will be built in phases. Phase I will be a nominal 550- to 600 MW combined-cycle plant. A water supply system, a gas pipeline connecting the power plant to the Kern River pipeline, connection to the existing Navajo-McCullogh transmission line, and road access to I-15 would also be required. The heat rejection system will utilize a hybrid cooling system comprised of natural draft dry-cooling towers with the ability to apply water overspray on the heating surfaces to provide additional cooling at ambient air temperatures greater than about 80°F (27ºC). The proposed project would require 600 workers during construction, scheduled to begin in 2012 with commercial operation in 2015 (BLM 2009e, Sithe Global 2010b).

Ongoing and Foreseeable Distribution Systems

Kern River Gas Transmission System. The Kern River Gas Transmission system transports 1.7 billion ft^3 of natural gas per day (4.8 million m^3 per day) from Wyoming to the Las Vegas area and then southwest as far as San Bernardino California. A two-pipeline delivery system exists along most of the pipeline route. The pipeline passes through the SEZ (FERC 2010).

UNEV Pipeline Project. Holly Energy Partners proposes to construct and operate a 399-mi (640-km) long, 12-in. (0.3-m) petroleum products pipeline that will originate at the Holly Corporation's Woods Cross, Utah, refinery near Salt Lake City and terminate near the Apex Industrial Park near the intersection of I-15 and State Route 93. The pipeline would generally follow the Kern River ROW within Nevada and pass just south of the SEZ (BLM 2010e).

Other Ongoing and Foreseeable Projects

Arizona Nevada Tower Corporation Communication Sites. Arizona Nevada Tower Corporation has constructed seven cellular telephone signal relay towers in Lincoln County along the U.S. 93 corridor between Coyote Springs Valley and the town of Pioche. Four of the seven sites are 100 ft × 100 ft (30.5 m × 30.5 m) parcels. The remaining three are 50 ft × 100 ft (15.7 m × 30.5 m), 50 ft × 120 ft (15.7 m × 36.6 m), and 100 ft × 200 ft (30.5 m × 61.0 m). Utility corridors were extended to six of the sites to supply electricity. Solar cells are the primary source of power for the Alamo Peak site, with wind generation as the backup. The towers are steel lattice, three-sided, and free standing, and each tower base is a 30 ft^2 (9.1 m^2) concrete slab. The towers at Alamo Peak and Highland Peak are 125 ft (38.1 m) high, and the other five are 195 ft (59.4 m) high (BLM 2007c).

Clark, Lincoln, and White Pine Counties Groundwater Development Project. The Southern Nevada Water Authority (SNWA) proposes to construct a groundwater development project that would transport approximately 122,755 ac-ft/yr (151 million m^3/yr) of groundwater under existing water rights and applications from several hydrographic basins in eastern Nevada and western Utah. The proposed facilities include production wells, 306 mi (490 km) of buried water pipelines, 5 pumping stations, 6 regulating tanks, 3 pressure reducing stations, a buried storage reservoir, a water treatment facility, and about 323 mi (517 km) of 230-kV overhead power lines, 2 primary and 5 secondary substations. The project would develop groundwater in the following amounts in two hydraulically connected valleys that are up-gradient of the Dry Lake SEZ: Dry Lake Valley (11,584 ac-ft/yr [14.3 million m^3/yr]) and Delamar Valley (2,493 ac-ft/yr [3.1 million m^3/yr]). In addition, an undetermined amount of water could be developed and transferred from Coyote Spring Valley, which is north of the SEZ and down-gradient of the other two basins (SNWA 2010)

Coyote Springs Investment (CSI) Development Project. CSI intends to develop a new town in southern Lincoln County at the junction of U.S. 93 and State Route 168. The town would be a master-planned community on 21,454 acres (86.8 km^2), and would include residential, commercial, and industrial land uses. Plans call for more than 111,000 residential dwelling units at a density of 5 units per acre (0.004047 km^2). Also included in the community would be public buildings, hotels, resorts, casinos, commercial and light industrial areas, roads, bridges, and a heliport. Utilities and other infrastructure would be developed to serve the town, including power facilities, sanitary sewer and wastewater treatment facilities, stormwater facilities, solid waste disposal transfer stations, and telecommunications facilities. Water supply treatment facilities, monitoring wells, production wells, storage facilities, and transmission and distribution facilities would also be built. Approximately 70,000 ac-ft/yr (86 million m^3/yr) of water would be needed for the community at full build-out, which may occur over a period of about 40 years. Currently, CSI and its affiliates hold approximately 36,000 ac-ft/yr (44.0 million m^3/yr) in certificated groundwater rights in various basins within Lincoln County. CSI currently owns the 21,454-acre (86.8-km^2) development area and holds leases on an additional 7,548 acres (30.6 km^2) of BLM land in Lincoln County and 6,219 acres (25.2 km^2) of BLM land in Clark County within or next to the privately held land. These adjacent areas would be managed by BLM for the protection of federally-listed threatened or endangered species; activities would be limited to non-motorized recreation or scientific research. The development is 15 mi (24 km) north of the SEZ (USFWS 2008).

Dry Lake Groundwater Testing/Monitoring Wells. The SNWA intends to construct two to four groundwater wells within two 2.5-acre (0.01-km^2) (1.0-acre [0.004-km^2] long-term) locations and a 1.5-acre [0.006-km^2] short-term) location in Dry Lake. The dimensions for the long-term ROW would be 168 ft × 260 ft (51 m × 79 m), and the dimensions for the short-term ROW would be 330 ft × 330 ft (100 m × 100 m) for each site. Two 12-in. (0.3-m) and two 20-in. (0.5-m) wells would be drilled to between 2,200 and 2,400 ft (670 and 730 m) in depth. Access to the well sites would be from both existing roads and a new 809-ft (246-m) long access road. Water generated during the tests would be discharged into the natural drainage network around the sites. At the completion of hydraulic testing, the SNWA will continue to record data to establish baseline ranges of the groundwater levels in the area.

Lincoln County Land Act (LCLA) Groundwater Development and Utility ROW. This project involves the construction of the infrastructure required to pump and convey groundwater resources in the Clover Valley and Tule Desert Hydrographic Areas. The construction includes 75 mi (122 km) of collection and transmission pipeline, 30 wells, 5 storage tanks, water pipeline booster stations, transmission lines and substations, and a natural gas pipeline. A total of 240 acres (0.97 km^2) will be permanently disturbed, and 1,878 acres (7.6 km^2) will be temporarily disturbed. The site is 45 mi (72 km) northeast of the SEZ (USFWS 2009c).

Meadow Valley Gypsum Project. Meadow Valley Gypsum was issued a Finding of No Significant Impact (BLM 2008b) following an Environmental Assessment of proposed mining, processing, and transporting gypsum on public lands. The project would be located 50 mi (80 km) south of Caliente in Lincoln County, Nevada. The project would disturb 46.7 acres (0.2 km^2) and would consist of an open pit, processing plant, and 1.5-mi (2.4-km) long access road.

Mesquite Nevada General Aviation Replacement Airport. The City of Mesquite, Nevada, is proposing to replace its existing airport with a new airport on Mormon Mesa, adjacent to I-15 near Riverside, Nevada, and about 40 mi (64 km) northeast of the SEZ. The airport would require BLM to release 2,560 acres (10.36 km^2) of BLM land for acquisition by the City of

Mesquite. The airport would include a new runway with associated parallel taxiway, general aviation support, and maintenance facilities. The existing airport would be decommissioned and the site would be released for nonaeronautical uses (FAA 2008).

NV Energy Microwave and Mobile Radio Project. NV Energy is proposing to install a new microwave and radio communications network at 13 sites. Two sites are located within the SEZ and one is located 45 mi (72 km) north of the SEZ. The two closest sites are small, about 0.1 acres (0.0004 km^2). The further site is 0.6 acres (0.0024 km^2), but requires 57 acres (0.23 km^2) of land disturbance for access and power-line ROW. Each site would include a communication shelter, two propane tanks, and a generator. Two of the sites have a 160-ft (50-m) self-supporting lattice tower, and one, an 80-ft (25-m) tower (BLM 2010f).

Grazing

There are no active grazing allotments in the immediate vicinity of the SEZ.

Mining

The Meadow Valley Gypsum Project is proposing to mine gypsum on public land, approximately 35 mi (56 km) northeast of the SEZ, as noted above. A total of 46.7 acres (0.189 km^2) would be disturbed during the 10-year lifetime of the project. A 1.5-mi (2.5-km) access road and a 1.8-acre (0.0073-km^2) railroad siding would be constructed (BLM 2007d).

11.3.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change for the proposed Dry Lake SEZ are presented in this section. Table 11.3.22.3-1 lists the relevant impacting factors for the trends.

11.3.22.3.1 Population Growth

Over the period 2000 to 2008, the population grew annually by 4.0% in Clark County, the ROI for the Dry Lake SEZ (Section 11.3.19.1.5). The population of the ROI in 2008 was 1,879,093. The annual growth rate for the state of Nevada as a whole was 3.4%. The ROI population is projected to increase to 2,710,303 by 2021 and to 2,791,161 by 2023.

11.3.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floor space, transportation, manufacturing, and services. Given that

TABLE 11.3.22.3-1 General Trends Relevant to the Proposed SEZs in Nevada

General Trend	Impacting Factors
Population growth	Urbanization Increased use of roads and traffic Land use modification Employment Education and training Increased resource use (e.g., water and energy) Tax revenue
Energy demand	Increased resource use Energy development (including alternative energy sources) Energy transmission and distribution
Water availability	Drought conditions and water loss Conservation practices Changes in water distribution
Climate change	Water cycle changes Increased wildland fires Habitat changes Changes in farming production and costs

population growth is expected in seven SEZ areas in Nevada between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5, 0.4, and 0.1% each year, respectively (EIA 2009).

11.3.22.3.3 Water Availability

As described in Section 11.3.9.1.2, the proposed Dry Lake SEZ is located within the Garnet Valley groundwater basin. Groundwater depths in the basin have been recorded at between 230 and 760 ft (70 and 230 m) below ground surface. Groundwater discharge through evapotranspiration is minimal, while recharge from precipitation on the valley floor and the surrounding mountains is estimated to be 400 ac-ft/yr (490,000 m^3/yr). Inflows from the adjacent Hidden Valley groundwater basin are estimated to be 400 ac-ft/yr (490,000 m^3/yr), while estimated discharge from the basin to the California Wash groundwater basin to the west is 800 ac-ft/yr (990,000 m^3/yr).

In 2005, water withdrawals from surface waters and groundwater in Clark County were 680,000 ac-ft/yr (839 million m^3/yr), of which 83% came from surface waters and 17% came from groundwater. The largest water use was public supply at 526,000 ac-ft/yr (649 million m^3/yr), while thermoelectric water use was 28,000 ac-ft/yr (34 million m^3/yr), and irrigation use was about 17,000 ac-ft/yr (21 million m^3/yr). Annual groundwater withdrawals in Garnet Valley are permitted up to 3,400 ac-ft/yr (4.2 million m^3/yr); withdrawals ranged from 797 to 1,558 ac-ft/yr (980,000 to 1.9 million m^3/yr) between 2001 and 2009. Most of the withdrawals were for mining and industrial uses. The Las Vegas Valley Water District has leased the majority of the SNWA's rights to 2,200 ac-ft/yr (2.7 million m^3/yr) of Garnet Valley groundwater to dry-cooled power plants in the area (Section 11.3.9.1.3).

In 1990, Garnet Valley was designated as a groundwater basin by the State Engineer. The preferred uses of groundwater were specified to exclude irrigation and to include municipal, quasi-municipal, industrial, commercial, mining, stockwater, and wildlife purposes. In 2002, the State Engineer suspended new applications for water in the carbonate-rock aquifer systems within Garnet Valley to allow further study of the system. Applications for 44,500 ac-ft/yr (55 million m^3/yr) of water rights are currently being held in abeyance (Section 11.3.9.1.3).

11.3.22.3.4 Climate Change

Governor Jim Gibbons' Nevada Climate Change Advisory committee (NCCAC) conducted a study of climate change and its effects on Nevada (NCCAC 2008). The report summarized the current scientific understanding of climate change and its potential impacts on Nevada. A report on global climate change in the United States prepared by the U.S. Global Change Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from these reports indicate the following:

- Decreased precipitation with a greater percentage of that precipitation coming from rain, which will result in a greater likelihood of winter and spring flooding, and decreased stream flow in the summer;

- The average temperature in the southwest has already increased by about 1.5ºF compared to a 1960 to 1979 baseline, and the average annual temperature is projected to rise 4ºF to 10ºF by the end of the century;

- Warming climate and related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires;

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end;

- Much of the southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region;

- As temperatures rise, landscape will be altered as species shift their ranges northward and upward to cooler climates;

- Temperature increases, when combined with urban heat island effects for major cities such as Las Vegas, present significant stress to health, electricity, and water supply; and

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

11.3.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Dry Lake SEZ on the basis of the following assumptions: (1) because of the moderate size of the proposed SEZ (10,000 to 30,000 acres [40.5 to 121 km^2]), up to two projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 12,519 acres (50.7 km^2) (80% of the entire proposed SEZ). For purposes of analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. Since an existing 500-kV transmission line runs through the SEZ, no analysis of impacts has been conducted for the construction of a new transmission line outside of the SEZ that might be needed to connect solar facilities to the regional grid (see Section 11.3.1.2). Regarding site access, the nearest major roads are I-15 and U.S. 93, which lie along the southeast and southwest sides of the SEZ, respectively. It is assumed that no new access roads would be constructed to support solar development in the SEZ.

Cumulative impacts that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section in each resource area are discussed below. At this stage of development, because of the uncertain nature of future projects in terms of size, number, location within the proposed SEZ, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

11.3.22.4.1 Lands and Realty

The southern portion of the proposed Dry Lake SEZ is highly developed with many types of energy, water, and transportation infrastructure facilities present. Three designated transmission corridors that pass through the area, including a 368 corridor, are heavily developed with transmission lines, natural gas and refined petroleum product lines, and water lines. A natural gas power plant is being expanded within the boundary of the SEZ, and two additional natural gas power plants are located just southwest of the SEZ on private land. The northern portion of the SEZ is relatively undeveloped. Dirt roads provide access to the interior of the SEZ (Section 11.3.2.1).

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. While there are numerous energy-related developments in and around the SEZ, solar energy facilities would become a dominating visual presence in the area because of their large size.

As shown in Table 11.3.22.2-2 and Figure 11.3.22.2-1, there are four foreseeable and 16 pending solar development applications and 1 foreseeable and 9 pending wind site testing applications within a 50-mi (80-km) radius of the proposed Dry Lake SEZ. Five of the 16 pending solar applications are partially or totally within the SEZ, as is one of the wind site testing applications. The large number of applications along with the identified foreseeable renewable energy projects indicates strong interest in the renewable energy development within 50 mi (80 km) of the proposed SEZ.

Several foreseeable projects of other types are of note within this distance, including proposed groundwater development and associated utility projects and several proposed transmission line and pipeline projects that would lie on or near the SEZ, and a planned community development on 21,454 acres (86.8 km^2) that would lie about 15 mi (24 km) north of the SEZ. Proposed projects are described in Section 11.3.22.2.2.

The development of utility-scale solar projects in the proposed Dry Lake SEZ in combination with other ongoing, foreseeable, and potential actions within the geographic extent of effects, nominally 50 mi (80 km), could have cumulative effects on land use in the vicinity of the proposed SEZ. Ongoing and foreseeable actions on or near the SEZ would add to impacts from the SEZ and result in cumulative impacts on accessibility of land for other purposes and on groundwater and visual resources, among other resource impacts, depending in part on where and how many potential renewable energy projects are actually built.

11.3.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

There are nine specially designated areas within 25 mi (40 km) of the proposed Dry Lake SEZ in Nevada (Section 11.3.3.1). Potential exists for there to be cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and the construction of transmission lines outside the SEZ. The exact nature of cumulative visual impacts on the users of these areas would depend on the specific solar technologies employed in the SEZ and the locations selected within the SEZ for solar facilities. Currently proposed solar and wind projects on the SEZ and within the geographic extent of effects could cumulatively affect sensitive areas. Renewable energy facilities and associated roads and transmission lines and other future projects would add to the visual clutter of the area and could affect wilderness characteristics, would produce fugitive dust emissions, and could strain water resources and reduce access to specially designated areas.

11.3.22.4.3 Rangeland Resources

Because the Dry Lake SEZ does not contain any grazing allotments, solar energy development within the SEZ would have no impact on livestock and grazing or contributions to cumulative impacts on grazing (Section 11.3.4.1.1).

Because the Dry Lake SEZ is about 8 mi (13 km) or more from any wild horse and burro HMA managed by BLM and about 33 mi (53 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly or indirectly affect wild horses and burros that are managed by these agencies and would not contribute to cumulative impacts on these species.

11.3.22.4.4 Recreation

Limited outdoor recreation (e.g., backcountry driving, OHV use, and some camping and hunting) occurs on or in the immediate vicinity of the SEZ. Construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. Road closures and access restrictions within the proposed SEZ would affect OHV use in particular. Foreseeable and potential future actions would similarly affect areas of low recreational use and would have minimal effects on recreation. Thus, cumulative impacts on recreation within the geographic extent of effects are not expected.

11.3.22.4.5 Military and Civilian Aviation

The proposed Dry Lake SEZ is not located under any military airspace. Nellis Air Force Base has indicated that their operations may be impacted by solar towers or other tall structures that could be located in the SEZ. In addition, structures higher than 50 ft (15 m) may present unacceptable electromagnetic concerns for the National Test and Training Range located to the west and north of the SEZ (Section 11.3.6.2). Foreseeable and potential solar facilities, proposed communication towers, and proposed new transmission lines within and outside the SEZ could present additional concerns for military aviation and could result in cumulative impacts on military aviation. The North Las Vegas and McCarran International airports are located far enough away from the SEZ that there would be no effect on their operations and thus no cumulative effects on civilian aviation.

11.3.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from construction of other foreseeable and potential renewable energy facilities, proposed transmission lines, proposed water, oil, and gas pipelines, proposed residential development, and from recreational uses. Overall, the cumulative impacts on soil resources could be small to moderate from several large foreseeable solar projects and other types of projects within the geographic extent of effects.

In addition to soil loss from erosion, landscaping of solar energy facilities and other future projects within and outside the SEZ could alter drainage patterns and lead to increased siltation of surface water streambeds. However, as for erosion, programmatic design features would be in place to minimize such impacts.

11.3.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 11.3.8, a number of active mining claims and a mineral processing plant lie in the southern tip of the proposed Dry Lake SEZ, but no active oil and gas leases or proposals for geothermal energy development are pending in the SEZ. Because of the generally low level of mineral production in the area, because the impact of other foreseeable actions on mineral accessibility within the geographic extent of effects is expected to be low, and because the existing mineral rights in the southern tip of the proposed SEZ would not be affected, no cumulative impacts on mineral resources are expected.

11.3.22.4.8 Water Resources

Section 11.3.9.2 describes the water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities. The amount of water needed during the peak construction year for all evaluated solar technologies would be 2,408 to 3,480 ac-ft (3.0 million to 4.3 million m^3). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for all evaluated solar technologies would range from 71 to 37,593 ac-ft/yr (88 thousand to 46 million m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. As discussed in Section 11.3.22.2.3, water withdrawals in 2005 in Clark County were 680,000 ac-ft/yr (839 million m^3/yr), of which 83% came from surface waters and 17% came from groundwater. The largest water use category was public supply, at 526,000 ac-ft/yr (649 million m^3/yr). Cumulatively, therefore, the additional water resources needed for solar facilities in the SEZ during operations would constitute a very small (0.01%) to moderate (5.5%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Clark County) depending on the solar technology used (PV technology at the low end and the wet-cooled parabolic trough technology at the high end). However, as discussed in Section 11.3.9.1.3, withdrawals from the Garnet Valley ranged from 797 to 1,558 ac-ft/yr (980,000 to 1.9 million m^3/yr) between 2001 and 2009. Annual withdrawals are permitted up to 3,400 ac-ft/yr (4.2 million m^3/yr), of which 2,200 ac-ft/yr (2.7 million m^3/yr) is currently leased by Las Vegas Valley Water District, mainly to supply dry-cooled power plants. Thus, solar developments on the SEZ would have the capacity to far exceed the permitted groundwater withdrawal levels in the Garnet Valley basin using wet-cooling. Full development with dry-cooled solar trough technologies would require up to 3,791 ac-ft/yr, or more than currently permitted levels (Section 11.3.9.2.2). As discussed in Section 11.3.9.1, the Garnet Valley basin-fill aquifer has an estimated perennial yield of 400 ac-ft/yr (490,000 m^3/yr). Thus, the current withdrawals in the basin are 2 to 4 times higher than the estimated perennial yield of the basin-fill materials. Groundwater may be available within the carbonate aquifer, but further study is needed to determine the connectivity of the system within Nevada and the potential impacts from large-scale groundwater withdrawals.

While solar development of the proposed SEZ with water-intensive technologies would likely be infeasible due to impacts on groundwater supplies and existing demands on water rights, excessive groundwater withdrawals could disrupt the existing groundwater supplies in the Garnet Valley and in hydraulically connected basins. In addition, land disturbance for solar facility construction could cause localized soil erosion and sedimentation of ephemeral washes and the dry lake, degrade associated habitats, and alter groundwater recharge and discharge processes (Section 11.3.9.2.4). Thus, a significant increase in withdrawals from solar development within the proposed SEZ could result in a major impact on groundwater, while further cumulative impacts could occur when combined with other current and future uses in the region, including from foreseeable and potential solar developments on public and private lands nearby, as described in Section 11.3.22.2. Groundwater level declines could also affect flow in the White River Groundwater Flow System and impact groundwater discharge to the Muddy River Springs or the Virgin River. This section notes that several natural gas power plants are already located near to or within the boundaries of the proposed SEZ. While a number of these plants use dry cooling, all such plants require water for a variety of other operational purposes.

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 19 to 148 ac-ft (23,000 to 183,000 m^3) during the peak construction year and would range from less than 2 up to 35 ac-ft/yr (up to 43,000 m^3/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to put undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet-cooling systems, there would also be from 395 to 711 ac-ft/yr (0.49 to 0.88 million m^3) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

11.3.22.4.9 Vegetation

The proposed Dry Lake SEZ is located within the Creosotebush-Dominated Basins ecoregion, which is characterized by sparse creosotebush, white bursage, and big galleta grass, with cacti, yucca, ephedra, and Indian ricegrass also common. Sonora-Mojave Creosote–White Bursage Desert Scrub is the predominant cover type within the proposed SEZ. Areas surrounding the SEZ include the Creosotebush-Dominated Basins and Arid Footslopes ecoregions. The dominant cover type in the 5-mi (8-km) area of indirect effects is Sonora-Mojave Creosote–

White Bursage Desert Scrub. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the SEZ over 80% of its area would result in moderate impacts on the North American Warm Desert Pavement cover type and small impacts on all other cover types in the affected area (Section 11.3.10.2.1). Dry Lake playa habitats, riparian habitats, or dry wash communities within or downgradient from solar projects could be affected by ground-disturbing activities, while increased runoff from facilities could affect the hydrology of these areas. Dry Lake playa contains 3,310.5 acres (13.4 km^2) of wetlands, 1,022 acres (4.1 km^2) within the SEZ. In addition, groundwater drawdown by solar facilities could affect mesquite or other communities supported by shallow groundwater, including those in Moapa Warm Springs or Corn Creek Springs. A further concern in disturbed areas is the establishment and spread of noxious weeds and invasive species.

The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other construction, agriculture, recreation, and transportation. The cumulative dust loading could result in reduced productivity or changes in plant community composition. Similarly, surface runoff from project areas after heavy rains could increase sedimentation and siltation in areas downstream. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

Solar facilities within the SEZ in combination with other ongoing and reasonably foreseeable future actions would have a cumulative effect on both common and uncommon cover types within the 50-mi (80-km) geographic extent of effects. Sensitive habitats, including wetlands, would be of particular concern. Numerous ongoing, foreseeable and potential projects lie within this range, including three solar facilities under development and 13 potential facilities with applications covering over 75,000 acres (304 km^2) (Section 11.3.22.2). Many other large-acreage developments exist or are proposed within this area, including several large power plants, transmission line and pipeline projects, the 21,454-acre (86.8-km^2) Coyote Springs Investment residential development, and a community airport. In addition, the city of Las Vegas lies about 20 mi (32 km) southwest of the proposed SEZ, and the proposed East Mormon Mountain SEZ lies about 43 mi (69 km) to the northeast. Taken together, current and future projects could have moderate to large cumulative effects on vegetation in the region. The degree of such impacts would depend to a large extent on the level of actual solar development in the region. Other future developments, including the Coyote Springs residential project, would also contribute significantly to cumulative effects. The Dry Lake SEZ would make a relatively small contribution to cumulative effects, however, given its modest size in comparison to other developments.

11.3.22.4.10 Wildlife and Aquatic Biota

Wildlife species that could potentially be affected by the development of utility-scale solar energy facilities in the proposed SEZ include amphibians, reptiles, birds, and mammals. The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, and wildlife injury or mortality. In general, impacted species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These design features may include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats.

As noted in Section 11.3.22.2, other ongoing, reasonably foreseeable and potential future actions within 50 mi (80 km) of the proposed SEZ include three solar facilities under development and 13 potential facilities with applications covering over 75,000 acres (304 km^2) on public land, two foreseeable large solar facilities on private land, several existing large power plants, several proposed transmission line and pipeline projects, the proposed 21,454-acre (86.8-km^2) Coyote Springs Investment residential development, and a proposed new community airport (Section 11.3.22.2). While impacts from full build-out over 80% of the proposed SEZ would result in small impacts on amphibian, reptile, bird, and mammal species (Section 11.3.11), impacts from foreseeable development within the 50-mi (80-km) geographic extent of effects could be moderate to large. However, many of the wildlife species present within the proposed SEZ that could be affected by other actions would still have extensive available habitat within the region, while contributions to cumulative impacts from solar facilities within the proposed SEZ would be relatively small.

There are no perennial or intermittent streams within the proposed Dry Lake SEZ or in the 5-mi (8-km) area of indirect effects. Ephemeral washes in the SEZ contain water only following rainfall and typically do not support wetland or riparian habitats. Dry Lake, 981 acres (4 km^2) of which are located within the SEZ, similarly has standing water mainly after rainfall. Such areas may contain biota adapted to such conditions, as described in Section 11.3.11.4.1. Thus, no standing aquatic communities are likely to be present in the proposed SEZ. The area of indirect effects holds 6,185 acres (25 km^2) of dry lakes and associated wetlands and 7 mi (11 km) of two intermittent streams. Both streams are typically dry and are not expected to contain permanent aquatic habitat or communities, but drain into perennial streams or Lake Mead within the 50-mi (80-km) geographic extent of effects, which do contain aquatic species, including federally endangered fish species (Section 11.3.11.2). Soil disturbance from construction of solar facilities in the SEZ could result in soil transport to surface streams via water and airborne routes, but this is expected to be low with mitigations in place. Groundwater drawdown by operating solar facilities within the SEZ could affect aquatic habitats in springs supported by groundwater. Cumulative impacts on aquatic biota from all ongoing and foreseeable development within the geographic extent of effects could be significant given the high level of foreseen development. However, contributions to such impacts from solar development within the proposed SEZ would be relatively small. The magnitude of overall cumulative impacts on aquatic species would depend on the extent of eventual solar and other development in the region.

11.3.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

On the basis of recorded occurrences or suitable habitat, as many as 63 special status species could occur within the Dry Lake SEZ or could be affected by groundwater use there. The following seven special status species are known to occur within the affected area of the Dry Lake SEZ: Las Vegas bearpoppy, Meadow Valley sandwort, rosy two-tone beardtongue, threecorner milkvetch, yellow two-tone beardtongue, desert tortoise, and Nelson's bighorn sheep. In addition, there are 13 groundwater-dependent species or species with habitats that may be dependent on groundwater discharge from the Garnet Valley groundwater basin. Occurrences of the desert tortoise have been recorded near the SEZ, while critical habitat for the desert tortoise lies with the 5-mi (8-km) area of indirect affects outside the SEZ. Numerous species that occur on or in the vicinity of the SEZ are listed as threatened or endangered by the state of Nevada or listed as a sensitive species by the BLM (Section 11.3.12.1). Avoidance of habitat and minimization of erosion, sedimentation, and dust deposition are all design features to be used to reduce or eliminate the potential for these species to be affected by the construction and operation of utility-scale solar energy projects in the SEZs and related developments (e.g., access roads and transmission line connections) outside the SEZ. Special-status species are also affected by ongoing actions within the geographic extent of effects; these include impacts from urban areas, roads, transmission lines, and power plants in the area. Future developments, including as many as five large solar facilities under development, 13 potential facilities with applications covering over 75,000 acres on public land, several proposed transmission line and pipeline projects, the proposed 21,454-acre (86.8-km^2) Coyote Springs Investment residential development, and a proposed new community airport (Section 11.3.22.2), will add further effects. Potential developments cover large areas and long linear distances and are likely to affect special status species. Total cumulative impacts could be moderate to large. However, contributions to cumulative impacts from solar development with the proposed SEZ would be relatively small. Actual impacts would depend on the number, location, and technologies of projects that are actually built. Future projects would employ mitigation measures to limit effects.

11.3.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other nearby projects outside the proposed SEZ or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. The dust generation from construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment.

Operation of solar facilities within the area proposed for the SEZ would contribute minimal air emissions from combustion to those from operation of existing and future industrial sources in the area, mainly gas-fired power plants, so the only type of air pollutant of concern is dust generated during construction of new facilities in addition to that produced by winds. Because there are a fair number of other foreseeable and potential actions that could produce fugitive dust emissions, it is possible that construction of two or more projects could overlap in both time and affected area and produce small cumulative air quality effects due to dust emissions.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as coal, oil, and natural gas. As discussed in Section 11.3.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the Dry Lake SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 12% of all emissions from the current electric power systems in Nevada.

11.3.22.4.13 Visual Resources

The proposed Dry Lake SEZ is located in the Dry Lake Valley east of the Arrow Canyon Range and west of the Dry Lake Range. The valley is bounded by mountain ranges to the east, southeast, and west (Section 11.3.14.1). The area is a combination of rural and industrial in character, with a high level of cultural disturbance; disturbances include power plants, roads, railroads, transmission lines, mining, and industrial facilities. The VRI values for the SEZ and immediate surroundings are VRI Class IV, indicating low visual values.

Construction of utility-scale solar facilities in the SEZ would further alter the natural scenic quality of the area. Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Other foreseeable and potential solar and wind projects and related roads and transmission lines outside the proposed SEZ would cumulatively affect the visual resources in the area.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area. There currently are four foreseeable and 16 pending solar development applications and one foreseeable and 9 pending wind site testing applications within a 50-mi (80-km) radius of the proposed Dry Lake SEZ (Figure 11.3.22.2-1). In addition, several proposed transmission projects and pipeline projects would pass through or near the proposed SEZ as discussed in Section 11.3.22.2. While the contribution these potential projects would make to cumulative impacts in the area depends on the location of facilities that are actually built, it may be concluded that the general visual character of the landscape within this distance would be further altered from a natural state by the presence of these developments. Because of the topography of the region, such developments, located in basin flats, would be visible at great distances from surrounding mountains, which include sensitive viewsheds. Given the proximity of some current proposals, it is possible that two or more facilities would be viewable from a single location. In addition, facilities would be located near major roads and thus would be viewable by motorists, who would also be viewing transmission lines, towns, and other infrastructure, as well as the road system itself.

As additional facilities are added, several projects might become visible from one location, or in succession, as viewers move through the landscape, as by driving on local roads. In general, the new developments would not be expected to be consistent in terms of their appearance and, depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Considering the above, moderate cumulative visual impacts could occur within the geographic extent of effects from future solar, wind, and other existing and future developments.

11.3.22.4.14 Acoustic Environment

Numerous industrial, road, and aircraft noise sources lie around the proposed Dry Lake SEZ, particularly the southern portion. The existing noise sources around the SEZ include road traffic, railroad traffic, aircraft flyover, industrial activities, and recreational activities. The construction of solar energy facilities could increase the noise levels periodically for up to 3 years per facility, but there would be little or minimal noise impacts on nearby residences during operation of solar facilities, including from solar dish engine facilities and from parabolic trough or power tower facilities using TES, which could affect nearby residences.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZs are described in Section 11.3.22.2. Because nearest residents are relatively far from the SEZ and from other foreseeable projects with respect to noise impacts, cumulative noise effects during the construction or operation of solar facilities are unlikely.

11.3.22.4.15 Paleontological Resources

The proposed Dry Lake SEZ has low potential for the occurrence of significant fossil material in about 90% of its area, mainly alluvial deposits, and unknown potential in about 10% of its area, mainly playa deposits and residual materials (Section 11.3.16.1). While impacts on significant paleontological resources are unlikely to occur in the SEZ, a review of the geological deposits in the specific sites selected for future projects would be needed to determine whether a paleontological survey was warranted. Any paleontological resources encountered would be mitigated to the extent possible as determined through consultation with the BLM. No significant contributions to cumulative impacts on paleontological resources are expected.

11.3.22.4.16 Cultural Resources

The area around Dry Lake is rich in cultural history, with settlements dating as far back as 12,000 years. The area covered by the proposed Dry Lake SEZ has the potential to contain significant cultural resources. Areas with potential for significant sites within the proposed SEZ include dune areas within the valley floor. At least 22 sites have been recorded within the SEZ, one of which, the Old Spanish Trail/Mormon Road, is listed in the NRHP; six additional sites have been determined to be eligible for inclusion in the NRHP (Section 11.3.17.1). It is possible that the development of utility-scale solar energy projects in the SEZ would contribute to cumulative impacts on cultural resources in the region, such as visual effects on the Old Spanish National Historic Trail. Such contributions on the trail would be relatively small compared to those from other ongoing, foreseeable, and potential development within the 25-mi (40-km) geographic extent of effects (Section 11.3.22.2) because of the intervening topography that helps mask some of the impact from the SEZ. While any future solar projects would disturb large areas, the specific sites selected for future projects would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Nevada SHPO and appropriate Native American governments, it is likely that most adverse effects on significant resources in the region could be mitigated to some degree. It is unlikely that any sites recorded in the SEZ would be of such individual significance that, if properly mitigated, development would cumulatively cause an irretrievable loss of information about a significant resource type, but this would depend on the results of the future surveys and evaluations.

11.3.22.4.17 Native American Concerns

The Moapa River Valley adjacent to Dry Lake Valley is a core area of Southern Paiute population and culture and is the location of several proposed solar projects within and outside the Dry Lake SEZ (Figure 11.3.22.2-1). While to date, no specific concerns have been raised to the BLM regarding the proposed Dry Lake SEZ, it is possible that the development of utility-scale solar energy projects in the SEZ would contribute to cumulative impacts on resources important to Native Americans, including traditional plant and animal species; and water. When commenting on past projects in the region, the Southern Paiute have expressed concern over adverse effects on a wide range of resources (Section 11.3.18.2). The extent of potential impacts can only be determined through consultation. The Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. Government-to-government consultation is under way with federally recognized Native American Tribes with possible traditional ties to the Dry Lake area. All federally recognized Tribes with Southern Paiute roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. Continued discussion with the area Tribes through government-to-government consultation is necessary to effectively consider and address the Tribes' concerns about solar energy development in the Dry Lake SEZ.

11.3.22.4.18 Socioeconomics

Solar energy development projects in the proposed Dry Lake SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding

ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services. Temporary workers involved in other new developments in the area, including other renewable energy development would also contribute to these effects. The number of workers involved in the construction of solar projects in the peak construction year (including the transmission lines) could range from about 260 to 3,500, depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 440 (solar PV) to as high as 5,800 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occasionally occur within a 50-mi (80-km) radius of the SEZ over the 20-year or more solar development period.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-year duration, and could combine with those from other new developments in the area, including numerous foreseeable and potential solar and wind energy projects and several proposed transmission line and pipeline projects (Section 11.3.22.2). The number of workers needed at the SEZ solar facilities would be in the range of 30 to 550, with approximately 40 to 800 total jobs created in the region, assuming full build-out of the SEZ (Section 11.3.19.2.2). Population increases would contribute to general upward trends seen in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

11.3.22.4.19 Environmental Justice

Any impacts from solar development could have cumulative impacts on minority and low-income populations within 50 mi (80 km) of the proposed SEZ in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual impacts, noise, and exposure to fugitive dust. Actual impacts would depend on the geographic range of effects and on where low-income populations are located relative to solar and other proposed facilities. Overall, effects from facilities within the SEZ are expected to be small, while other foreseeable and potential actions could contribute additional small effects on minority and low-income populations, given the relatively high level of development possible. While no minority or low-income populations are currently present within the 50-mi (80-km) ROI (Section 11.3.20.1), any future minority and low-income populations could experience small cumulative effects of some types; these could include effects on visual resources or from fugitive dust, from all actions within the geographic extent of effects, but contributions from solar development in the proposed Dry Lake SEZ would be small. If needed, mitigation measures can be employed to reduce the impacts on these populations in the vicinity of the SEZ.

11.3.22.4.20 Transportation

I-15 runs along and through the southeast edge of the proposed Dry Lake SEZ and U.S. 93 runs along the southwest border of the SEZ. The Las Vegas metropolitan area lies approximately 15 mi (24 km) to the southwest of the SEZ along I-15. The closest public airport is the North Las Vegas Airport 21 mi (34 km) to the southwest. Nellis Air Force Base is located 13 mi (21 km) to the southwest. The closest railroad access is in Las Vegas and in Moapa, about 24 mi (39 km) to the northeast of the SEZ. During construction of utility-scale solar energy facilities, there could be up to 1,000 workers commuting to the construction site at the SEZ, which could increase the AADT on these roads by 2,000 vehicle trips for each facility under construction. With as many as two facilities assumed to be under construction at the same time, traffic on I-15 and U.S. 93 could experience slowdowns in the area of the SEZ (Section 11.3.21.2). This increase in highway traffic caused by construction workers could likewise have small to moderate cumulative impacts on traffic flow in combination with existing traffic levels and increases from additional future developments in the area; this could include impacts from any of several proposed solar projects near the proposed SEZ, should construction schedules overlap. Local road improvements may be necessary on portions of I-15 near the SEZ. Any impacts during construction activities would be temporary. The impacts can also be mitigated to some degree by staggered work schedules and ride-sharing programs. Traffic increases during operation would have little contribution to cumulative impacts and would be relatively small because of the low number of workers needed to operate the solar facilities.

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11.3.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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DES 10-59 • DOI/EIS-0403 December 2010

Draft Programmatic Environmental Impact Statement for

Solar Energy Development in Six Southwestern States

Volume 5, Part 2

Chapter 11: Nevada Proposed Solar Energy Zones

U.S. DEPARTMENT OF ENERGY

NATIONAL SYSTEM OF PUBLIC LANDS

On the cover:
Typical Solar Fields for Various Technology Types (clockwise from upper left):
Solar Parabolic Trough (Source: Hosoya et al. 2008),
Solar Power Tower (Credit: Sandia National Laboratories. Source: NREL 2010a),
Photovoltaic (Credit: Arizona Public Service. Source: NREL 2010b), and
Dish Engine (Credit: R. Montoya. Source: Sandia National Laboratories 2008).
Reference citations are available in Chapter 1.

Background photo: Parabolic trough facility from an elevated viewpoint
(Credit: Argonne National Laboratory)

Draft Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States (DES 10-59; DOE/EIS-0403)

Responsible Agencies: The U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) and the U.S. Department of Energy (DOE) are co-lead agencies. Nineteen cooperating agencies participated in the preparation of this PEIS: U.S. Department of Defense; U.S. Bureau of Reclamation; U.S. Fish and Wildlife Service; U.S. National Park Service; U.S. Environmental Protection Agency, Region 9; U.S. Army Corps of Engineers, South Pacific Division; Arizona Game and Fish Department; California Energy Commission; California Public Utilities Commission; Nevada Department of Wildlife; N-4 Grazing Board, Nevada; Utah Public Lands Policy Coordination Office; Clark County, Nevada, including Clark County Department of Aviation; Dona Ana County, New Mexico; Esmeralda County, Nevada; Eureka County, Nevada; Lincoln County, Nevada; Nye County, Nevada; and Saguache County, Colorado.

Locations: Arizona, California, Colorado, Nevada, New Mexico, and Utah.

Contacts: *For further information about this PEIS, contact:* Linda Resseguie, BLM Washington Office, e-mail: linda_resseguie@blm.gov, phone: (202) 912-7337; or Jane Summerson, DOE Solar PEIS Document Manager, e-mail: jane.summerson@ee.doe.gov, phone: (202) 287-6188; or visit the PEIS Web site at http://solareis.anl.gov.

Abstract: The BLM and DOE are considering taking actions to facilitate solar energy development in compliance with various orders, mandates, and agency policies. For the BLM, these actions include the evaluation of a new BLM Solar Energy Program applicable to all utility-scale solar energy development on BLM-administered lands in six southwestern states (Arizona, California, Colorado, Nevada, New Mexico, and Utah). For DOE, they include the evaluation of developing new program guidance relevant to DOE-supported solar projects. The Draft PEIS assesses the environmental, social, and economic effects of the agencies' proposed actions and alternatives.

For the BLM, the Draft PEIS analyzes a no action alternative, under which solar energy development would continue on BLM-administered lands in accordance with the terms and conditions of the BLM's existing solar energy policies, and two action alternatives for implementing a new BLM Solar Energy Program. Under the solar energy development program alternative (BLM's preferred alternative), the BLM would establish a new Solar Energy Program of administration and authorization policies and required design features and would exclude solar energy development from certain BLM-administered lands. Under this alternative, approximately 22 million acres of BLM-administered lands would be available for right-of-way (ROW) application. A subset of these lands, about 677,400 acres, would be identified as solar energy zones (SEZs), or areas where the BLM would prioritize solar energy and associated transmission infrastructure development. Under the SEZ program alternative, the same policies and design features would be adopted, but development would be excluded from all BLM-administered lands except those located within the SEZs.

For DOE, the Draft PEIS analyzes a no action alternative, under which DOE would continue to conduct environmental reviews of DOE-funded solar projects on a case-by-case basis, and one action alternative, under which DOE would develop programmatic guidance to further integrate environmental considerations into its analysis and selection of solar projects that it will support.

The EPA Notice of Availability (NOA) of the Draft PEIS was published in the *Federal Register* on December 17, 2010. Comments on the Draft PEIS are due by March 17, 2011.

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VOLUME 6

Reader's Guide

The detailed analysis of the proposed solar energy zones (SEZs) in Nevada, provided in Sections 11.1 through 11.7, will be used to inform BLM decisions regarding the size, configuration, and/or management of these SEZs. These sections also include proposed mitigation requirements (termed "SEZ-specific design features"). Please note that the SEZ-specific summaries of Affected Environment use the descriptions of Affected Environment for the six-state study area presented in Chapter 4 of the PEIS as a basis. Also note that the SEZ-specific design features have been proposed with consideration of the general impact analyses for solar energy facilities presented in Chapter 5, and on the assumption that all programmatic design features presented in Appendix A, Section A.2.2, will be required for projects that will be located within the SEZs.

BLM will implement its SEZ-specific decisions through the BLM Record of Decision for the Final PEIS. Comments received during the review period for the Draft PEIS will inform BLM decisions.

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NOTATION

The following is a list of acronyms and abbreviations, chemical names, and units of measure used in this document. Some acronyms used only in tables may be defined only in those tables.

GENERAL ACRONYMS AND ABBREVIATIONS

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
AC	alternating current
ACC	air-cooled condenser
ACEC	Area of Critical Environmental Concern
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AERMOD	AMS/EPA Regulatory Model
AFC	Application for Certification
AGL	above ground level
AIRFA	American Indian Religious Freedom Act
AMA	active management area
AML	animal management level
ANHP	Arizona National Heritage Program
APE	area of potential effect
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
AQCR	Air Quality Control Region
AQRV	air quality-related value
ARB	Air Resources Board
ARRA	American Recovery and Reinvestment Act of 2009
ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee
ARS	Agricultural Research Service
ARZC	Arizona and California
ATSDR	Agency for Toxic Substances and Disease Registry
AUM	animal unit month
AVWS	Audio Visual Warning System
AWBA	Arizona Water Banking Authority
AWEA	American Wind Energy Association
AWRM	Active Water Resource Management
AZ DOT	Arizona Department of Transportation
AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department
AZGS	Arizona Geological Survey

BA	biological assessment
BAP	base annual production
BEA	Bureau of Economic Analysis
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BMP	best management practice
BNSF	Burlington Northern Santa Fe
BO	biological opinion
BOR	U.S. Bureau of Reclamation
BPA	Bonneville Power Administration
BRAC	Blue Ribbon Advisory Council on Climate Change
BSE	Beacon Solar Energy
BSEP	Beacon Solar Energy Project
BTS	Bureau of Transportation Statistics

CAA	Clean Air Act
CAAQS	California Air Quality Standards
Caltrans	California Department of Transportation
C-AMA	California-Arizona Maneuver Area
CAP	Central Arizona Project
CARB	California Air Resources Board
CAReGAP	California Regional Gap Analysis Project
CASQA	California Stormwater Quality Association
CASTNET	Clean Air Status and Trends NETwork
CAWA	Colorado Agricultural Water Alliance
CCC	Civilian Conservation Corps
CDC	Centers for Disease Control and Prevention
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CDWR	California Department of Water Resources
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CES	constant elasticity of substitution
CESA	California Endangered Species Act
CESF	Carrizo Energy Solar Farm
CFR	*Code of Federal Regulations*
CGE	computable general equilibrium
CIRA	Cooperative Institute for Research in the Atmosphere
CLFR	compact linear Fresnel collector
CPC	Center for Plant Conservation
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNHP	Colorado National Heritage Program

Colorado DWR	Colorado Department of Water Resources
CPUC	California Public Utilities Commission
CPV	concentrating photovoltaic
CRBSCF	Colorado River Basin Salinity Control Forum
CREZ	competitive renewable energy zone
CRSCP	Colorado River Salinity Control Program
CSA	Candidate Study Area
CSC	Coastal Services Center
CSFG	carbon-sequestration fossil generation
CSP	concentrating solar power
CSQA	California Stormwater Quality Association
CSRI	Cultural Systems Research, Incorporated
CTG	combustion turbine generator
CTPG	California Transmission Planning Group
CTSR	Cumbres & Toltec Scenic Railroad
CUP	Conditional Use Permit
CVP	Central Valley Project
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
CWHRS	California Wildlife Habitat Relationship System
DC	direct current
DHS	U.S. Department of Homeland Security
DNA	Determination of NEPA Adequacy
DNI	direct normal insulation
DNL	day-night average sound level
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
DRECP	California Desert Renewable Energy Conservation Plan
DSM	demand side management
DTC/C-AMA	Desert Training Center/California–Arizona Maneuver Area
DWMA	Desert Wildlife Management Area
EA	environmental assessment
ECAR	East Central Area Reliability Coordination Agreement
ECOS	Environmental Conservation Online System (USFWS)
EERE	Energy Efficiency and Renewable Energy (DOE)
Eg	band gap energy
EIA	Energy Information Administration
EIS	environmental impact statement
EISA	Energy Independence and Security Act of 2007
EMF	electromagnetic field
E.O.	Executive Order

EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EQIP	Environmental Quality Incentives Program
ERCOT	Electric Reliability Council of Texas
ERO	Electric Reliability Organization
ERS	Economic Research Service
ESA	Endangered Species Act of 1973
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRCC	Florida Reliability Coordinating Council
FSA	Final Staff Assessment
FTE	full-time equivalent
FY	fiscal year
G&TM	Generation and Transmission Modeling
GCRP	U.S. Global Climate Research Program
GDA	generation development area
GHG	greenhouse gas
GIS	geographic information system
GPS	global positioning system
GTM	Generation and Transmission Model
GUAC	Groundwater Users Advisory Council
GWP	global warming potential
HA	herd area
HAP	hazardous air pollutant
HAZCOM	hazard communication
HCE	heat collection element
HCP	Habitat Conservation Plan
HMA	Herd Management Area
HMMH	Harris Miller Miller & Hanson, Inc.
HRSG	heat recovery steam generator
HSPD	Homeland Security Presidential Directive
HTF	heat transfer fluid
HVAC	heating, ventilation, and air-conditioning

I	Interstate
IARC	International Agency for Research on Cancer
IBA	important bird area
ICE	internal combustion engine
ICWMA	Imperial County Weed Management Area
IEC	International Electrochemical Commission
IFR	instrument flight rule
IID	Imperial Irrigation District
IM	Instruction Memorandum
IMPS	Iron Mountain Pumping Station
IMS	interim mitigation strategy
INA	Irrigation Non-Expansion Area
IOP	Interagency Operating Procedure
IOU	investor-owned utility
IPPC	Intergovernmental Panel on Climate Change
ISA	Independent Science Advisor; Instant Study Area
ISB	Intermontane Seismic Belt
ISCC	integrated solar combined cycle
ISDRA	Imperial Sand Dunes Recreation Area
ISEGS	Ivanpah Solar Energy Generating System
ITP	incidental take permit
IUCNNR	International Union for Conservation of Nature and Natural Resources
IUCNP	International Union for Conservation of Nature Pakistan
KGA	known geothermal resources area
KML	keyhole markup language
KOP	key observation point
KSLA	known sodium leasing area
LCC	Landscape Conservation Cooperative
LCOE	levelized cost of energy
L_{dn}	day-night average sound level
LDWMA	Low Desert Weed Management Area
L_{eq}	equivalent sound pressure level
LLA	limited land available
LLRW	low-level radioactive waste (waste classification)
LRG	Lower Rio Grande
LSA	lake and streambed alteration
LSE	load-serving entity
LTVA	long-term visitor area
MAAC	Mid-Atlantic Area Council
MAIN	Mid-Atlantic Interconnected Network
MAPP	methyl acetylene propadiene stabilizer; Mid-Continent Area Power Pool
MCAS	Marine Corps Air Station
MCL	maximum contaminant level

MFP	Management Framework Plan
MIG	Minnesota IMPLAN Group
MLA	maximum land available
MOA	military operating area
MOU	Memorandum of Understanding
MPDS	maximum potential development scenario
MRA	Multiple Resource Area
MRI	Midwest Research Institute
MRO	Midwest Reliability Organization
MSDS	Material Safety Data Sheet
MSL	mean sea level
MTR	military training route
MWA	Mojave Water Agency
MWD	Metropolitan Water District
MWMA	Mojave Weed Management Area
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission (California)
NAIC	North American Industrial Classification System
NASA	National Aeronautics and Space Administration
NCA	National Conservation Area
NCCAC	Nevada Climate Change Advisory Committee
NCDC	National Climatic Data Center
NCES	National Center for Education Statistics
NDCNR	Nevada Department of Conservation and Natural Resources
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWP	Nevada Division of Water Planning
NDWR	Nevada Division of Water Resources
NEAP	Natural Events Action Plan
NEC	National Electric Code
NED	National Elevation Database
NEP	Natural Events Policy
NEPA	National Environmental Policy Act of 1969
NERC	North American Electricity Reliability Corporation
NHA	National Heritage Area
NHNM	National Heritage New Mexico
NHPA	National Historic Preservation Act of 1966
NID	National Inventory of Dams
NM DOT	New Mexico Department of Transportation
NLCS	National Landscape Conservation System
NMAC	*New Mexico Administrative Code*
NMBGMR	New Mexico Bureau of Geology and Mineral Resources

NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMED-AQB	New Mexico Environment Department-Air Quality Board
NMFS	National Marine Fisheries Service
NMOSE	New Mexico Office of the State Engineer
NMSU	New Mexico State University
NNHP	Nevada Natural Heritage Program
NNL	National Natural Landmark
NNSA	National Nuclear Security Administration
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NP	National Park
NPL	National Priorities List
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	*National Register of Historic Places*
NRS	*Nevada Revised Statutes*
NSC	National Safety Council
NSO	no surface occupancy
NSTC	National Science and Technology Council
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range
NVCRS	Nevada Cultural Resources Inventory System
NV DOT	Nevada Department of Transportation
NWCC	National Wind Coordinating Committee
NWI	National Wetlands Inventory
NWPP	Northwest Power Pool
NWR	National Wildlife Refuge
NWSRS	National Scenic River System
O&M	operation and maintenance
ODFW	Oregon Department of Fish and Wildlife
OHV	off-highway vehicle
ONA	Outstanding Natural Area
ORC	organic Rankine cycle
OSE/ISC	Office of the State Engineer/Interstate Stream Commission
OSHA	Occupational Safety and Health Administration
OTA	Office of Technology Assessment
PA	Programmatic Agreement
PAD	Preliminary Application Document
PAH	polycyclic aromatic hydrocarbon

PAT	peer analysis tool
PCB	polychlorinated biphenyl
PCM	purchase change material
PCS	power conditioning system
PCU	power converting unit
PEIS	programmatic environmental impact statement
PFYC	potential fossil yield classification
PIER	Public Interest Energy Research
P.L.	Public Law
PLSS	Public Land Survey System
PM	particulate matter
$PM_{2.5}$	particulate matter with a mean aerodynamic diameter of 2.5 μm or less
PM_{10}	particulate matter with a mean aerodynamic diameter of 10 μm or less
POD	plan of development
POU	publicly owned utility
PPA	Power Purchase Agreement
PPE	personal protective equipment
PSD	Prevention of Significant Deterioration
PURPA	Public Utility Regulatory Policy Act
PV	photovoltaic
PVID	Palo Verde Irrigation District
PWR	public water reserve
QRA	qualified resource area
R&I	relevance and importance
RCI	residential, commercial, and industrial (sector)
RCRA	Resource Conservation and Recovery Act of 1976
RD&D	research, development, and demonstration; research, development, and deployment
RDBMS	Relational Database Management System
RDEP	Restoration Design Energy Project
REA	Rapid Ecoregional Assessment
REAT	Renewable Energy Action Team
REDI	Renewable Energy Development Infrastructure
ReEDS	Regional Energy Deployment System
REPG	Renewable Energy Policy Group
RETA	Renewable Energy Transmission Authority
RETAAC	Renewable Energy Transmission Access Advisory Committee
RETI	Renewable Energy Transmission Initiative
REZ	renewable energy zone
RF	radio frequency
RFC	Reliability First Corporation
RFDS	reasonably foreseeable development scenario
RGP	Rio Grande Project
RGWCD	Rio Grande Water Conservation District

RMP	Resource Management Plan
RMPA	Rocky Mountain Power Area
RMZ	Resource Management Zone
ROD	Record of Decision
ROI	region of influence
ROS	recreation opportunity spectrum
ROW	right-of-way
RPG	renewable portfolio goal
RPS	Renewable Portfolio Standard
RRC	Regional Reliability Council
RSEP	Rice Solar Energy Project
RSI	Renewable Systems Interconnection
RTTF	Renewable Transmission Task Force
RV	recreational vehicle
SAAQS	State Ambient Air Quality Standards
SAMHSA	Substance Abuse and Mental Health Services Administration
SCADA	supervisory control and data acquisition
SCE	Southern California Edison
SCRMA	Special Cultural Resource Management Area
SDRREG	San Diego Regional Renewable Energy Group
SDWA	Safe Drinking Water Act of 1974
SEGIS	Solar Energy Grid Integration System
SEGS	Solar Energy Generating System
SEI	Sustainable Energy Ireland
SEIA	Solar Energy Industrial Association
SES	Stirling Energy Systems
SETP	Solar Energy Technologies Program (DOE)
SEZ	solar energy zone
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SLRG	San Luis & Rio Grande
SMA	Special Management Area
SMP	suggested management practice
SNWA	Southern Nevada Water Authority
SPP	Southwest Power Pool
SRMA	Special Recreation Management Area
SSA	Socorro Seismic Anomaly
SSI	self-supplied industry
ST	solar thermal
STG	steam turbine generator
SUA	special use airspace
SWAT	Southwest Area Transmission
SWIP	Southwest Intertie Project
SWPPP	Stormwater Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project

TAP toxic air pollutant
TCC Transmission Corridor Committee
TDS total dissolved solids
TEPPC Transmission Expansion Planning Policy Committee
TES thermal energy storage
TSA Transportation Security Administration
TSCA Toxic Substances Control Act of 1976
TSDF treatment, storage, and disposal facility
TSP total suspended particulates

UACD Utah Association of Conservation Districts
UBWR Utah Board of Water Resources
UDA Utah Department of Agriculture
UDEQ Utah Department of Environmental Quality
UDNR Utah Department of Natural Resources
UDOT Utah Department of Transportation
UDWQ Utah Division of Water Quality
UDWR Utah Division of Wildlife Resources
UGS Utah Geological Survey
UNEP United Nations Environmental Programme
UNPS Utah Native Plant Society
UP Union Pacific
UREZ Utah Renewable Energy Zone
USACE U.S. Army Corps of Engineers
USC *United States Code*
USDA U.S. Department of Agriculture
USFS U.S. Forest Service
USFWS U.S. Fish and Wildlife Service
USGS U.S. Geological Survey
Utah DWR Utah Division of Water Rights
UTTR Utah Test and Training Range
UWS Underground Water Storage, Savings and Replenishment Act

VACAR Virginia-Carolinas Subregion
VCRS Visual Contrast Rating System
VFR visual flight rule
VOC volatile organic compound
VRI Visual Resource Inventory
VRM Visual Resource Management

WA Wilderness Area
WAPA Western Area Power Administration
WECC Western Electricity Coordinating Council
WECC CAN Western Electricity Coordinating Council – Canada
WEG wind erodibility group
WGA Western Governors' Association

WGFD	Wyoming Game and Fish Department
WHA	wildlife habitat area
WHO	World Health Organization
WRAP	Water Resources Allocation Program; Western Regional Air Partnership
WRCC	Western Regional Climate Center
WREZ	Western Renewable Energy Zones
WRRI	Water Resources Research Institute
WSA	Wilderness Study Area
WSC	wildlife species of special concern
WSMR	White Sands Missile Range
WSR	Wild and Scenic River
WSRA	Wild and Scenic Rivers Act of 1968
WWII	World War II
YPG	Yuma Proving Ground
ZITA	zone identification and technical analysis
ZLD	zero liquid discharge

CHEMICALS

CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
H_2S	hydrogen sulfide
Hg	mercury
N_2O	nitrous oxide
NH_3	ammonia
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
Pb	lead
SF_6	sulfur hexafluoride
SO_2	sulfur dioxide
SO_x	sulfur oxides

UNITS OF MEASURE

ac-ft	acre-foot (feet)
bhp	brake horsepower
°C	degree(s) Celsius
cf	cubic foot (feet)
cfs	cubic foot (feet) per second
cm	centimeter(s)
dB	decibel(s)
dBA	A-weighted decibel(s)
°F	degree(s) Fahrenheit
ft	foot (feet)
ft^2	square foot (feet)
ft^3	cubic foot (feet)
g	gram(s)
gal	gallon(s)
GJ	gigajoule(s)
gpcd	gallon per capita per day
gpd	gallon(s) per day

gpm	gallon(s) per minute
GW	gigawatt(s)
GWh	gigawatt hour(s)
GWh/yr	gigawatt hour(s) per year
h	hour(s)
ha	hectare(s)
Hz	hertz
in.	inch(es)
J	joule(s)
K	degree(s) Kelvin
kcal	kilocalorie(s)
kg	kilogram(s)
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
kPa	kilopascal(s)
kV	kilovolt(s)
kVA	kilovolt-ampere(s)
kW	kilowatt(s)
kWh	kilowatt-hour(s)
kWp	kilowatt peak
L	liter(s)
lb	pound(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mg	milligram(s)

Mgal	million gallons
mi	mile(s)
mi^2	square mile(s)
min	minute(s)
mm	millimeter(s)
MMt	million metric ton(s)
MPa	megapascal(s)
mph	mile(s) per hour
MW	megawatt(s)
MWe	megawatt(s) electric
MWh	megawatt-hour(s)
ppm	part(s) per million
psi	pound(s) per square inch
psia	pound(s) per square inch absolute
rpm	rotation(s) per minute
s	second(s)
scf	standard cubic foot (feet)
TWh	terawatt hours
VdB	vibration velocity decibel(s)
W	watt(s)
yd^2	square yard(s)
yd^3	cubic yard(s)
yr	year(s)
μg	microgram(s)
μm	micrometer(s)

ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS

The following table lists the appropriate equivalents for English and metric units.

Multiply	By	To Obtain
English/Metric Equivalents		
acres	0.004047	square kilometers (km^2)
acre-feet (ac-ft)	1,234	cubic meters (m^3)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
degrees Fahrenheit (ºF) –32	0.5555	degrees Celsius (ºC)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
miles per hour (mph)	1.609	kilometers per hour (kph)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)
Metric/English Equivalents		
centimeters (cm)	0.3937	inches (in.)
cubic meters (m^3)	0.00081	acre-feet (ac-ft)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
degrees Celsius (ºC) +17.78	1.8	degrees Fahrenheit (ºF)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
kilometers per hour (kph)	0.6214	miles per hour (mph)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km^2)	247.1	acres
square kilometers (km^2)	0.3861	square miles (mi^2)
square meters (m^2)	10.76	square feet (ft^2)
square meters (m^2)	1.196	square yards (yd^2)

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11.4 DRY LAKE VALLEY NORTH

11.4.1 Background and Summary of Impacts

11.4.1.1 General Information

The proposed Dry Lake Valley North SEZ is located in Lincoln County in southeastern Nevada (Figure 11.4.1.1-1). The SEZ has a total area of 76,874 acres (311 km^2). In 2008, the county population was 4,643, while adjacent Clark County to the south had a population of 1,879,093. The closest population centers to the SEZ are Pioche, located about 15 mi (24 km) to the east, and Caliente, located about 15 mi (24 km) to the southeast; both communities have populations of about 1,000. The smaller communities of Caselton and Prince are located about 13 mi (21 km) to the east of the SEZ. Las Vegas is located about 110 mi (180 km) to the south.

The nearest major road to the Dry Lake Valley North SEZ is State Route 318, which is about 7 mi (11 km) to the west of the SEZ, while U.S. 93 is about 8 mi (13 km) to the south. Access to the interior of the SEZ is by dirt roads. The nearest railroad access is approximately 25 mi (40 km) away, while nearby airports include Lincoln County Airport in Panaca and Alamo Landing Field in Alamo, which are located about 13 mi (21 km) south–southeast of and 35 mi (56 km) southwest of the SEZ, respectively. The proposed Delamar Valley SEZ lies about 23 mi (37 km) to the south of the proposed Dry Lake Valley North SEZ.

A 69-kV transmission line intersects the southeast corner of the SEZ. It is assumed that this existing transmission line could potentially provide access from the SEZ to the transmission grid (see Section 11.4.1.1.2).

There are one pending solar development ROW application, six authorized and one pending wind site testing applications, and one pending wind development application on BLM-administered land within a 50-mi (80-km) radius of the proposed Dry Lake Valley North SEZ. There are currently no solar applications within the SEZ. These applications are discussed in Section 11.4.22.2.1.

The proposed Dry Lake Valley North SEZ is undeveloped and remote. The overall character of the surrounding land is rural. The SEZ is located in the Dry Lake Valley and is framed by mountain ranges on the east and west. The North Pahroc Range rises about 6 mi (10 km) west of the SEZ, and the West Range, Bristol Range, Highland Range, Ely Springs Range, Black Canyon Range, and Burnt Springs Range occur east of the SEZ. No permanent surface water sources occur in the proposed SEZ. Vegetation is generally sparse, with large areas of low grasses and low-height scrubland.

The proposed Dry Lake Valley North SEZ in Nevada and other relevant information are shown in Figure 11.4.1.1-1. The criteria used to identify the proposed Dry Lake Valley North SEZ in Nevada as an appropriate location for solar energy development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated

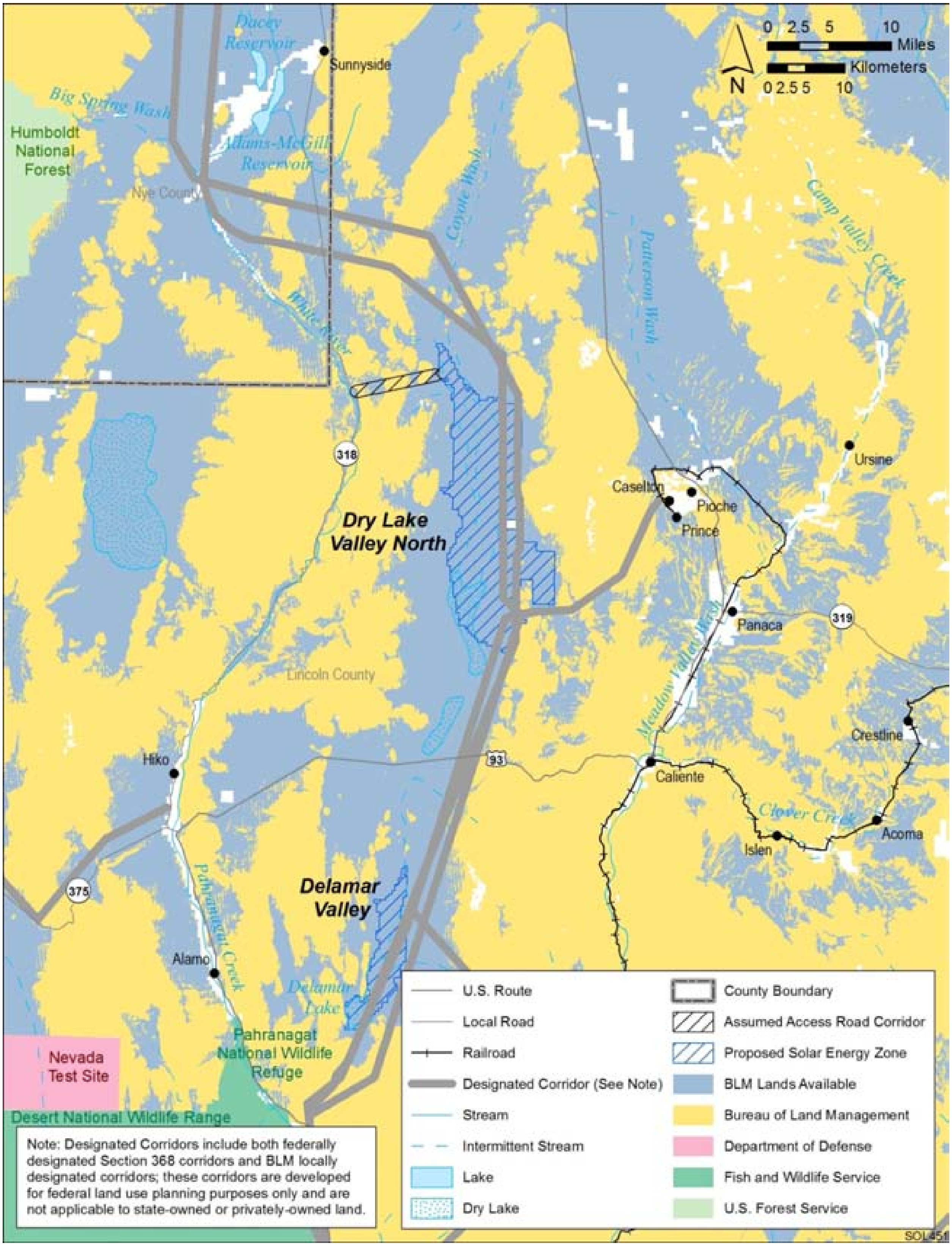

FIGURE 11.4.1.1-1 Proposed Dry Lake Valley North SEZ

critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.4.1 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Dry Lake Valley North SEZ, other restrictions might be appropriate. The analyses in the following sections address the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Dry Lake Valley North SEZ encompassed 49,775 acres (201 km^2). Subsequent to the study area scoping period, the boundaries of the proposed Dry Lake Valley North SEZ were altered substantially after further observations by the BLM District Office indicating that the additional area met all criteria for solar development. The revised SEZ is approximately 27,100 acres (110 km^2), or about 54%, larger than the original SEZ as published in June 2009.

11.4.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the proposed Dry Lake Valley North SEZ is assumed to be 80% of the SEZ area over a period of 20 years; these values are shown in Table 11.4.1.2-1, along with other development assumptions. Full development of the Dry Lake Valley North SEZ would allow development of facilities with an estimated total of 6,833 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 12,300 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 69-kV line that runs through the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 69-kV capacity of that line would be inadequate for 6,833 to 12,300 MW of new capacity (note: a 500- kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Dry Lake Valley North SEZ to load centers; however, at this time, the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in the PEIS, it was assumed that an existing 69-kV transmission line that intersects the SEZ could provide initial access to the transmission grid; thus, no additional acreage disturbance for transmission line access was assessed. Access to the existing 69-kV transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different, off-site, grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they are needed.

TABLE 11.4.1.2-1 Proposed Dry Lake Valley North SEZ—Assumed Development Acreages, Maximum Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Area of Assumed Transmission Line ROW and Road ROW	Distance to Nearest Designated Transmission Corridor[e]
76,874 acres and 61,499 acres[a]	6,833 MW[b] and 12,300 MW[c]	NV 318 7 mi[d]	0 mi and 69 kV	0 acres and 51 acres	0 mi

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] To convert mi to km, multiply by 1.609.

[e] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

An additional 51 acres (0.2 km^2) would be needed for new road access to support solar development in the Dry Lake Valley North SEZ, as summarized in Table 11.4.1.2-1. This estimate was based on the assumption that a new 7-mi (11-km) access road to the nearest major road, State Route 318, would support construction and operation of solar facilities. While there are dirt/ranch roads within the SEZ, additional internal road construction would likely be required to support solar facility construction.

11.4.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 11.4.2 through 11.4.21 for the proposed Dry Lake Valley North SEZ are summarized in tabular form. Table 11.4.1.3-1 is a comprehensive list of the impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 11.4.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Dry Lake Valley North SEZ are included in Sections 11.4.2 through 11.4.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 11.4.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Dry Lake Valley North SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ (80% of the total area) could disturb up to 61,499 acres (102 km^2). Solar development would introduce a new and discordant land use into the area.	None.
	Construction of a new access road from State Route 318 could disturb up to 51 acres (0.2 km^2) of public land.	Priority consideration should be given to utilizing existing county roads to provide construction and operational access to the SEZ.
	Because of the extended length of the SEZ, east–west travel across the valley could be cut off, requiring extensive detours for public land users.	None.
	Solar development would require coordination with existing ROWs for two transmission lines, the pending Southern Nevada Water Authority pipeline ROW, and a short segment of road ROW.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	There would be a small adverse impact on wilderness characteristics in the Weepah Spring and Big Rocks WAs.	None.
	Silver State Off-Highway Vehicle Trail/Byway users seeking a scenic drive experience would be adversely affected.	
Rangeland Resources: Livestock Grazing	The Simpson allotment would likely be closed, displacing the permittees. Sixty-five % of the Ely Springs Cattle allotment would be lost. All of the winter range for the permittees in the Dry Lake Valley and Thorley areas of use in the Wilson Creek allotment and the Simpson allotment would be lost. A total of 12,163 AUMs would be lost, and operations of six permittees would suffer major impacts.	Within the Ely Springs cattle allotment, solar development should be sited to minimize the number of pastures affected.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Rangeland Resources: Wild Horses and Burros	Loss of 5.4% of the Silver King HMA.	Installation of fencing and access control, provision for wild horse movement corridors, delineation of open range, traffic management, compensatory habitat restoration, and access to or development of water sources should be coordinated with the BLM.
Recreation	Developed portions of the SEZ would become excluded from recreational use.	If solar development would obstruct the route used for desert racing, alternative locations for that use should be considered at the time specific solar development proposals are analyzed.
Military and Civilian Aviation	Portions of the proposed Dry Valley Lake North SEZ are covered by two MTRs with 200-ft (61-m) AGL operating limits and a major SUA. There could be potentially adverse impacts on military training and testing missions.	None.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation). Portions of the dry lake may not be a suitable location for construction.	None.
Minerals (fluids, solids, and geothermal resources)	Existing oil and gas leases represent a prior existing right that could affect solar energy development of the SEZ.	None.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Water Resources	Ground-disturbance activities (affecting up to 12% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 4,220 ac-ft (5.2 million m^3) of water during peak construction year. Construction activities would generate as much as 222 ac-ft (274,000 m^3) of sanitary wastewater. Assuming full development of the SEZ, operations would use the following amounts of water: • For parabolic trough facilities (12,296-MW capacity), 8,779 to 18,616 ac-ft/yr (11 million to 23 million m^3/yr) for dry-cooled systems; 61,650 to 184,605 ac-ft/yr (76 million to 228 million m^3/yr) for wet-cooled systems. • For power tower facilities (6,831-MW capacity), 4,858 to 10,323 ac-ft/yr (6 million to 13 million m^3/yr) for dry-cooled systems; 34,231 to 102,539 ac-ft/yr (42 million to 126 million m^3/yr) for wet-cooled systems. • For dish engine facilities (6,831-MW capacity), 3,492 ac-ft/yr (4.3 million m^3/yr). • For PV facilities (6,831-MW capacity), 349 ac-ft/yr (430,000 m^3/yr). Assuming full development of the SEZ, operations would generate up to 172 ac-ft/yr (212,000 m^3/yr) of sanitary wastewater and up to 3,493 ac-ft/yr (4.3 million m^3/yr) of blowdown water.	Water resource analysis indicates that wet-cooling options would not be feasible for full build-out of the SEZ; other technologies should incorporate water conservation measures. Land disturbance activities should avoid impacts to the extent possible in the vicinity of the ephemeral stream washes and the dry lake present on the site. Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters. Groundwater rights must be obtained from the NDWR. Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection. Groundwater monitoring and production wells should be constructed in accordance with state standards. Water for potable uses would have to meet or be treated to meet water quality standards in accordance with the *Nevada Administrative Code*.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Vegetation[b]	Up to 80% (61,499 acres [249 km^2]) of the SEZ would be cleared of vegetation; re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Playa habitats, such as those on the SEZ and the playas southwest of the SEZ, greasewood flats communities, or other intermittently flooded areas downgradient from solar projects in the SEZ or the assumed access road could be affected by ground disturbing activities.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as cheatgrass or halogeton. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. Dry washes, playas, and wetlands within the SEZ, and dry washes within the access road corridor, should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetlands, playas, and dry washes to reduce the potential for impacts. Appropriate engineering controls should be used to minimize impacts on dry wash, playa, marsh, scrub-shrub wetland, riparian, and greasewood flat habitats, including occurrences downstream of solar projects or assumed access road, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*		Groundwater withdrawals should be limited to reduce the potential for indirect impacts on habitats dependent on springs associated with the Dry lake Valley basin, Delamar Valley Basin, or other hydrologically connected basins. Potential impacts on springs should be determined through hydrological studies.
Wildlife: Amphibians and Reptiles[a]	Direct impacts from SEZ development would be moderate (i.e., loss of >1 to ≤10% of potentially suitable habitats within the SEZ region) for all representative amphibian species; and several reptile species. Direct impacts on other representative reptile species would be small (i.e., loss of ≤1% of potentially suitable habitats). With implementation of design features, indirect impacts would be expected to be negligible.	The unnamed dry lake and wash habitats should be avoided.
Wildlife: Birds[b]	Direct impacts on about one-third of the representative bird species would be small (i.e., loss of ≤1% of potentially suitable habitats) to moderate (i.e., loss of >1 to ≤10% of potentially suitable habitats within the SEZ region) for the other representative bird species. Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act. The unnamed dry lake and wash habitats should be avoided.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Wildlife: Mammals[b]	Based on land cover analyses, direct impacts on cougar and mule deer would be moderate (i.e., loss of >1 to ≤10% of potentially suitable habitats within the SEZ region); while direct impacts on elk and pronghorn would be small (i.e., loss of ≤1% of potentially suitable habitats). Direct impacts on all other representative mammal species would be small (6 species) to moderate (24 species). Based on mapped ranges for big game; direct impacts would be small for elk and mule deer and moderate for pronghorn. Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These impacts are expected to be negligible with the implementation of design features.	The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. Playa and wash habitats should be avoided.
Aquatic Biota[b]	No permanent water bodies or streams are present within the boundaries of the Dry Lake Valley North SEZ, assumed new access road, or the areas of indirect effects. The nearest perennial surface water (White River) is about 7 mi (11 km) from the SEZ and less than 1 mi (1.6 km) from the area of direct disturbance for the presumed new access road. Also, the intermittent streams in the SEZ do not drain into any permanent surface waters. Therefore, no direct or indirect impacts on perennial surface water features are expected.	Appropriate engineering controls should be implemented to minimize the amount of contaminants and sediment entering Coyote Wash and the unnamed washes and dry lakes within the SEZ.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Special Status Species[b]	Potentially suitable habitat for 22 special status species occurs in the affected area of the Dry Lake Valley North SEZ. For special status species, between 0 and 15% of the potentially suitable habitat in the region occurs in the area of direct effects.	Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible for some species, translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Consultation with the USFWS and NDOW may be needed to address the potential for impacts on the desert tortoise. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Avoiding or minimizing disturbance to playa habitat on the SEZ could reduce or eliminate impacts on 5 special status species.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.
Air Quality and Climate	*Construction*: Predicted 24-hour and annual PM_{10} concentration levels could exceed the AAQS levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. Higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area. Construction emissions from the engine exhaust of heavy equipment and vehicles could cause some short-term impacts on AQRVs (e.g., visibility and acid deposition) at the nearest federal Class I areas. *Operations*: Positive impact due to avoided emission of air pollutants from combustion-related power generation: 32 to 57% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada avoided (up to 30,404 tons/yr SO_2, 26,078 tons/yr NO_x, 0.17 ton/yr Hg, and 16,737,000 tons/yr CO_2).	None.
Visual Resources	The SEZ is in an area of low scenic quality, with cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads.	None.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	Solar development could produce large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape. The SEZ is located 8.2 mi (13.2 km) from the Big Rocks WA. Because of the open views of the SEZ and elevated viewpoints, weak to strong visual contrasts could be observed by WA visitors. The SEZ is located 8.4 mi (13.5 km) from the Weepah Spring WA. Because of the open views of the SEZ and elevated viewpoints, very weak to strong visual contrasts could be observed by WA visitors. Approximately 9.5 mi (15.3 km) of U.S. 93 (a state-designated scenic byway) is within the SEZ viewshed. Moderate visual contrasts could be observed within the SEZ by travelers on U.S. 93. Approximately 100 mi (160 km) of the Silver State Trail scenic byway is within the SEZ viewshed. Because of the close proximity of the byway to the SEZ and the elevated viewpoints from some locations along the byway, strong visual contrasts could be observed by travelers on the Silver State Trail. The SEZ is adjacent to the Chief Mountain SRMA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by SRMA visitors.	

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction*. For construction activities occurring near the southeastern SEZ boundary (the boundary closest to the nearest residence), estimated noise levels at the nearest residence (about 10 mi [16 km]) from the SEZ boundary) would be about 16 dBA, which is well below a typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn} at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas. *Operations*. Noise levels at the nearest residences from a parabolic trough or power tower facility would be about 22 dBA, which is much lower than the typical daytime mean rural background level of 40 dBA. For 12-hour daytime operation, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated for the nearest residences, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. In the case of 6-hour TES, the estimated nighttime noise level at the nearest residences would be would be 32 dBA, which is a little higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level at the nearest residences, about 10 mi (16 km) from the SEZ boundary, would be about 39 dBA, which is below the typical daytime mean rural background level of 40 dBA. Assuming 12-hour daytime operation, the estimated 41 dBA L_{dn} at these residences would be well below the EPA guideline of 55 dBA L_{dn} for residential areas.	None.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Paleontological Resources	Few, if any, impacts on significant paleontological resources are likely to occur in 91% of the proposed Dry Lake Valley North SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. The potential for impacts on significant paleontological resources in the remaining 9% of the SEZ is unknown. A more detailed investigation of the playa deposits is needed prior to project approval.	The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations.
Cultural Resources	The Dry Lake Valley North SEZ has a high potential for containing prehistoric sites, especially in the dry lake and dune areas at the southern end of the SEZ; potential for historic sites also exists in the area but to a lesser degree. Thus, direct impacts on significant cultural resources could occur; however, further investigation is needed at the project-specific level. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine if any are eligible for listing in the NRHP as historic properties. Impacts on cultural resources also are possible in areas related to the access ROW, as new areas of potential cultural significance could be directly affected by construction or opened to increased access from road use.	SEZ-specific design features would be determined through consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations..

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Native American Concerns	While no comments specific to the proposed Dry Lake Valley North SEZ have been received from Native American Tribes to date, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. In the area, the Southern Paiute have expressed concern over adverse effects of other energy projects on a wide range of resources. As consultation with the Tribes continues and project-specific analyses are undertaken, it is also possible that Native American concerns will be expressed over potential visual and other effects on specific resources and culturally important landscapes within or adjacent to the SEZ.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.
Socioeconomics	*Livestock grazing:* Construction and operation of solar facilities could decrease the amount of land available for livestock grazing in the SEZ, resulting in the loss of three jobs (total) and $0.1 million (total) in income in the ROI. *Construction:* 685 to 9,071 total jobs; $41.9 million to $554.2 million income in ROI for solar facilities. *Operations:* 182 to 4,126 annual total jobs; $6.3 million to $155.3 million annual income in the ROI for solar facilities. *Construction of new access road*: 148 total jobs, $5.8 million income	None.
Environmental Justice	Because low-income populations, as defined by CEQ guidelines, are located within the 50-mi (80-km) radius around the SEZ, impacts, although small, could disproportionately affect low-income populations. No minority populations occur within the 50-mi (80-km) radius; thus any adverse impacts of solar projects could not disproportionately affect minority populations.	None.

TABLE 11.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Dry Lake Valley North SEZ	SEZ-Specific Design Features
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum) or possibly 6,000 vehicle trips per day if three larger projects were to be developed at the same time. The volume of traffic on either State Route 318 or U.S. 93 would increase by a factor of about 2, 4, or 6 maximum in the area of the SEZ for one, two, or three projects, respectively. Because higher traffic volumes would be experienced during shift changes, traffic on either highway could experience moderate slowdowns during these time periods in the general area of the SEZ.	None.

Abbreviations: AAQS = ambient air quality standards; AGL = above ground level; AQRV = air quality–related value; AUM = animal unit months; BLM = Bureau of Land Management; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; dBA = A-weighted decibel; DoD = U.S. Department of Defense; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; L_{dn} = day-night average sound level; MTR = military training route; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NNHP = Nevada Natural Heritage Program; NO_x = nitrogen oxides; NRHP = *National Register of Historic Places*; PEIS = programmatic environmental impact statement; PFYC = potential fossil yield classification; PM = particulate matter; PM_{10} = particulate matter with an aerodynamic diameter of 10 µm or less; PSD = prevention of significant deterioration; PV= photovoltaic; ROI = region of influence; ROW = right-of-way; SEZ = solar energy zone; SO_2 = sulfur dioxide; SRMA = Special Recreation Management Area; SUA = special use airspace; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; WA = Wilderness Area.

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Dry Lake Valley North SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 11.4.10 through 11.4.12.

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11.4.2 Lands and Realty

11.4.2.1 Affected Environment

The proposed Dry Lake Valley North SEZ is a very large and very well blocked area of BLM-administered public land with only one 600-acre (2-km^2) parcel of private land on the east side of the SEZ. The private land has a few ranch buildings on it and is completely surrounded by the SEZ. The overall character of the land in and around the SEZ area is isolated and undeveloped. The southwestern portion of the SEZ includes part of a playa lake. State Route 318 provides access to the northern end of the SEZ via a 10-mi (16-km) connecting dirt road. U.S. 93 provides good access to the southern portion of the SEZ via a dirt road that connects to the highway and provides access to the eastern side of the SEZ from the south. This road on the east side of Dry Lake Valley is about 9 mi (14 km) from U.S. 95 before it enters the SEZ and then passes through most of the east side of the area. Numerous dirt roads cross the SEZ or access livestock facilities in the area.

There are three designated transmission corridors in the proposed SEZ (see Figure 11.4.1.1-1). The eastern corridor is a designated Section 368 (of the Energy Policy Act of 2005) energy corridor. There are two transmission ROWs in the eastern corridor, but no facilities have yet been constructed. A 69-kV transmission line is located in the most southeasterly designated corridor and crosses the very southeastern end of the SEZ. There is a ROW for a short segment of road located in the southern portion of the SEZ.

The SNWA has a ROW application for a pipeline that would pass through the middle of the proposed SEZ. The pipeline has been proposed to convey water from northern Nevada to the Las Vegas area.

As of February 2010, there were no ROW applications for solar energy facility development on the proposed Dry Lake Valley North SEZ.

11.4.2.2 Impacts

11.4.2.2.1 Construction and Operations

Full development of the proposed Dry Lake Valley North SEZ could disturb up to 61,499 acres (102 km^2) (Table 11.4.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and isolated, utility-scale solar energy development would be a new and discordant land use to the area.

Existing ROW authorizations on the SEZ would not be affected by solar energy development since they are prior rights. Should the proposed SEZ be identified as an SEZ in the

ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights issued for solar energy development. Because the area currently has so few ROWs present, it is not anticipated that approval of solar energy development would have a significant impact on ROW availability in the area.

The three designated transmission corridors occupy a portion of the SEZ and could limit future solar development in these corridors. To avoid technical or operational interference between transmission and solar energy facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. The corridors could be relocated outside the SEZ to allow full solar development within the SEZ. Alternatively, capacity of the corridors could be restricted to allow solar development. Transmission capacity is becoming a more critical factor, and reducing corridor capacity in this SEZ may have future, but currently unknown, consequences. This is an administrative conflict that the BLM can address through its planning process, but there would be implications either for the amount of potential solar energy development or for the amount of transmission capacity that can be accommodated.

The existing dirt roads located in the SEZ would be closed wherever solar energy facilities are developed. Because of the 25-mi (40-km) length of the SEZ, if east–west travel across the SEZ is prevented by solar energy development, a long detour around the site could be required. This would adversely affect a wide range of public land users.

11.4.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because a 69-kV transmission line crosses the SEZ, no new transmission line construction was assessed, assuming that additional project-specific analysis would be done for new transmission construction or line upgrades.

Because State Route 318 is the closest highway to the SEZ, it is assumed that a new 7-mi (11-km) road would be constructed to connect the SEZ to that highway. This would result in the surface disturbance of about 51 acres (0.2 km^2) of public land. Alternative or additional access to the SEZ could be provided from U.S. 93, which passes near the southern end of the SEZ. In this case, improvement of existing roads could be undertaken. Roads and transmission lines would be constructed within the SEZ as part of the development of the area.

11.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions would be the establishment of a large industrial area that would exclude many existing and potential uses of the land and would be a new and discordant land use to the area.

Proposed design features specific to the proposed Dry Lake Valley North SEZ include:

- Priority consideration should be given to utilizing existing roads to provide construction and operational access to the SEZ.

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11.4.3 Specially Designated Areas and Lands with Wilderness Characteristics

11.4.3.1 Affected Environment

Fourteen specially designated areas occur within 25 mi (40 km) of the proposed Dry Lake Valley North SEZ that potentially could be affected by solar energy development within the SEZ. These include six designated WAs, the Chief Mountain SRMA, four Utah State Park Units, the Mount Wilson Backcountry Byway, the Silver State Off-Highway Vehicle Trail and Backcountry Byway, and the Highway 93 State-designated Scenic Byway. The boundaries of the Weepah Spring and Big Rocks WAs are within about 8 mi (13 km) of the SEZ, while the boundaries of the South Pahroc Range, Far South Egans, Parsnip Peak, and Clover Mountains WA, and the Mount Wilson Backcountry Byway are between 15 mi (24 km) and 25 mi (40 km) from the SEZ. The Highway 93 Scenic Byway is located within 15 mi (24 km) of the SEZ (see Figure 11.4.3.1-1). Viewshed analysis shows that the Mount Wilson Back Country Byway and the four Utah State Park Units would have no visibility of solar development within the SEZ; thus they are not considered further.

There are no areas with wilderness characteristics outside of designated wilderness areas within 25 mi (40 km) of the SEZ.

11.4.3.2 Impacts

11.4.3.2.1 Construction and Operations

The primary potential impact on the nine remaining areas near the SEZ would be from visual impacts of solar energy development that could affect scenic, recreational, or wilderness characteristics of the areas. The visual impact on specially designated areas is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be an important visual component in the viewshed from limited portions of these specially designated areas, as summarized in Table 11.4.3.2-1. The data provided in the table assume the use of the power tower solar energy technology, which because of the potential height of these facilities, could be visible from the largest amount of land of the technologies being considered in the PEIS. Viewshed analysis for this SEZ has shown that the visual impacts of shorter solar energy facilities would be slightly less than for power tower technology (See Section 11.4.14 for more detail on all viewshed analyses discussed in this section). Assessment of the visual impact of solar energy projects must be conducted on a site-specific and technology-specific basis to accurately identify impacts.

In general, the closer a viewer is to solar development, the greater the impact on an individual's perception. From a visual analysis perspective, the most sensitive viewing distances generally are from 0 to 5 mi (0 to 8 km). The viewing height above a solar energy development area, the size of the solar development area, and the purpose for which a person is visiting an

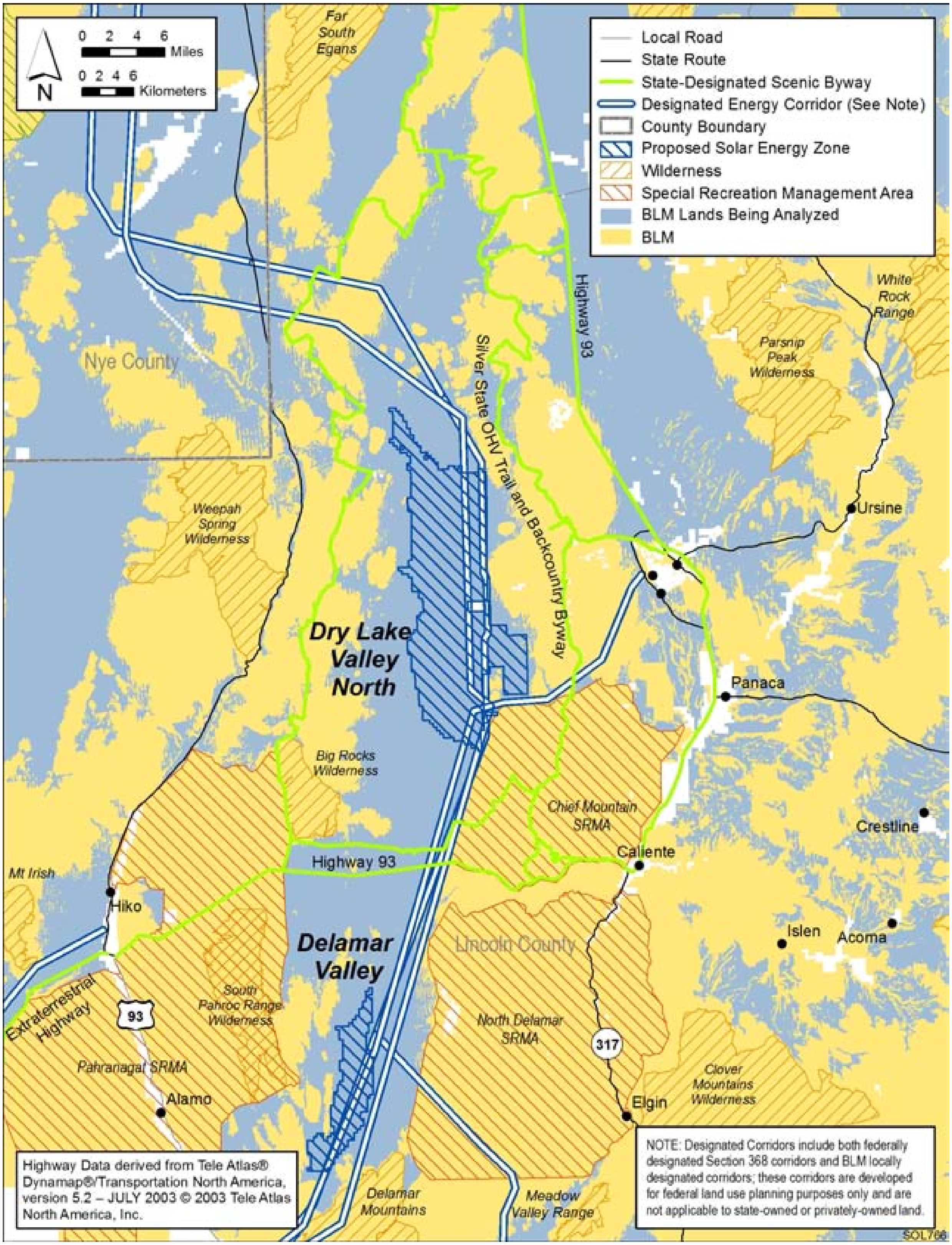

FIGURE 11.4.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Dry Lake Valley North SEZ

TABLE 11.4.3.2-1 Potentially Affected Specially Designated Areas within a 25-mi (40-km) Viewshed of the Proposed Dry Lake Valley North SEZ[a]

Feature Type	Feature Name (Total Acreage/ Linear Distance)	Feature Area or Linear Distance[b] Visible within 15 mi	Visible within 25 mi
Byway	Highway 93 State Scenic Byway (149 mi)	41 mi (5.6%)[c]	41 mi (5.6%)
	Silver State OHV Trail and Backcountry Byway (240 mi)	–[d]	–
SRMA	Chief Mountain SRMA (111,151 acres)	39,076 (35%)	–
Wilderness Area	Big Rocks (12,929 acres)	1,590 acres (12.3%)	1,590 acres (12.3%)
	Clover Mountains (85,621 acres)		26 acres (0.03%)
	Far South Egans (36,297 acres)		454 acres (1.3%)
	Parsnip Peak (43,485 acres)		1,833 acres (4.2%)
	South Pahroc Range (25,674 acres)		2,391 acres (9.3%)
	Weepah Spring (51,309 acres)	13,468 acres (26.3%)	13,600 acres (26.5%)

[a] Assuming power tower technology with a height of 650 ft (198.1 m).

[b] To convert acres to km^2, multiply by 0.004047. To convert mi to km, multiply by 1.609.

[c] Percentage of total feature acreage or road length viewable.

[d] A dash indicates data not available.

area is also important. Individuals seeking a wilderness or scenic experience within these areas could be expected to be more adversely affected than those simply traveling along the highway with another destination in mind. In the case of the Dry Valley Lake North SEZ, the low-lying location of the SEZ in relation to surrounding specially designated areas would highlight the industrial-like development in the SEZ. In addition because of the generally undeveloped nature of the whole area, and the potentially very large area of solar development, impacts on wilderness characteristics may be more significant than in other areas that are less pristine.

The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas that were used to assess potential impacts on specially designated areas do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

Weepah Spring and Big Rocks Wilderness Areas

Solar development within the SEZ, especially full development, would be readily visible from portions of these two areas. Because of the topography, essentially all of the area that would be visible from these areas is located within 15 mi (24 km) of the SEZ. The nearest boundaries of both WAs are about 8 mi (13 km) distant from the SEZ, beyond the most sensitive visual zone of 0 to 5 mi (0 to 8 km), and solar development would not likely be a dominating factor in the viewshed of the areas. However, because of the clear line of sight and the potential size of the solar development in the SEZ, there likely would be a small adverse impact on wilderness characteristics in both areas. On the basis of the percentage of the area of each wilderness within the viewshed of the SEZ, Weepah Spring would be affected to a greater extent than would Big Rocks.

Highway 93 State Scenic Byway

Viewshed analysis of the scenic byway shows that the views travelers on Highway 93 would have of the SEZ would be from the south and at a distance of about 8 to 10 mi (13 to 16 km) distance. The highway is elevated above the level of the SEZ by about 500 ft (152 m), and travelers would have a clear view of development within the SEZ for about 10 mi (16 km). Because of the distance to the SEZ and the nature of highway travel, however, it is not anticipated that there would be any adverse impact on the use of the scenic highway. It is possible that some highway travelers might find the solar energy development a point of interest.

Silver State OHV Trail and Backcountry Byway

The trail/byway encircles the SEZ and is within 1 to 5 mi (0.6 to 3 km) of the SEZ through much of its route. While some portions of the trail are screened by topography, much of it is in clear view of the SEZ. About one-quarter of the trail/byway is north of the SEZ and is completely screened by intervening mountains. While it is difficult to judge the impact of solar development on users of the trail/byway, it is assumed that any visitors seeking a scenic drive would be adversely affected by the presence of solar energy facilities so close to their route of travel. Users of the trail/byway that are more interested in the motorized or OHV experience may be less adversely affected by the presence of solar development.

Chief Mountain SRMA

The SRMA is managed primarily for motorized OHV recreation, and there are more than 400 mi (643 km) of trails in the area. Portions of the SRMA are adjacent to the SEZ, and about 35% of the SRMA is within the viewshed of the SEZ. While many OHV users have an interest in the visual character of the areas in which they recreate, overall it is anticipated that because of the nature of the activity, distance to the SEZ, and limited visibility of development in the SEZ, there would be no adverse impact on use of the SRMA.

Clover Mountains, Far South Egans, Parsnip Peak, and South Pahroc Range Wilderness Areas

The nearest of these units is about 18 mi (29 km) from the SEZ, and although portions of the areas will have views of development in the SEZ, the distance from the SEZ reduces the impact of development on wilderness characteristics. The percentage of these areas that is in the viewshed of the SEZ is also small, and the overall effect on wilderness characteristics in these areas is expected to be minimal.

11.4.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line, no additional construction of transmission facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts on specially designated areas. See Section 11.4.1.2 for the development assumptions underlying this analysis.

Construction of an access road to State Route 318 would add about 51 acres (0.2 km^2) of surface disturbance to the impact associated with the SEZ facilities. The disturbance caused by the road construction would not likely cause additional adverse impacts on specially designated areas.

11.4.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features to protect wilderness, recreation, or scenic values of specially designated areas would be required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions may be the adverse impacts on wilderness characteristics in two WAs

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11.4.4 Rangeland Resources

Rangelands resources include livestock grazing and wild horses and burros, both of which are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Dry Lake Valley North SEZ are discussed in Sections 11.4.4.1 and 11.4.4.2.

11.4.4.1 Livestock Grazing

11.4.4.1.1 Affected Environment

The proposed Dry Lake Valley North SEZ contains portions of three perennial grazing allotments. Four other allotments have very small amounts of land within the SEZ and because there are no anticipated impacts on these allotments, they are not considered further. The low-lying and flat lands included in the SEZ are used primarily as winter range. There are water developments within the area that support grazing use.

11.4.4.1.2 Impacts

Construction and Operations

Should utility-scale solar development occur in the SEZ, grazing would be excluded from the areas developed as provided for in the BLM grazing regulations (43 CFR Part 4100). This would include reimbursement of permittees for their portion of the value for any range improvements in the area removed from the grazing allotment. The impact of this change in the grazing permits would depend on several factors, including (1) how much of an allotment each permittee might lose to development, (2) how important the specific land lost is to each permittee's overall operation, and (3) the amount of actual forage production that would be lost by each permittee.

The public lands in this SEZ make up the majority of the lands in the Ely Springs Cattle and Simpson allotments as shown in Table 11.4.4.1-1. If full solar development were to occur in the SEZ, the federal grazing permit for the Simpson allotment likely would be cancelled. This would be a major impact and would result in displacing the four permittees who use the area and the loss of the 747 AUMs.

In the case of the Ely Springs Cattle allotment, by applying a simplified assumption that the grazing capacity of the allotment would be reduced by the same percentage as the reduction in acreage, grazing capacity would be reduced by 2,761 AUMs, or 65% of the available AUMs. This would be a major impact on the permittee. Depending on the area utilized for solar development, it might be possible to continue to graze on the remaining acreage in the allotment. This also would be dependent upon water availability in the remaining portion of the allotment and/or the ability to relocate water from existing points of use to the remaining area.

TABLE 11.4.4.1-1 Grazing Allotments within the Proposed Dry Valley Lake North SEZ

Allotment	Total Acres[a]	% of Acres in SEZ[b]	Active BLM AUMs	No. of Permittees
Ely Springs Cattle	56,128	65	4,248	1
Wilson Creek	848,000[c]	3	46,374[d]	8
Simpson	8,379	91	747	4

[a] Included public, private, and state lands included in the allotment based on the Allotment Master Report in BLM's Rangeland Administration System (BLM 2009e).

[b] Percentage of the total allotment acreage of public lands located in the SEZ.

[c] Four use areas were recently removed from the Wilson Creek allotment, reducing the acreage below that shown in the Rangeland Administration System.

[d] This number predates the removal of four areas of use from the allotment. Actual number still to be calculated.

The Wilson Creek allotment is very large, but it is divided into specific areas of use that are utilized by 11 permittees. Permittees generally operate within their own areas of use, but five permittees (four cattle and one sheep) operate in the Dry Lake Valley Use Area and utilize 10,149 AUMs. One permittee (cattle) operates in the Thorley use area and utilizes 1,267 AUMs. Four of the permittees in the two Wilson Creek use areas also are permittees in the Simpson allotment. The two use areas plus the Simpson allotment compose almost the total winter range available to these six permittees. The total forage in these three areas that would be lost is 12,163 AUMs. This is the only winter range available to these permittees, and its loss would have a major impact on their operations. There is no additional winter range available within the area as a replacement to the lands within the SEZ; thus the winter grazing capacity lost would have to be replaced through feeding of hay and/or reductions in cattle numbers. In addition, the water developments that support grazing in this portion of the allotment are reservoirs that would also be lost. Because the impact falls solely on the winter range portion of the operations, the economic impact of replacing the lost natural winter forage with hay would have a disproportionate and major impact on the six permittees (Johnson 2010).

The loss of 12,163 AUMs would constitute a moderate impact on the total livestock use authorized within the Caliente Field Office. This conclusion was derived from comparing the loss of the 12,163 AUMs with the total of 43,255 BLM-authorized AUMs in the Caliente Field Office in grazing year 2009. The loss would be about 28%.

Defining the impacts on individual grazing permits and permittees requires a specific analysis of each case on the basis of at a minimum, the three factors identified above. The loss of the AUMs from all three affected allotments would have a significant impact on six permittees. The final degree of impact would depend on how important the public lands in these allotments are to their overall livestock operation.

Although the degree of impact on the permittees in these three allotments would vary with their individual situations, there would be an adverse economic impact on them from the loss of use of all or important portions of their respective use areas. There may also be an adverse social impact, since for many permittees, operating on public lands has been a longstanding tradition, and their operations are important to them. It is possible that solar developers could acquire the preference for BLM grazing permits in the affected allotments through transfer from willing permittees; developers could agree to compensate permittees for their interest through range improvements on public lands used in conjunction with that preference in order to minimize the impact on existing permittees; however, such agreements are not required as part of BLM regulations.

Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of a transmission line in the SEZ, and assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of transmission line construction outside of the SEZ was conducted (see Section 11.4.1.2).

The 51-acre (0.2-km^2) disturbance associated with construction of the new access road to the northern end of the SEZ would not have a significant impact on livestock grazing.

11.4.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide mitigation for some identified impacts. The exception would be the adverse impacts on the grazing permittees in the three affected grazing allotments.

Proposed design features specific to the proposed Dry Lake Valley North SEZ include the following:

- Within the Ely Springs Cattle allotment, solar development should be sited to minimize the number of pastures affected.

11.4.4.2 Wild Horses and Burros

11.4.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nearly 100 wild horse and burro herd management areas (HMAs) occur within Nevada (BLM 2009g). Two HMAs in Nevada are located within the 50-mi (80-km) SEZ region for the proposed Dry Lake Valley North SEZ. Five HMAs in Utah also occur wholly or partially within the SEZ region (BLM 2010e) (Figure 11.4.4.2-1). A portion of the Silver King HMA occurs within the SEZ, and within the indirect impact area of the SEZ. The Silver King HMA has an estimated population of 505 wild horses, with an appropriate management level of only 60 to 128 wild horses (BLM 2010b). The BLM conducted a gather from September 26 through October 14, 2010, and removed 448 excess wild horses from within and outside the Silver King HMA (BLM 2010i).

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to the proposed Dry Lake Valley North SEZ is the Quinn Territory, located within a portion of the Humboldt National Forest. The closest portion of this territory is located on the western edge of the 50-mi (80-km) SEZ region (Figure 11.4.4.2-1). Information on the management of this territory for wild horses and burros was not available.

11.4.4.2.2 Impacts

The Silver King HMA is 606,000 acres (2,452.4 km^2) in size (BLM 2010i). About 32,440 acres (131.3 km^2) would be in the area of direct impact for the proposed Dry Lake Valley North SEZ. This would result in the loss of about 5.4% of the HMA. The acreage of the HMA within the indirect impact area for the SEZ is 210,266 acres (850.9 km^2) or 34.7% of the HMA.

Construction and operation of solar energy facilities within the proposed Dry Lake Valley North SEZ would stress resources capable of supporting wild horses in the Silver King HMA. Based on criteria used to evaluate direct impacts on wildlife species (see Appendix M), the loss of 5.4% of the Silver King HMA would be considered a moderate impact on the wild horse population within the HMA (i.e., >1 but $\leq$10% of the population or its habitat would be lost and the activity would result in a measurable but moderate [not destabilizing] change in carrying capacity or population size in the affected area). However, as more than 88% of the wild horse population has been recently gathered (BLM 2010g), the remaining population should not be compromised by the loss of up to 5.4% of the HMA. Because the closest portion of the Quinn Territory is located at the edge of the 50-mi (80-km) SEZ region, no horses or burros in the territory would be affected by construction or operations of a solar facility in the proposed Dry Lake Valley North SEZ.

11.4.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Solar energy development on BLM lands would be subject to the conditions of the Wild Free-Roaming Horses and Burros Act of 1971. The recently completed gather of wild horses from the Silver King HMA (BLM 2010i) would help to minimize impacts on wild horses caused

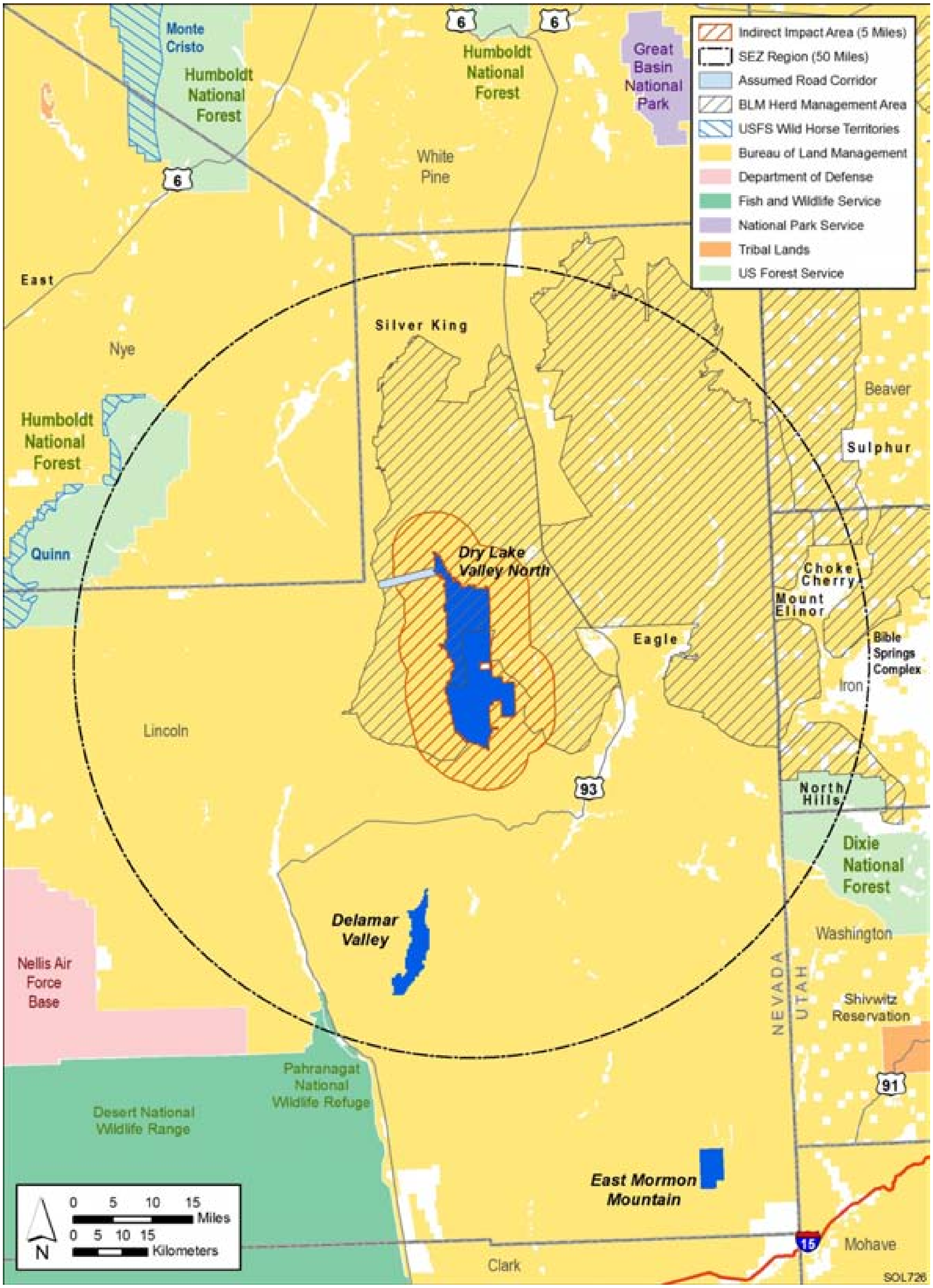

FIGURE 11.4.4.2-1 Wild Horse and Burro Herd Management Areas and Territories within the Analysis Area for the Proposed Dry Lake Valley North SEZ (Sources: BLM 2009g; USFS 2007)

by construction and operations of solar energy development in the proposed Dry Lake Valley North SEZ. In addition, the following SEZ-specific design feature is recommended:

- Installation of fencing and access control, provision for movement corridors, delineation of open range, traffic management (e.g., vehicle speeds), compensatory habitat restoration, and access to or development of water sources should be coordinated with the BLM.

11.4.5 Recreation

11.4.5.1 Affected Environment

The site of the proposed Dry Lake Valley North SEZ is flat with numerous roads and trails that provide access into the area. Backcountry driving and OHV use of the roads and trails are the major recreation activities in the area, although there are also camping and hunting opportunities in and around the area. Wild horses can be seen in the area. Some of the use in the SEZ is related to the 111,181-acre (450-km^2) Chief Mountain SRMA, which is located south and east of the SEZ. The SRMA is the focus for OHV use in the area and contains about 400 mi (640 km) of roads, OHV routes, and trails. There are about three motorcycle races and one to two truck and buggy races in the area per year. Three trailheads serve the area; two have bathroom facilities (Boyce 2010). About 31 mi (50 km) of the 260-mi (418-km) congressionally designated Silver State Off-Highway Vehicle Trail[1] is within the SRMA. Designated portions of the OHV trail encircle the SEZ. There are two access points to the trail near the boundary of the SEZ. In recent years, two desert race events have been held annually that use the Silver State Trail in the vicinity of the SEZ. The SEZ area and surrounding area have been designated as limited to travel on existing roads and trails.

11.4.5.2 Impacts

11.4.5.2.1 Construction and Operations

Recreational use would be eliminated from portions of the SEZ developed for solar energy production. Since the area contains numerous roads and trails, closure of the SEZ to recreational use would have an undetermined impact on the existing OHV use in the area. The Chief Mountain SRMA with more than 400 mi (643 km) of OHV trails and the Silver State Trail and Backcountry Byway would not be directly affected by development of the SEZ. Because of the 25-mi (40-km) length of the SEZ, if east–west travel across the SEZ were prevented by solar energy development, a long detour around the site would be required. This would adversely affect recreation and other public land users. Whether recreational visitors would continue to use any remaining undeveloped portions of the SEZ is unknown. .

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If open OHV routes within the SEZ were identified during project-specific analyses, these routes would be redesignated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

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[1] The trail was initially designated in Section 401(b) of the Lincoln County Conservation, Recreation, and Development Act of 2004 (16 U.S.C. 1244; Public Law 108-424).

11.4.5.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line, no additional construction of transmission facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional recreational impacts. See Section 11.4.1.2 for the development assumptions underlying this analysis.

Construction of an access road to State Route 318 would add about 51 acres (0.2 km^2) of surface disturbance to the impact associated with the SEZ facilities. The disturbance caused by the road construction would not likely cause additional adverse impacts on recreation.

11.4.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide mitigation for some identified impacts. The exception would be that recreational use of the area developed for solar energy production would be lost and would not be mitigatable.

A design feature specific to the proposed Dry Lake Valley North SEZ is:

- Because of the length of the SEZ and the potential for solar development severing current east–west travel, legal vehicular access through the area should be maintained. If the solar development would obstruct the route used for desert racing, alternative locations for that use should be considered at the time specific solar development proposals are analyzed.

11.4.6 Military and Civilian Aviation

11.4.6.1 Affected Environment

Portions of the proposed Dry Valley Lake North SEZ are covered by two MTRs with 200-ft (61-m) AGL operating limits and a major SUA. The area is completely included within the airspace use boundary of the NTTR. Supersonic speeds are authorized at and above 5,000 ft AGL (1,524 m) in the NTTR in this area. The closest military installations to the proposed SEZ are the NTTR, which is located about 60 mi (97 km) southwest of the SEZ, and Nellis Air Force Base, which is located about 100 mi (160 km) south of the area.

There are no civilian municipal aviation facilities that would be affected by solar facilities located within the SEZ.

11.4.6.2 Impacts

The military has expressed serious concern over solar energy facilities being constructed within the SEZ, and Nellis Air Force Base has indicated that any facilities more than 50 ft (15 m) high may be incompatible with low-level aircraft use of the MTR. Further, the NTTR has indicated that solar technologies requiring structures higher than 50 ft (15 m) AGL may present unacceptable electromagnetic compatibility concerns for its test mission. The NTTR maintains that a pristine testing environment is required for the unique national security missions conducted on the NTTR. The potential electromagnetic interference impacts from solar facilities on testing activities at the NTTR, coupled with potential training route obstructions created by taller structures, make it likely solar facilities exceeding 50 ft (15 m) would significantly affect military operations.

There would be no impact on civilian municipal aviation facilities.

11.4.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been proposed. The programmatic design features described in Appendix A, Section A.2.2, would require early coordination with the DoD to identify and mitigate, if possible, potential impacts on the use of MTRs.

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11.4.7 Geologic Setting and Soil Resources

11.4.7.1 Affected Environment

11.4.7.1.1 Geologic Setting

Regional Setting

The proposed Dry Lake Valley North SEZ is located in Dry Lake Valley, a north-trending closed basin within the Basin and Range physiographic province in southern Nevada. The valley lies to the south of Muleshoe Valley, at the southern ends of the Schnell Creek and Fairview Ranges (Figure 11.4.7.1-1). It extends southward about 40 mi (64 km), bounded by the North Pahroc Range to the west and the Bristol, Highland, and Burnt Springs Ranges to the east, and ends at a series of low bedrock hills that also mark the southern end of the North Pahroc Range. Dry Lake Valley is one of many structural basins (grabens) typical of the Basin and Range province.

Exposed sediments in Dry Lake Valley consist mainly of modern alluvial and eolian deposits (Figure 11.4.7.1-2). Fan deposits along the valley margins are made up of poorly sorted gravel, gravelly sand, and sand. Playa lake sediments (Qp) occur in the valley center to the south and cover about 10% of the SEZ. The surrounding mountains are composed mainly of Late Proterozoic and Cambrian metamorphic rocks overlain by Paleozoic carbonate and shale and capped by late-Tertiary ash-flow tuffs from the Caliente caldera complex, one of a series of Tertiary caldera complexes in the valley. The oldest rocks in the region are the Precambrian metamorphic rocks (CZq) exposed in the Highland Range to the east and the Delamar Mountains to the southeast.

Semiconsolidated to unconsolidated basin-fill deposits are estimated to be about 3-mi (5-km) thick across most of Dry Lake Valley (Mankinen et al. 2008); estimates of the basin's maximum depth range from 3 to 4 mi (6.5 to 8.2 km) in the valley center, below Dry Lake (Mankinen et al. 2008; Scheirer 2005). Shallow basin-fill aquifers occur in the sand and gravel deposits. Most of these aquifers are hydraulically isolated from similar aquifers in adjacent valleys, but some are connected by flow through the underlying carbonate-rock aquifer (Mankinen et al. 2008).

Topography

The Dry Lake Valley is an elongated basin; it is about 40 mi (64 km) long and 8 mi (13 km) wide. It lies to the north of Delamar Valley (Figure 11.4.7.1-1). Elevations along the valley axis range from about 5,100 ft (1,550 m) at its northern end and along the valley sides to about 4,750 ft (1,450 m) at Point of Rock Reservoir at its southern end. Alluvial fan deposits occur along the mountain fronts on both sides of the valley and have coalesced into continuous

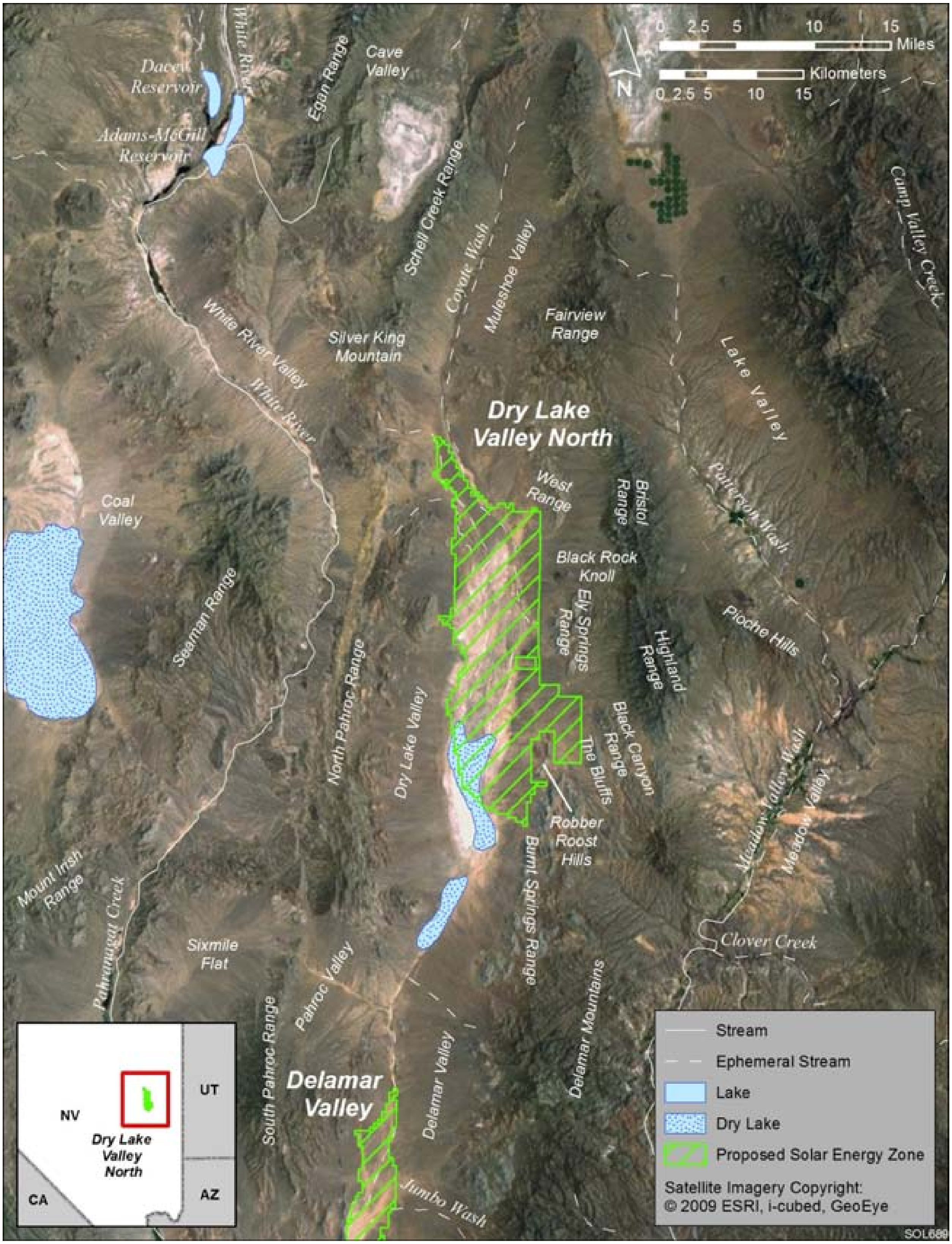

FIGURE 11.4.7.1-1 Physiographic Features of the Dry Lake Valley North Region

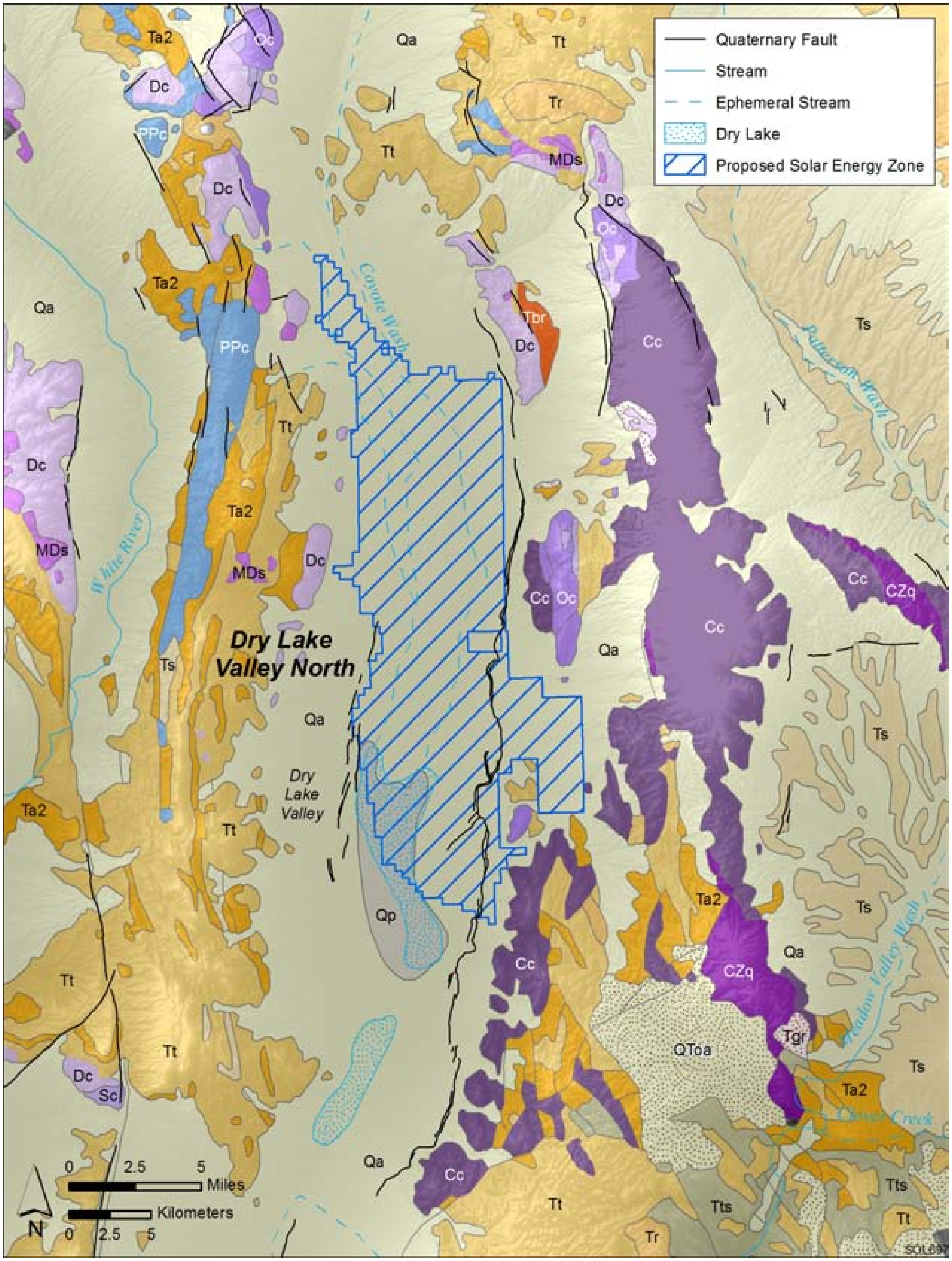

FIGURE 11.4.7.1-2 Geologic Map of the Dry Lake Valley North Region (Sources: Ludington et al. 2007; Stewart and Carlson 1978)

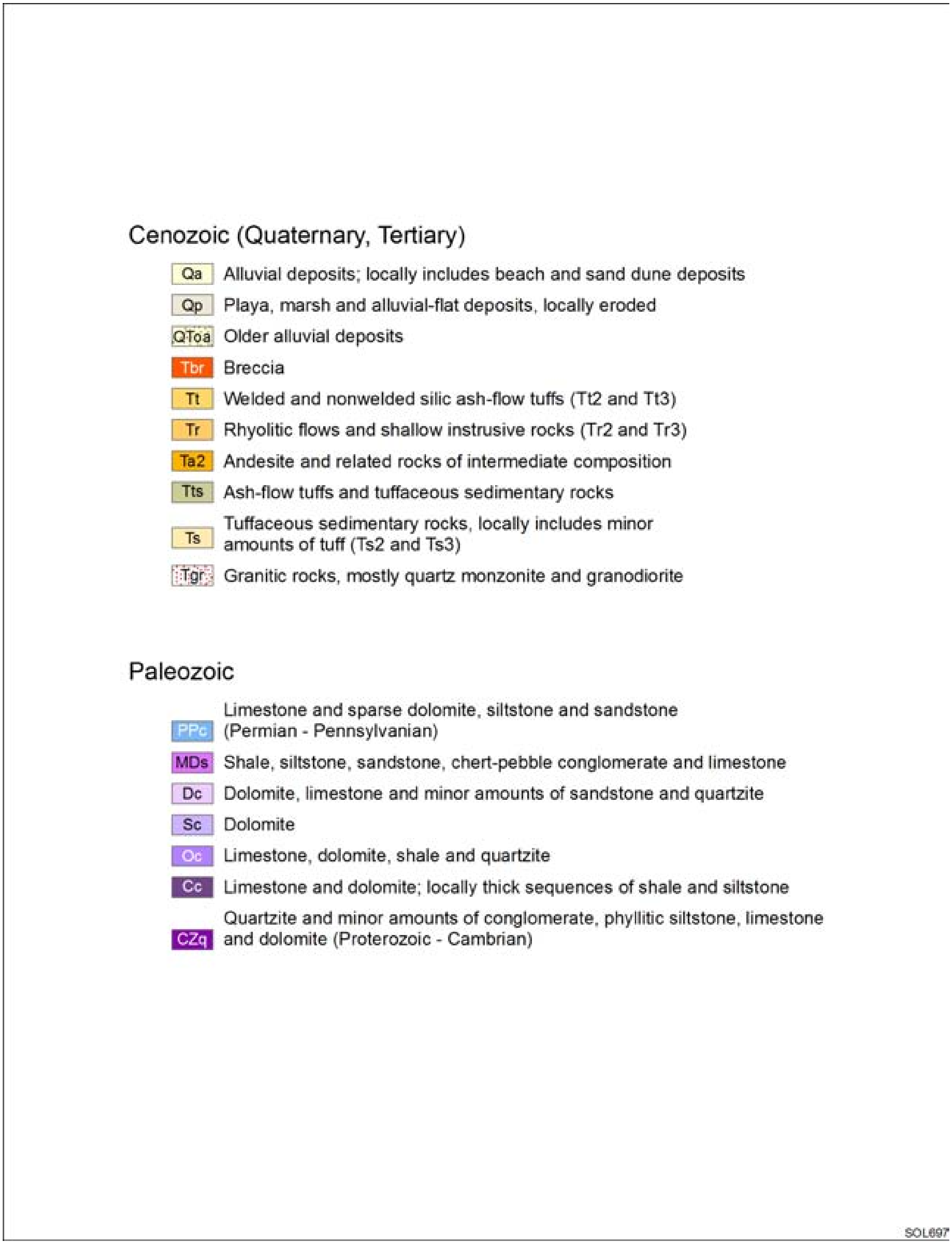

FIGURE 11.4.7.1-2 (Cont.)

fan aprons with widths of about 1 to 4 mi (2 to 6 km) (Swadley et al. 1992). Fan aprons on the east side of the valley are steeper and more deeply dissected than those along the west side. The valley is drained by the Coyote Wash, an ephemeral stream that originates in the Muleshoe Valley to the north and terminates at Dry Lake, a playa in the central part of the valley. The valley floor is broad and flat; its main topographic features are the range front alluvial fans.

The proposed Dry Lake Valley North SEZ is located in the northern part of Dry Lake Valley, between the North Pahroc Range to the west and the Bristol and Highland Ranges to the east. Its terrain slopes gently to the southwest and south. Elevations range from about 5,080 ft (1,550 m) in the northwest corner to 4,580 ft (1,400 m) near the SEZ's southwest corner at Dry Lake (Figure 11.4.7.1-3).

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Dry Lake Valley North SEZ. Solar project developers may need to conduct a geotechnical investigation to identify and assess geologic hazards locally to better identify facility design criteria and site-specific design features to minimize their risk.

Seismicity. Dry Lake Valley is located within the Southern Nevada Seismic Belt (also called the Pahranagat Shear Zone), a south-southwest trending zone of seismic activity characterized mainly by background earthquakes (i.e., earthquakes not associated with surface expression) (DePolo and DePolo 1999). The seismic zone is not well understood because it does not follow the dominant strike (north–south) of faulting in southern Nevada, but is thought to accommodate strain between an area of extension to the south (Mojave Desert) and the much more rigid area of the central Great Basin to the north (Kreemer et al. 2010). Faults within the Pahranagat Shear Zone are estimated to exhibit as much as 10 to 12 mi (16 to19 km) of left-lateral movement (Tschanz and Pampeyan 1970).The proposed Dry Lake Valley North SEZ lies between two north-trending extensional (normal) faults: the Dry Lake fault to the east, and the West Dry Lake and White River Faults to the west (Figure 11.4.7.1-4).

The Dry Lake fault extends about 30 mi (50 km) along the eastern edge of Dry Lake Valley, from the western flank of the Burnt Springs Range northward to the West Range, and crossing portions of the Dry Lake Valley North SEZ (Figure 11.4.7.1-4). The fault is not well studied, and displacement is largely inferred from mapped scarps and lineaments. Displacement along its northern length is down to the west; its length forms the eastern boundary of the structural basin (graben) occupied by Dry Lake Valley. Scarp morphology and the estimated age of offset sediments (Late Pleistocene) place the most recent movement along the fault at less than 130,000 years ago. The slip rate along this fault is estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Sawyer and Anderson 1999).

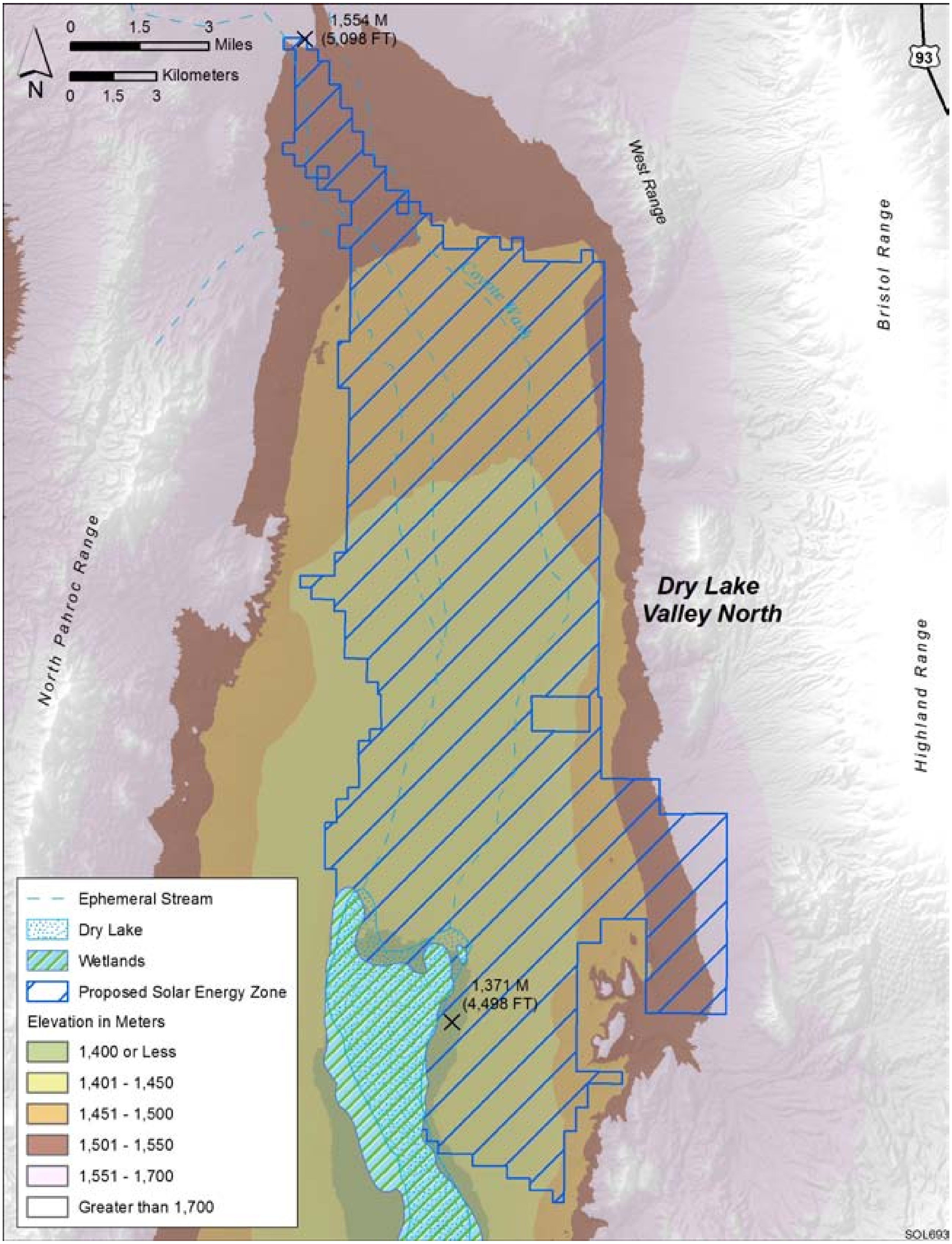

FIGURE 11.4.7.1-3 General Terrain of the Proposed Dry Lake Valley North SEZ

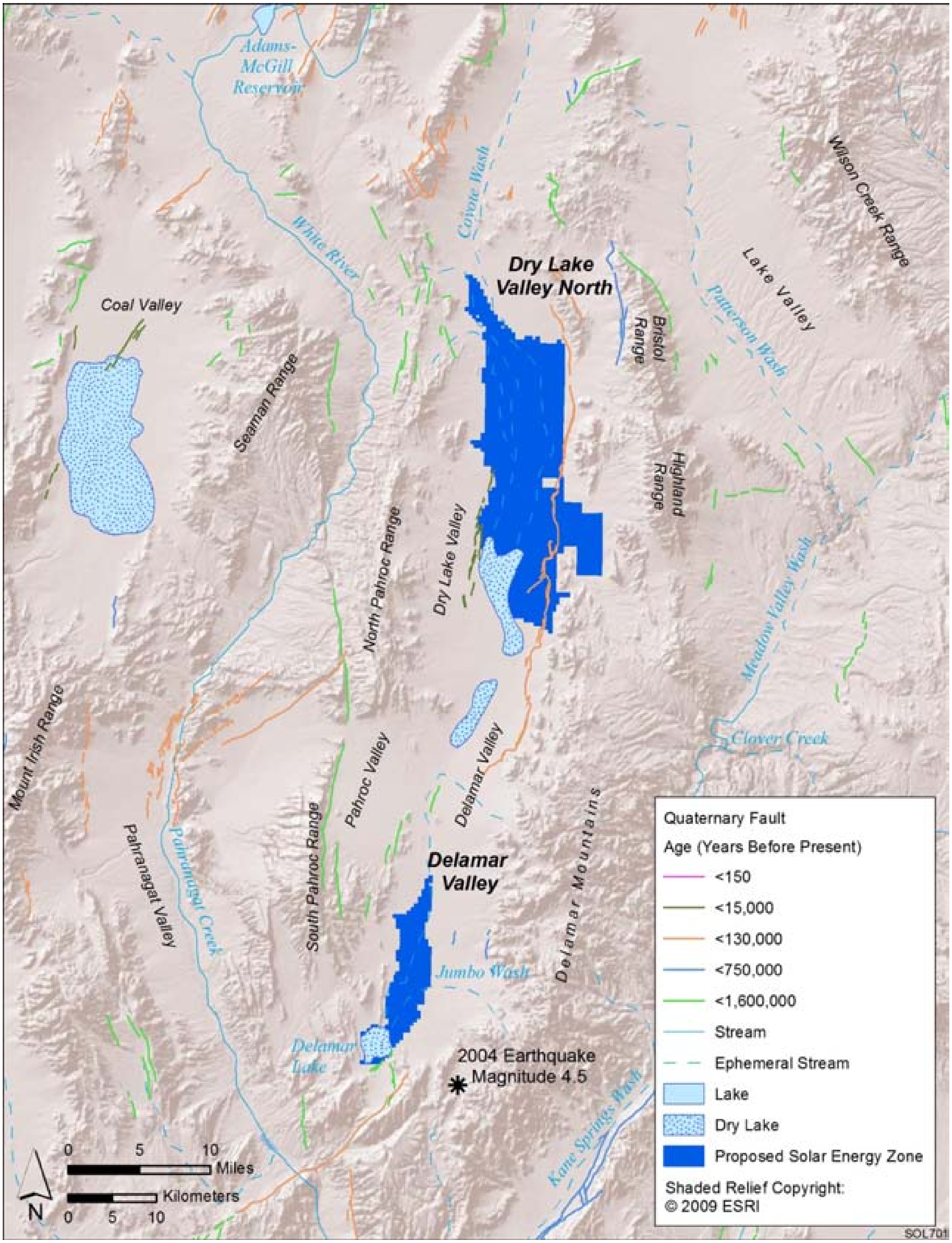

FIGURE 11.4.7.1-4 Quaternary Faults in the Dry Lake Valley North Region (Sources: USGS and NBMG 2010; USGS 2010c)

West Dry Lake fault is composed of a group of discontinuous faults extending north–northeast along the western edge of Dry Lake in the central part of Dry Lake Valley. Fault traces are marked by east-facing, low scarps (less than 3 ft [1 m]). The faults either mark the western boundary of the structural basin underlying Dry Lake Valley or a mid-basin structure. Offsets of late Holocene alluvium place the most recent activity at less than 15,000 years ago. The slip rates along these faults are estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Anderson 1999).

The discontinuous group of normal faults making up the White River fault bound the North Pahroc Range and low hills dividing the White River Valley and Dry Lake Valley, just to the northwest of the Dry Lake Valley North SEZ. Photogeologic interpretation places the most recent activity along these faults as Late Tertiary to Early Quaternary (about 1.6 million years ago). The slip rates along these faults are estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Sawyer 1998).

From June 1, 2000, to May 31, 2010, 44 earthquakes were recorded within a 61-mi (100-km) radius of the proposed Dry Lake Valley North SEZ. The largest earthquake during that period occurred on May 16, 2004. It was located about 40 mi (64 km) south of the SEZ in the Gregerson Basin (near the Delamar Mountains) and registered a Richter scale magnitude (ML[2]) of 4.5 (Figure 11.4.7.1-4). During this period, 28 (64%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0; none were greater than 4.5 (USGS 2010c).

Liquefaction. The proposed Dry Lake Valley North SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.08 and 0.10 g. Shaking associated with this level of acceleration is generally perceived as strong; however, potential damage to structures is light (USGS 2008). Given the deep water table (from 200 to 600 ft [61 and 201 m] below the surface [USGS 2010b]) and the low intensity of ground shaking estimated for Dry Lake Valley, the potential for liquefaction in valley sediments is also likely to be low.

Volcanic Hazards. Several calderas in southern Nevada are the sources of voluminous and widespread Tertiary volcanic deposits throughout the region. These include the Indian Peak caldera complex to the east of Dry Lake Valley, between the Highland Range and the Nevada-Utah border; the Caliente caldera complex, also to the east, in the northern Delamar and Clover Mountains and extending into western Utah; the smaller Kane Springs Wash caldera in the southern Delamar Mountains; and the Central Nevada caldera complex to the northwest of Dry Lake Valley (Scott et al. 1992). Tertiary volcanism overlaps periods of extension in southern

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2 Richter scale magnitude (ML) was the original magnitude defined by Richter and Gutenberg for local earthquakes in 1935. It was based on the maximum amplitude recorded on a Wood-Anderson torsion seismograph but is currently calculated for earthquakes with magnitudes ranging from 2 to 6, using modern instruments with adjustments (USGS 2010d).

Nevada and occurred as recently as 2.6 million years ago (late Pliocene) (Noble 1972); however, there is no evidence of more recent volcanic activity associated with these complexes.

Dry Lake Valley is located about 100 mi (161 km) to the northeast of the southwestern Nevada volcanic field, which consists of volcanic rocks (tuffs and lavas) of the Timber Mountain–Oasis Valley caldera complex and Silent Canyon and Black Mountain calderas (Section 11.1.7.1; Figure 11.1.7.1-4). The area has been studied extensively because of its proximity to the Nevada Test Site and Yucca Mountain repository. Two types of fields are present in the region: (1) large-volume, long-lived fields with a range of basalt types associated with more silicic volcanic rocks produced by melting of the lower crust, and (2) small-volume fields formed by scattered basaltic scoria cones during brief cycles of activity, called rift basalts because of their association with extensional structural features. The basalts of the region typically belong to the second group; examples include the basalts of Silent Canyon and Sleeping Butte (Byers et al. 1989; Crowe et al. 1983).

The oldest basalts in the region were erupted during the waning stages of silicic volcanism in the southern Great Basin in the Late Miocene and are associated with silicic volcanic centers like Dome Mountain (the first group). Rates of basaltic volcanic activity in the region have been relatively constant but generally low. Basaltic eruptions occurred from 1.7 million to 700,000 years ago, creating the cinder cones within Crater Flat (Stuckless and O'Leary 2007). The most recent episode of basaltic eruptions occurred at the Lathrop Wells Cone complex about 80,000 years ago (Stuckless and O'Leary 2007). There has been no silicic volcanism in the region in the past 5 million years. Current silicic volcanic activity occurs entirely along the margins of the Great Basin (Crowe et al. 1983).

Crowe et al. (1983) determined that the annual probability of a volcanic event for the region is very low (3.3×10^{-10} to 4.7×10^{-8}), similar to the probability of 1.7×10^{-8} calculated for the proposed Yucca Mountain repository (Cline et al. 2005). The volcanic risk in the region is associated only with basaltic eruptions; the risk of silicic volcanism is negligible. Perry (2002) cites geologic data that could increase the recurrence rate (and thus the probability of disruption). These include hypothesized episodes of an anomalously high strain rate, the hypothesized presence of a regional mantle hot spot, and new aeromagnetic data that suggest that previously unrecognized volcanoes may be buried in the alluvial-filled basins in the region.

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to facilities on the relatively flat terrain of valley floors such as the Dry Lake Valley if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

There has been no land subsidence monitoring within Dry Lake Valley to date; the potential for subsidence is not currently known.

Other Hazards. Other potential hazards at the proposed Dry Lake Valley North SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Disturbance of soil crusts and desert pavement on soil surfaces may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those found in the Dry Lake Valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) will depend on specific morphology of the fan (National Research Council 1996). Section 11.4.9.1.1 provides further discussion of flood risks within the Dry Lake Valley North SEZ.

11.4.7.1.2 Soil Resources

Soils within the proposed Dry Lake Valley North SEZ are predominantly a mix of sandy loams, silt loams, loamy sands, and loams (Figure 11.4.7.1-5). Soil map units within the Dry Lake Valley North SEZ are described in Table 11.4.7.1-1. These level to nearly level soils are derived from alluvium and eolian deposits from mixed sources, typical of soils on alluvial fans and basin floors. They are characterized as very deep (though a few have are shallow to a duripan) and well drained. Most soils on the site have moderate surface runoff potential and moderately rapid permeability. The natural soil surface is moderately well suitable for roads with a slight to moderate erosion hazard when used as roads or trails. The Penoyer-Geer soils along Coyote wash in the north part of the site and some of the dry lake soils (Ewelac-Playas and Saltydog-Geer associations) are not suitable for roads because of a severe rutting hazard. The water erosion potential is low to moderate for most soils (except for the Penoyer-Geer soils along Coyote wash). Except for the Koyan-Slaw-Penoyer soils near the center of the site which are highly susceptible to wind erosion, most of the soils have a moderate susceptibility to wind erosion, with as much as 86 tons (78 metric tons) of soil eroded by wind per acre (4,000 m^2) each year (NRCS 2010). Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

Only the playa soils (Ewelac-Playas and Ambush-Panacker-Playas associations) within the proposed Dry Lake Valley North SEZ are rated as partially hydric.[3] Flooding is rare for most soils at the site. Soils throughout the SEZ, covering a total of about 37,000 ac (150 km^2) or 49% are classified as prime farmland, if irrigated and reclaimed of excess salts and sodium (NRCS 2010).

11.4.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar

[3] A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding (NRCS 2010).

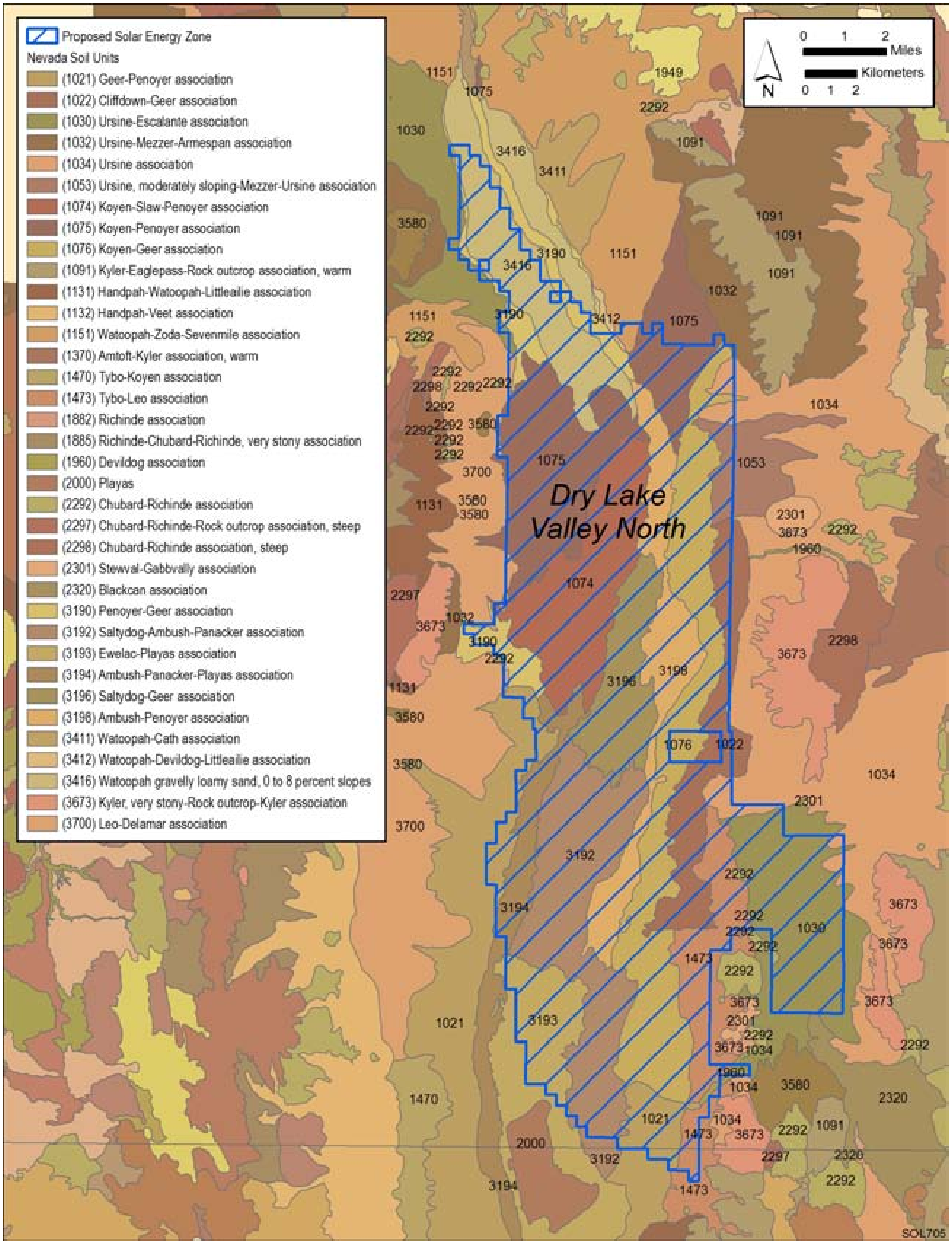

FIGURE 11.4.7.1-5 Soil Map for the Proposed Dry Lake Valley North SEZ (Source: NRCS 2008)

TABLE 11.4.7.1-1 Summary of Soil Map Units within the Proposed Dry Lake Valley North SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
1076	Koyen-Geer association	Low	Moderate (WEG 4)[d]	Consists of about 60% Koyen loamy sand and 30% Geer sandy loam. Level to nearly level soils on alluvial fan skirts, alluvial flats, and drainageways. Parent material is alluvium from volcanic rocks with a high component of loess (Koyen) and welded tuff and limestone with a minor component of volcanic ash (Geer). Very deep and well drained, with moderate surface runoff potential and moderate to moderately rapid permeability. Available water capacity is moderate. Moderate rutting hazard. Used mainly for livestock grazing, wildlife habitat, and cultivated crops of alfalfa and small grains (Geer). Prime farmland[e] if irrigated and reclaimed of excess salts and sodium.	10,396 (14)
3192	Saltydog-Ambush-Panacker association	Moderate	Moderate (WEG 3)	Consists of 40% Saltydog loam, 30% Ambush fine sandy loam, and 20% Panacker fine sandy loam. Level to nearly level soils on alluvial flats. Parent material is alluvium and lacustrine deposits from limestone and welded tuff (Saltydog) and eolian deposits over lacustrine deposits. Very deep and well drained, with moderate surface runoff potential and moderate to moderately rapid permeability. Available water capacity is moderate to high. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat. Prime farmland if irrigated and reclaimed of excess salts and sodium.	9,627 (13)
1075	Koyen-Penoyer association	Low	Moderate (WEG 4)	Consists of 50% Koyan gravelly sandy loam and 35% Penoyer silt loam. Level to nearly level soils on basin floors and inset fans. Parent material is alluvium from volcanic rocks with a high loess component and alluvium over lacustrine deposits. Very deep and well drained, with moderate surface runoff potential and moderate to moderately rapid permeability. Available water capacity is moderate to high. Moderate rutting hazard. Used mainly for livestock grazing; some irrigated cropland (alfalfa, small grains, potatoes, and sugar beets). Prime farmland if irrigated and reclaimed of excess salts and sodium.	8,793 (11)

TABLE 11.4.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
1074	Koyan-Slaw-Penoyer association	Low	High (WEG 1)	Consists of 55% Kenoyan loamy fine sand, 20% Slaw silt loam, and 15% Penoyer very fine sandy loam. Level to nearly level soils on basin floors, basin floor remnants, and fan skirts. Parent material is alluvium from volcanic rocks with a high loess component. Very deep and well drained, with moderate surface runoff potential and slow (Slaw) to moderately rapid permeability. Available water capacity is moderate to high. Moderate rutting hazard. Used mainly for livestock grazing, wildlife habitat, and limited irrigated cropland.	7,016 (9)
1030	Ursine-Escalante association	Moderate	Moderate (WEG 5)	Consists of 55% Ursine gravelly loam and 30% Escalante fine sandy loam. Nearly level to gently sloping soils formed on inset fans, fan remnants, and drainageways. Parent material is alluvium from rhyolite and some limestone. Shallow to a duripan (Ursine) to very deep and well drained, with high surface runoff potential (very slow infiltration rate) and moderate to moderately rapid permeability. Moderately to strongly saline. Available water capacity is very low to low. Moderate rutting hazard. Used mainly for livestock grazing, wildlife habitat, and limited irrigated cropland.	6,370 (8)
3198	Ambush-Penoyer association	Moderate	Moderate (WEG 3)	Consists of 50% Ambush fine sandy loam and 40% Penoyer very fine sandy loam. Level to nearly level soils on alluvial flats. Parent material is eolian deposits over lacustrine deposits. Very deep and well drained, with moderate surface runoff potential and moderate to moderately rapid permeability. Available water capacity is moderate to high. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat.	5,435 (7)
3416	Watoopah gravelly loamy sand (0 to 8% slopes)	Low	Moderate (WEG 3)	Nearly level to gently sloping soils on alluvial fan remnants. Parent material is alluvium from volcanic ash, welded tuff, and rhyolite. Very deep and well drained, with moderate surface runoff potential and moderately rapid permeability. Available water capacity is low. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat.	4,634 (6)

TABLE 11.4.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
1473	Tybo-Leo association	Moderate	Moderate (WEG 4)	Consists of 60% Tybo gravelly coarse sandy loam and 25% Leo very gravelly sandy loam. Nearly level soils on inset fans and fan remnants. Parent material is alluvium from mixed sources, including volcanic rocks. Shallow to a duripan (Tybo) to very deep and well to excessively drained, with high surface runoff potential (very slow infiltration rate) and moderately rapid to rapid permeability. Available water capacity is very low to low. Moderate rutting hazard. Used mainly for livestock grazing, wildlife habitat, and irrigated cropland.	4,015 (5)
3196	Saltydog-Geer association	Moderate	Moderate (WEG 4L)	Consists of about 60% Saltydog loam and 30% Geer fine sandy loam. Level to nearly level soils on alluvial flats. Parent material is alluvium from welded tuff and limestone with a minor component of volcanic ash. Very deep and well drained, with moderate surface runoff potential and moderate to moderately rapid permeability. Available water capacity is moderate to high. Severe rutting hazard. Used mainly for livestock grazing and wildlife habitat. Prime farmland if irrigated and reclaimed of excess salts and sodium.	3,990 (5)
1022	Cliffdown-Geer association	Low	Moderate (WEG 5)	Consists of about 60% Cliffdown very gravelly sandy loam and 30% Geer fine sandy loam. Nearly level to gently sloping soils on fan remnants and fan skirts. Parent material is alluvium from welded tuff and limestone with a minor component of volcanic ash. Very deep and well to somewhat excessively drained, with moderate surface runoff potential and moderately rapid permeability. Available water capacity is low to moderate. Slight rutting hazard. Used mainly for grazing and wildlife habitat.	3,755 (5)

TABLE 11.4.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
3193	Ewelac-Playas association	Moderate	Moderate (WEG 4)	Consists of 50% Ewelac silt loam and 40% Playas (silty clay loam). Level to nearly level soils on basin floors and alluvial flats. Parent material is lacustrine deposits from mixed sources. Very deep and somewhat poorly (playas) to moderately well drained, with high surface runoff potential (very slow infiltration) and moderately rapid permeability. Available water capacity is very low (playas) to high. Severe rutting hazard. Used mainly for livestock grazing and wildlife habitat.	2,821 (4)
1021	Geer-Penoyer association	Moderate	Moderate (WEG 3)	Consists of about 65% Geer fine sandy loam and 30% Penoyer silt loam. Level to nearly level soils on alluvial fan skirts and alluvial flats. Parent material is alluvium from welded tuff and limestone with a minor component of volcanic ash. Very deep and well drained, with moderate surface runoff potential and moderate permeability. Available water capacity is high. Severe rutting hazard. Used mainly for livestock grazing and wildlife habitat.	2,679 (4)
3194	Ambush-Panacker-Playas association	Moderate	Moderate (WEG 3)	Consists of about 45% Ambush fine sandy loam, 30% Panacker fine sandy loam, and 15% Playas (silty clay loam). Level to nearly level soils on alluvial flats and basin floors. Parent material is eolian deposits and alluvium from mixed sources over lacustrine deposits. Very deep and somewhat poorly (playas) to well drained, with moderate surface runoff potential and moderate to moderately rapid permeability. Available water capacity is very low (playas) to high. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat. Prime farmland if irrigated and reclaimed of excess salts and sodium.	2,288 (3)

TABLE 11.4.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
3190	Penoyer-Geer association	High	Moderate (WEG 4L)	Consists of 45% Penoyer silt loam and 40% Geer fine sandy loam. Level to nearly level soils formed on inset fans and drainageways. Parent material is alluvium from welded tuff and limestone (with a minor component of volcanic ash). Very deep and well drained, with moderate surface runoff potential and moderate rapid permeability. Moderately to strongly saline. Available water capacity is high. Severe rutting hazard. Used mainly for livestock grazing and wildlife habitat.	2,267 (3)
1034	Ursine association	Moderate	Moderate (WEG 6)	Moderately sloping very gravelly loam on fan remnants. Parent material is alluvium from mixed sources. Shallow to a duripan and well drained, with high surface runoff potential (very slow infiltration rate) and moderately rapid permeability. Available water capacity is very low. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat.	1,271 (2)
1053	Ursine, moderately sloping-Mezzer-Ursine association	Moderate	Moderate (WEG 6)	Consists of about 60% Ursine very gravelly loam and 25% Mezzer very gravelly fine sandy loam. Moderately sloping soils on inset fans, fan remnants, and drainageways. Parent material is alluvium from mixed sources. Shallow to a durian (Ursine) to very deep and well drained, with high surface runoff potential (very slow infiltration rate) and moderately rapid permeability. Available water capacity is very low to low. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat.	797 (1)

TABLE 11.4.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
3700	Leo-Delamar association	Moderate	Moderate (WEG 3)	Consists of about 55% Leo gravelly sandy loam and 30% Delamar gravelly sandy loam. Level to nearly level soils on alluvial fan remnants and drainageways. Parent material is alluvium from mixed sources, including welded tuff and minor amounts of limestone. Moderately to very deep and well to excessively drained, with low surface runoff potential (high infiltration rate) and moderately slow to rapid permeability. Available water capacity is low. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat.	327 (<1)

[a] Water erosion potential rates based on soil erosion factor K, which indicates the susceptibility of soil to sheet and rill erosion by water. Values range from 0.02 to 0.69 and are provided in parentheses under the general rating; a higher value indicates a higher susceptibility to erosion. Estimates based on the percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8 low (see footnote d for further explanation).

[c] To convert from acres to km^2, multiply by 0.004047.

[d] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEGs 3 and 4, 86 tons (78 metric tons) per acre (4,000 m^2) per year; and WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year.

[e] Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses.

Source: NRCS (2010).

project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy developments in varying degrees and are described in more detail for the four phases of development in Section 5.7 1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility since some components would involve greater disturbance and would take place over a longer timeframe.

Portions of the dry lake may not be a suitable location for construction, because lakebed sediments are often saturated with shallow groundwater and likely collapsible. The lake sits within the lowest elevation area of Dry Lake Valley and serves as a sump for drainage in the valley.

11.4.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Dry Valley North SEZ. Implementing the programmatic design features described under both Soils and Air Quality in Appendix A, Section A.2.2., as required under BLM's Solar Energy Program, would reduce the potential for soil impacts during all project phases.

11.4.8 Minerals (Fluids, Solids, and Geothermal Resources)

11.4.8.1 Affected Environment

There were no locatable mining claims within the proposed Dry Lake Valley North SEZ as of June 14, 2010 (BLM and USFS 2010a), and the public land within the SEZ was closed to locatable mineral entry in June 2009, pending the outcome of this solar energy PEIS. All of the area has been previously leased for oil and gas development, and there are currently six existing leases within the SEZ that are classified as nonproducing (BLM and USFS 2010b). The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals, and for disposal of salable minerals. There is no geothermal leasing or development in or near the SEZ (BLM and USFS 2010b).

11.4.8.2 Impacts

The existing, nonproducing oil and gas leases within the SEZ are prior existing rights and represent a potential conflict with future solar development. As long as these leases remain in effect, solar development would require the cooperation of the oil and gas lessees. Such cooperation might be possible, since oil and gas development generally requires fewer than 5 acres (0.02 km^2) per well, but it would depend on accommodating the oil and gas lease holders' need for continued access to develop, maintain, and service any wells developed on the leases.

If the area were identified as a solar energy zone, it would continue to be closed to all incompatible forms of mineral development. For the purpose of this analysis, it was assumed that future development of oil and gas resources would continue to be possible, since such development could occur under the existing leases or from directional drilling from new leases. Since the SEZ does not contain existing mining claims, it was also assumed that there would be no future loss of locatable mineral production. The production of common minerals, such as sand and gravel and mineral materials used for road construction or other purposes, might take place in areas not directly developed for solar energy production.

The SEZ has had no history of development of geothermal resources or of leasing interest. For that reason, it is not anticipated that solar development would adversely affect the development of geothermal resources.

11.4.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features have been proposed. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for mineral resources.

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11.4.9 Water Resources

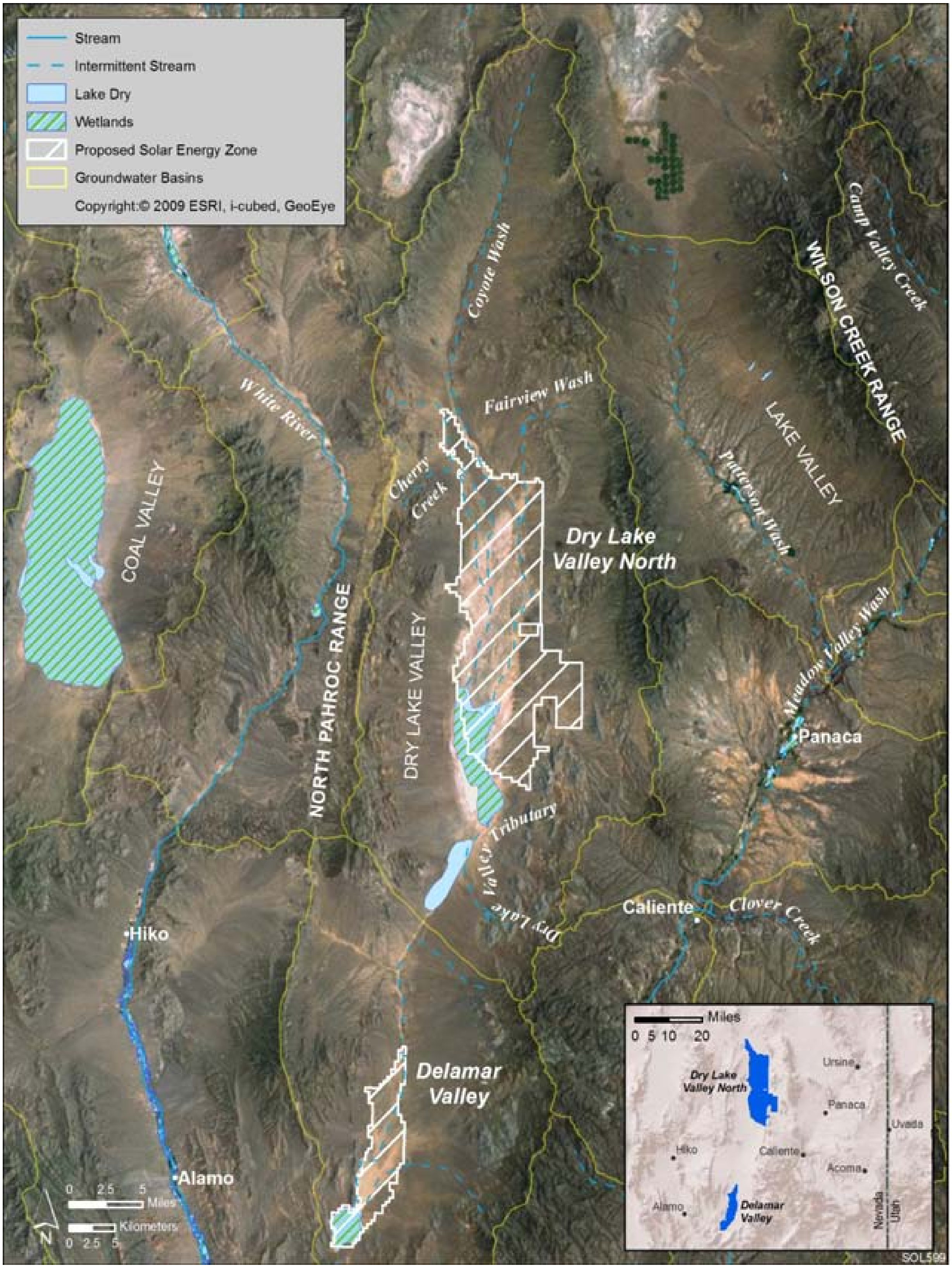
11.4.9.1 Affected Environment

The proposed Dry Lake Valley North SEZ is located within the Central Nevada Desert Basins subbasin of the Great Basin Region (USGS 2010a) and the Basin and Range physiographic province, which is characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed SEZ has surface elevations ranging between 4,580 and 5,080 ft (1,400 and 1,550 m). The Dry Lake Valley North SEZ is located within Dry Lake Valley, a basin characterized by a flat valley floor surrounded by uplifted volcanic and carbonate rock mountain ranges (Figure 11.4.9.1-1). Annual precipitation is estimated to be between 7 and 16 in./yr (18 and 41 cm/yr) depending on the elevation, with the lower rainfall expected on the valley floor and higher rainfall at higher elevations (WRCC 2010a). Pan evaporation rates are estimated to be 80 in./yr (203 cm/yr) (Cowherd et al. 1988; WRCC 2010b). Reference crop evapotranspiration has been estimated at 59 in./yr (150 cm/yr) in nearby Caliente (Huntington and Allen 2010).

11.4.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

There are no perennial surface water features within Dry Lake Valley. The primary surface water features within the proposed Dry Lake Valley North SEZ include several ephemeral washes and a dry lake (Figure 11.4.9.1-1; the area shown as wetland is the approximate location of the dry lake). The area encompassed by the dry lake is approximately 12.6 mi^2 (33 km^2). Coyote Wash and Cherry Creek flow from north to south into the dry lake through the central part of the Dry Lake Valley basin. Fairview Wash is a tributary to Coyote Wash that flows from the adjacent West Range. Evidence of braided streams and alluvial outwash plains (fans) are present throughout the SEZ, specifically in the area north of the dry lake and in the eastern part of the SEZ, likely caused by spring runoff from the hills to the east. The Dry Lake Valley Tributary is an ephemeral wash in the southern part of the Dry Lake Valley basin that flows north toward the dry lake, peak flows of which have been measured by the USGS to be up to 150 ft^3/s (4.2 m^3/s) (USGS 2010b; gauge 10245270). A shallow drainage divide separates Dry Lake Valley and Delamar Valley to the south. Surface water runoff from the surrounding mountains is estimated to be 9,000 ac-ft/yr (11 million m^3/yr) between both Dry Lake Valley and the adjacent Delamar Valley (NDWR 1971). Surface water evaporation is estimated to be minor and there are no surface water inflows to or outflows from the basin (NDWR 1971).

Flood hazards have not been identified (Zone D) for the region surrounding the proposed Dry Lake Valley North SEZ (FEMA 2009). Intermittent flooding may occur with temporary ponding and erosion along the ephemeral washes, from the hills on the sides of the basin, and within the lake area. Two wetlands have been identified by the NWI in the vicinity of the dry lake (USFWS 2009a). Within this area, 9,341 acres (38 km^2) have been identified as “lake” and 44 acres (0.18 km^2) have been identified as “freshwater forested/shrub wetland” area (USFWS 2009a). Further information regarding the small wetlands within the SEZ can be found in Section 11.4.10.1.



2 **FIGURE 11.4.9.1-1 Surface Water Features near the Proposed Dry Lake Valley North SEZ**

11.4.9.1.2 Groundwater

The proposed Dry Lake Valley North SEZ is located within the Dry Lake Valley groundwater basin (NDWR 2010b). Basin-fill deposits are estimated to be up to 4 mi (6.5 km) thick in the center of the basin, with an average thickness of 3 mi (5 km), and are underlain by and hydraulically connected to thick sequences of Paleozoic carbonate rocks (Dettinger 1989; Mankinen et al. 2008). Carbonate rocks have been found to be closer to the surface in the northern part of Dry Lake Valley (SNWA and BLM 2008). Volcanic rocks occur at the margins of the basin, underneath basin-fill in some areas of the basin, and are also underlain by the Paleozoic carbonate rock sequences (Dettinger 1989; Mankinen et al. 2008). No occurrence of evapotranspiration of groundwater is estimated to occur in Dry Lake Valley (NDWR 2008). The Paleozoic carbonate rocks that underlay the Dry Lake Valley basin are thought to be a part of the White River Groundwater Flow System, a regional-scale carbonate-rock aquifer that flows generally toward the south and terminates at Muddy River Springs and the Virgin River (Eakin 1966). The White River Groundwater Flow System is a part of a large carbonate-rock province that occurs within approximately one-third of Nevada, a large portion of Utah, and parts of Arizona and California (Harrill and Prudic 1998). Connectivity of the carbonate rocks that underlay Dry Lake Valley to the White River Groundwater Flow System is not well understood, and has yet to be studied in detail in this area (Harrill and Prudic 1998; NDWR 2008).

Estimates of recharge in the basin have varied significantly, depending up on the study. Recharge to the basin-fill aquifer was estimated to be 5,000 ac-ft/yr (6.2 million m^3/yr) by the Maxie-Eakin method (i.e., recharge is a percentage of precipitation), with 5,000 ac-ft/yr (6.2 million m^3/yr) estimated to flow out of the groundwater basin and into Delamar Valley groundwater basin to the south (NDWR 1971). The NDWR (1971) also estimated that there were no inflows to the Dry Lake Valley groundwater basin. Using a recharge model specifically designed to estimate recharge in the Great Basin Aquifer system, Flint et al. (2004) estimated average recharge in the basin to be between 10,600 ac-ft/yr and 11,300 ac-ft/yr (13 million and 14 million m^3/yr) using a 30-year climate record, geologic information, soil types, and other data input into a model. The study by Flint et al. (2004) also indicated that Dry Lake Valley is dominated by in-place recharge processes instead of by runoff processes. Other estimates of basin-scale recharge range from 13,000 ac-ft/year (16 million m^3/yr) to 15,667 ac-ft/year (19 million m^3/yr) (NDWR 2008).

Groundwater flows from the basin margins, where infiltration occurs along mountain front areas, south to Delamar Valley. Water levels in wells located within or adjacent to the proposed Dry Lake Valley North SEZ are generally between 200 and 660 ft (61 and 201 m) below ground surface, with the majority of the measurements of groundwater at deeper than 400 ft (122 m) below ground surface (USGS 2010b; wells 375624114444501, 380336114473501, and 374536114443001; SNWA and BLM 2008). The hydraulic gradient has been estimated to be 13 ft/mi (0.0025 ft/ft) (2.5 m/km [0.0025 m/m]) between Dry Lake Valley and Delamar Valley to the south (SNWA and BLM 2008). Unconfined conditions are thought to occur in the northern part of the Dry Lake Valley basin, and semiconfined to confined conditions are thought to occur in the southern part of the basin (SNWA and BLM 2008). An aquifer test performed within the valley fill in the basin indicated a transmissivity of 5,200 ft^2/day (483 m^2/day) for a shallow aquifer and 6,500 ft^2/day (604 m^2/day) for a deep aquifer (STINET 2010).

The SNWA and BLM (2008) identified a total of 98 springs within the basin. Four of the springs, all occurring in the northern portion of the basin, were monitored by the SNWA and BLM (2008) and the following flow rates were measured: two had flow rates of between 1 and 10 gpm (3.8 and 38 L/min) and two had flow rates of between 10 and 100 gpm (38 and 380 L/min). The NDWR (2008) has found that the springs of environmental concern within the basin (listed as Meloy Spring, Fence Spring, Bailey Spring, and Coyote Spring) are not directly connected to the principal groundwater aquifer in the basin.

The chemical quality of water in the Dry Lake Valley basin is varied. Groundwater sampling in the basin has indicated that some constituents exceed water quality standards (SNWA and BLM 2008). In some samples, concentrations of arsenic have been found to exceed the EPA MCL for arsenic and thallium, three of four samples exceeded secondary MCL for iron, and a high pH has been measured in waters within the basin (SNWA and BLM 2008; EPA 2009d). TDS concentrations have been found to range between 210 and 400 mg/L (SNWA and BLM 2008).

11.4.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million m^3/yr), with livestock and mining water uses on the order of 230 ac-ft/yr (280,000 m^3/yr) and 450 ac-ft/yr (560,000 m^3/yr), respectively (Kenny et al. 2009).

All waters in Nevada are the property of the public in the State of Nevada and subject to the laws described in Nevada Revised Statutes, Chapters 532 through 538 (available at http://leg.state.nv.us/nrs). The NDWR, led by the State Engineer, is the agency responsible for managing both the surface water and groundwater resources, which includes overseeing water right applications, appropriations, and interbasin transfers (NDWR 2010c). The two principle ideas behind water rights in Nevada are the prior appropriations doctrine and the concept of beneficial use. A water right establishes an appropriation amount and date such that more senior water rights have priority over newer water rights. In addition, water rights are treated as both real and personal property, such that water rights can be transferred without affecting the land ownership (NDWR 2010c). Water rights applications (new or transfer of existing) are approved if the water is available to be appropriated, if existing water rights will not be affected, and if the proposed use is not deemed to be harmful to the public interest. If these conditions are satisfied according to the State Engineer, a proof of beneficial use of the approved water must be provided within a certain time period, and following that a certificate of appropriation is issued (BLM 2001).

Dry Lake Valley is not a designated groundwater basin, meaning that there are no specifically designated beneficial uses for the water within the basin (NDWR 2010a). The NDWR estimates the perennial yield for each groundwater basin as the amount of water that can be economically withdrawn for an indefinite period without depleting the source (NDWR 1999). The NDWR (2010b) states that the perennial yield of the Dry Lake Valley basin is equal to 12,700 ac-ft/yr (15.7 million m^3/yr). Approximately 1,009 ac-ft/yr (1.2 million m^3/yr) (for irrigation) of water rights are permitted in the basin, and an additional 57 ac-ft/yr (70,000 m^3/yr) (18 ac-ft/yr [22,000 m^3/yr] for mining, rest for stock watering) of water rights are certified. Through Ruling 5875 in July 2008, the NDWR (2008) granted 11,584 ac-ft/yr (14 million m^3/yr) of water rights in the Dry Lake Valley groundwater basin to the SNWA for use in a project that would convey water to Las Vegas (SNWA 2008). This amount of water represents the remaining amount of unappropriated water within the Dry Lake Valley Basin, less 50 ac-ft/yr that would be reserved for future use within the basin (NDWR 2008). The SNWA would commit 1,500 ac-ft/yr (1.9 million m^3/yr) of those water rights to Lincoln County for use, but the rest would be transferred to Las Vegas (SNWA 2008). While the water rights were initially granted by the NDWR, the Seventh Judicial District Court of Nevada (Lincoln County) ordered that NDWR Ruling 5875 be remanded in October 2009 (BLM 2010c). In November 2009, the SNWA filed an appeal to the Nevada Supreme Court to fight this decision (BLM 2010c). In June 2010, the Nevada Supreme Court issued a ruling related to SNWA water rights applications in Dry Lake Valley: the NDWR was ordered to reconsider the SNWA water rights applications and reopen the protest period related to the applications (*Great Basin Water Network v. State Engineer* 2010).

11.4.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land-disturbance activities (construction, final developed site plan, and off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water–wetland–groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by the excessive withdrawal from aquifers).

11.4.9.2.1 Land-Disturbance Impacts on Water Resources

Impacts related to land-disturbance activities are common to all utility-scale solar energy developments, which are described in more detail for the four phases of development in

Section 5.9.1; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. Land-disturbance activities should be avoided to the extent possible in the vicinity of the ephemeral stream washes and the dry lake present on the site. Alterations to these systems could enhance erosion processes, disrupt groundwater recharge, and negatively affect plant and animal habitats associated with the ephemeral channels.

11.4.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Dry Lake Valley North SEZ include the following:

- On the basis of a total area of 76,874 acres (311 km^2), it is assumed that three solar projects would be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;

- The maximum land disturbance for an individual solar facility during the peak construction year is 3,000 acres (12 km^2);

- Assumptions on individual facility size and land requirements (Appendix M) along with the assumed number of projects and maximum allowable land disturbance, results in the potential to disturb up to 12% of the SEZ total area during the peak construction year; and

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry cooling (see Section 5.9.2.1).

Site Characterization

During site characterization, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Because there are no significant surface water bodies on the proposed Dry Lake Valley North SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources. The variable quality of water in the Dry Lake Valley basin could be an issue for potable water supply. Some groundwater samples taken in the basin have been found to have high arsenic, thallium, iron, and pH. If the groundwater supply used for a project does not meet drinking water quality standards, potable water would need to be brought in from off-site.

Water requirements for dust suppression and potable water supply during construction are shown in Table 11.4.9.2-1 and could be as high as 4,220 ac-ft (5.2 million m^3). The assumptions underlying these estimates for each solar energy technology are described in Appendix M. Groundwater wells would have to yield an estimated 1,700 to 2,600 gpm (6,400 to 9,800 L/min) to meet the estimated construction water requirements. These yields are on the order of a small to medium farm in Nevada (USDA 2009c), so multiple wells may be needed in order to obtain the water requirements. In addition, up to 222 ac-ft (274,000 m^3) of sanitary wastewater generated on-site would need to be either treated on-site or sent to an off-site facility. The availability of groundwater and the impacts of groundwater withdrawal would need to be assessed during the site characterization phase of a solar development project. Obtaining water from an offsite source could be necessary for solar development projects.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 11.4.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, hybrid, wet). Further

TABLE 11.4.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Dry Lake Valley North SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	2,724	4,086	4,086	4,086
Potable supply for workforce (ac-ft)	222	135	56	28
Total water use requirements (ac-ft)	2,946	4,220	4,142	4,114
Wastewater generated				
Sanitary wastewater (ac-ft)	222	135	56	28

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Table M.9-1 (Appendix M).

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 80 in./yr (203 cm/yr) (Cowherd et al. 1988; WRCC 2010b).

[c] To convert ac-ft to m^3, multiply by 1,234.

TABLE 11.4.9.2-2 Estimated Water Requirements during Operations at the Proposed Dry Lake Valley North SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	12,296	6,831	6,831	6,831
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	6,148	3,415	3,415	342
Potable supply for workforce (ac-ft/yr)	172	77	77	7.7
Dry cooling (ac-ft/yr)[e]	2,459–12,296	1,366–6,831	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	55,330–178,285	30,739–99,047	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	3,492	349
Dry-cooled technologies (ac-ft/yr)	8,779–18,616	4,858–10,323	NA	NA
Wet-cooled technologies (ac-ft/yr)	61,650–184,605	34,231–102,539	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	3,493	1,940	NA	NA
Sanitary wastewater (ac-ft/yr)	172	77	77	7.7

[a] Land area for the parabolic trough technology was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

[b] Water needs are linearly related to power. Water usage for any other size project can be estimated by using the multipliers provided in Table M.9-2 (Appendix M).

[c] Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

[d] To convert ac-ft to m^3, multiply by 1,234.

[e] Dry-cooling value assumes 0.2 to 1.0 ac-ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac-ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009).

[f] NA = not applicable.

[g] Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

refinements to water requirements for cooling would result from the percentage of time the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 11.4.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per MW. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 342 to 6,148 ac-ft/yr (422,000 to 7.6 million m^3/yr), and the workforce potable water supply is estimated to range from 7.7 to 172 ac-ft/yr (9,500 to 212,000 m^3/yr). The maximum total water usage during normal operation at full build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 184,605 ac-ft/yr (228 million m^3/yr). Water usage for dry-cooling systems would be as high as 18,616 ac-ft/yr (23 million m^3/yr), approximately a factor of 10 times less that the wet-cooling option. Non-cooled technologies, dish engine and PV systems, require substantially less water at full build-out capacity at 3,492 ac-ft/yr (4.3 million m^3/yr) for dish engine and 349 ac-ft/yr (430,000 m^3/yr) for PV (Table 11.4.9.2-2). Operations would produce up to 172 ac-ft/yr (212,000 m^3/yr) of sanitary wastewater; in addition, for wet-cooled technologies, 1,940 to 3.493 ac-ft/yr (2.4 million to 4.3 million m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed Dry Lake Valley North SEZ. However, obtaining water from an off-site source could be necessary for solar development projects. Perennial yield in the basin has been estimated to be 12,700 ac-ft/yr (16 million m^3) (NDWR 2008). At the level of full build-out, technologies that use wet cooling would exceed the estimated basin yield, so wet cooling would not be feasible for full build-out of the Dry Lake Valley North SEZ. To the extent possible, facilities using dry cooling should implement water conservation practices to limit water needs.

If groundwater withdrawals exceeded the sustainable yield of the basin, then groundwater levels would decline in the basin and potentially lead to declines the adjacent Delamar Valley, which receives outflow from the Dry Lake Valley groundwater basin. These indirect impacts can disturb regional groundwater flow patterns and recharge patterns, which have implications for ecological habitats (discussed in Section 11.4.10.1).

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled and the site reclaimed to its pre-construction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and may also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because quantities of water needed during the decommissioning/reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

11.4.9.2.3 Off-Site Impacts: Roads and Transmission Lines

The proposed Dry Lake Valley North SEZ is located approximately 7 mi (11 km) east of State Route 318, and an existing 69-kv transmission line runs through the proposed SEZ, as described in Section 11.4.1.2. Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. Water needed for road modification and transmission line construction activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. As a result, water use impacts would be negligible. Impacts on surface water and groundwater quality resulting from spills would be minimized by implementing the mitigation measures described in Section 5.9.3 (e.g., cleaning up spills as soon as they occur). Ground-disturbing activities that have the potential to increase sediment and dissolved solid loads in downstream waters would be conducted following the mitigation measures outlined in Section 5.9.3 to minimize impacts associated with alterations to natural drainage pathways and hydrologic processes.

11.4.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources from solar energy development at the proposed Dry Lake Valley North SEZ are associated with land-disturbance effects on the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land-disturbance activities can cause localized erosion and sedimentation issues, as well as altering groundwater recharge and discharge processes. Land-disturbance activities should be avoided to the extent possible in the vicinity of the ephemeral stream washes and the dry lake present on the site. Alterations to these systems could enhance erosion processes, disrupt groundwater recharge, and negatively affect plant and animal habitats associated with the ephemeral channels.

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater is the primary water resource available to solar energy facilities in the proposed Dry Lake Valley North SEZ; however, aquifer characteristics and the region's sustainable yield are not fully quantified. The estimates of groundwater recharge, discharge, and underflow from adjacent basins suggest that there may not be available groundwater available to support water-intensive technologies, such as those using wet cooling.

The NDWR (2008) has declared that there are 11,584 ac-ft (14 million m^3/yr) of water available annually in the basin for beneficial uses. However, the allocations are under review by the Nevada Supreme Court and the water rights applications have been opened up by the NDWR to public comment. Concerned parties could present new information about the groundwater basin, and thus the NDWR could alter its previous assessment of water availability in the basin. Based on the information presented here, wet cooling would not be feasible for full build-out of the Dry Lake Valley North SEZ. To the extent possible, facilities using dry cooling should implement water conservation practices to limit water needs.

For the purpose of evaluating a more realistic build-out scenario reflecting the available water supplies, an estimate of the maximum power capacity for each technology was made assuming that groundwater extractions were limited to 11,584 ac-ft/yr (14 million m^3/yr). For solar trough technologies, this quantity of water would allow approximately 2,310 and 12,296 MW to be produced using wet- and dry-cooling options, respectively. For power tower technologies, this quantity of water would allow approximately 2,312 and 6,833 MW to be produced using wet- and dry-cooling options, respectively. This water-limited power capacity represents 19 to 100% of the area-based full build-out capacity for parabolic trough facilities and 34 to 100% of the area-based full build-out capacity for power tower facilities. This analysis of the potential power production capacity based on limited water resources should serve as an estimate only. Dish engine facilities and PV facilities would not be limited by water availability and could generate full area-based build-out capacity, and thus are the preferred technologies for large-scale solar energy production at the proposed Dry Lake Valley North SEZ.

11.4.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would mitigate some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Proposed design features specific to the proposed Dry Lake Valley North SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures;

- Land-disturbance activities should avoid impacts to the extent possible in the vicinity of the ephemeral stream washes and the dry lake present on the site;

- Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters;

- Groundwater rights must be obtained from the NDWR;

- Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection (NDEP 2010);

- Groundwater monitoring and production wells should be constructed in accordance with state standards (NDWR 2006); and

- Water for potable uses would have to meet or be treated to meet water quality standards in according to *Nevada Administrative Code* (445A.453-445A.455).

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11.4.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Dry Lake Valley North SEZ. The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects is defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 60-ft (18-m) wide portion of an assumed access road corridor. No new transmission developments are expected to be needed to serve development on the SEZ due to the proximity of existing infrastructure (see Section 11.4.1.2 for development assumptions). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed access road corridor, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the area of direct effects. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

11.4.10.1 Affected Environment

The proposed Dry Lake Valley North SEZ is located primarily within the Shadscale-Dominated Saline Basins Level IV ecoregion, which supports shadscale (*Atriplex confertifolia*) and black greasewood (*Sarcobatus vermiculatus*) low scrub communities in valley bottoms, and also includes remnant lake terraces and scattered sand dunes (Bryce et al. 2003). This internally drained nearly flat to gently sloping ecoregion includes soils with high salt and alkali content, which are dry for extended periods. Additional commonly occurring species include bud sagebrush (*Picrothamnus desertorum*), fourwing saltbrush (*Atriplex canescens*), rubber rabbitbrush (*Ericameria nauseosa*), alkali sacaton (*Sporobolus airoides*), bottlebrush squirreltail (*Elymus elymoides*), inland saltgrass (*Distichlis spicata*), Indian ricegrass (*Achnatherum hymenoides*), Great Basin wildrye (*Leymus cinereus*), and galleta (*Pleuraphis jamesii*). The southwestern portion of the SEZ is located within the Salt Deserts Level IV ecoregion, which contains nearly level playas, salt flats, mud flats, and saline lakes (Bryce et al. 2003). These habitats are mostly barren and may be salt encrusted in dry periods. Scattered plants are salt tolerant and include pickleweed (*Salicornia* sp.), seepweed (*Suaeda fruticosa*), iodine bush (*Allenrolfea occidentalis*), black greasewood, alkali sacaton, and inland saltgrass. Scattered sand dunes also occur in this ecoregion and perennial and intermittent springs are common. The southeastern portion is located within the Carbonate Sagebrush Valleys Level IV ecoregion, which supports sparse Great Basin sagebrush shrub communities of black sagebrush (*Artemisia nova*) and winterfat (*Krascheninnikovia lanata*), with grasses such as blue grama (*Bouteloua gracilis*) (Bryce et al. 2003). Additional species include Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), rabbitbrush (*Ericameria* sp./*Chrysothamnus* sp.), bottlebrush squirreltail, Indian ricegrass, and cheatgrass (*Bromus tectorum*). Annual precipitation in the vicinity of the SEZ is very low, averaging 8.7 in. (22.2 cm) at Caliente, Nevada (see Section 11.4.13).

The area surrounding the SEZ consists of a mosaic of these ecoregions, as well as the Carbonate Woodland Zone Level IV ecoregion, which contains communities with a pinyon (*Pinus monophylla*)-juniper (*Juniperus osteosperma*) canopy over a sagebrush and mountainbrush shrub layer. These ecoregions lie within the Central Basin and Range Level III ecoregion, described in Appendix I, and are part of the Great Basin desertscrub biome.

Land cover types described and mapped under SWReGAP (USGS 2005a) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Dry Lake Valley North SEZ are shown in Figure 11.4.10.1-1. Table 11.4.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the proposed Dry Lake Valley North SEZ are classified primarily as Inter-Mountain Basins Mixed Salt Desert Scrub. Additional cover types within the SEZ are given in Table 11.4.10.1-1. Winterfat (*Krascheninnikovia lanata*), fourwing saltbush (*Atriplex canescens*), rabbitbrush, shadscale, ephedra (*Ephedra* sp.), spiny hopsage (*Grayia spinosa*), buckwheat (*Eriogonum* sp.), globemallow (*Sphaeralcea* sp.), wire lettuce (*Stephanomeria* sp.), cholla (*Cylindropuntia* sp.), Indian rice grass (*Achnatherum hymenoides*), sand dropseed (*Sporobolus cryptandrus*), big galleta (*Pleuraphis rigida*), James' galleta (*Pleuraphis jamesii*), and purple threeawn (*Aristida purpurea*) were observed to be dominant species in various portions of the low scrub communities present in the SEZ in August 2009; the grasses are more common in the northern portion of the SEZ. Sensitive habitats on the SEZ include desert dry washes, playas, and wetlands. The area has had a long history of livestock grazing, and the plant communities present within the SEZ have likely been affected by grazing.

The indirect impact area, including the area surrounding the SEZ within 5 mi (8 km) includes 24 cover types, which are listed in Table 11.4.10.1-1. The predominant cover types are Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Mixed Salt Desert Scrub, and Great Basin Xeric Mixed Sagebrush Shrubland.

Two wetlands mapped by the NWI are located within the southwestern portion of the SEZ (USFWS 2009a) (Figure 11.4.10.1-2). A palustrine wetland with a scrub-shrub plant community, approximately 44.0 acres (0.2 km^2) in size, is mapped by SWReGAP as Inter-Mountain Basins Mixed Salt Desert Scrub. A large lacustrine wetland is mapped primarily as Inter-Mountain Basins Playa, with Inter-Mountain Basins Greasewood Flat occurring primarily along the margin and small areas of Inter-Mountain Basins Mixed Salt Desert Scrub. Approximately 3,691 acres (14.9 km^2) of this 9,341.0-acre (37.8-km^2) wetland are located within the SEZ. The remaining portion is located entirely within the indirect impact area. Numerous smaller playa areas that are not mapped by the NWI are scattered throughout much of the SEZ, as well as southwest of the SEZ. A small wetland area in the southeast portion of the SEZ, approximately 2 acres (0.1 km^2) in size, is mapped as North American Arid West Emergent Marsh. This area is likely a water development for livestock use. Numerous dry

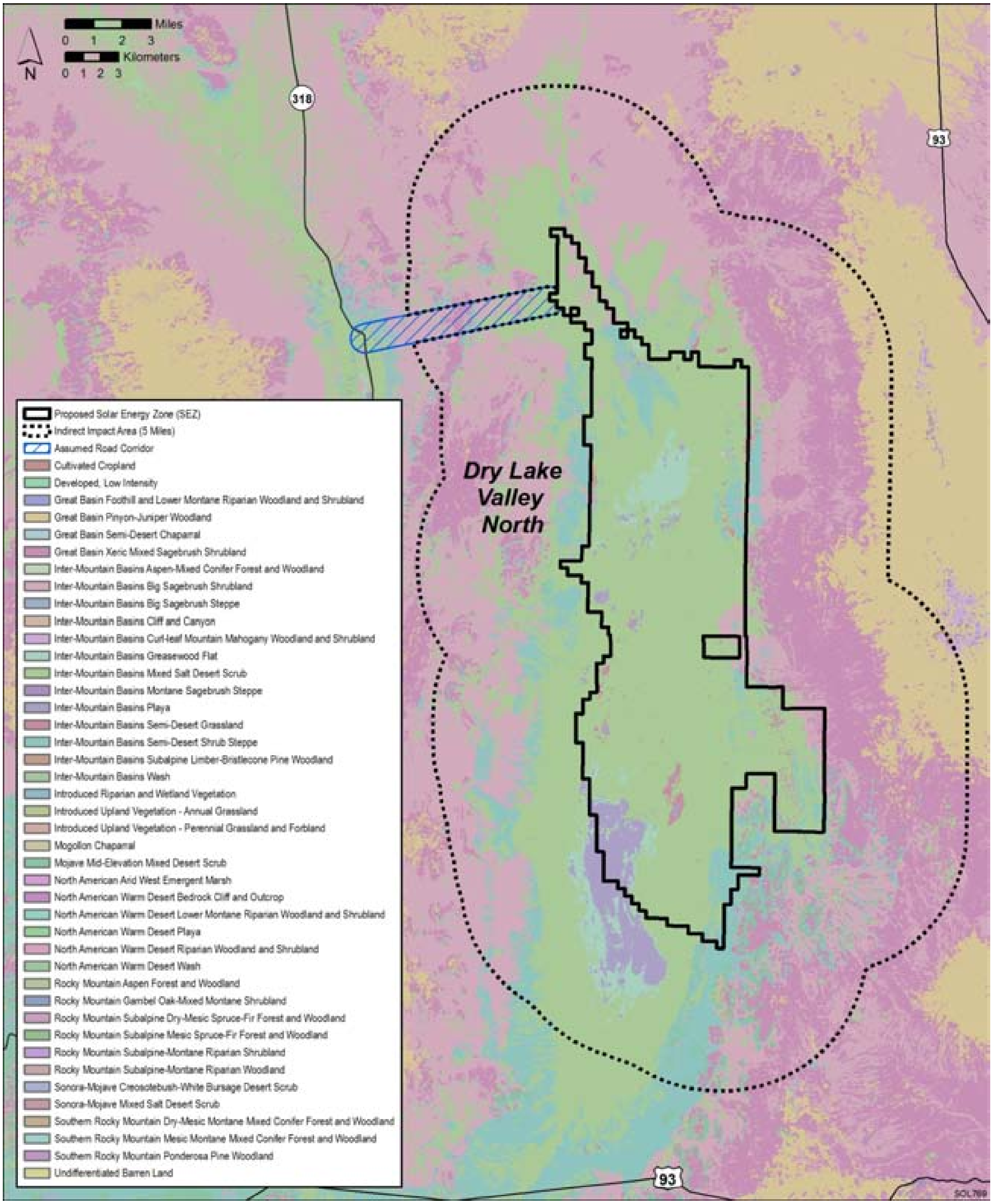

FIGURE 11.4.10.1-1 Land Cover Types within the Proposed Dry Lake Valley North SEZ (Source: USGS 2004)

TABLE 11.4.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Dry Lake Valley North SEZ and Potential Impacts

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Mixed Salt Desert Scrub: Generally consists of open shrublands that include at least one species of *Atriplex*, along with other shrubs. Perennial grasses dominate a sparse to moderately dense herbaceous layer.	60,489 acres[g] (10.6%, 10.9%)	19 acres (<0.1%)	60,613 acres (10.6%)	Large
Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	5,776 acres (2.2%, 2.2%)	5 acres (<0.1%)	19,839 acres (7.5%)	Moderate
Inter-Mountain Basins Greasewood Flat: Dominated or co-dominated by greasewood (*Sarcobatus vermiculatus*) and generally occurring in areas with saline soils, a shallow water table, and intermittent flooding, although remaining dry for most growing seasons. This community type generally occurs near drainages or around playas. These areas may include, or may be co-dominated by, other shrubs, and may include a graminoid herbaceous layer.	3,430 acres (7.1%, 8.3%)	0 acres	3,235 acres (6.7%)	Moderate
Inter-Mountain Basins Playa: Playa habitats are intermittently flooded and generally barren or sparsely vegetated. Depressions may contain small patches of grass, and sparse shrubs may occur around playa margins.	3,011 acres (16.8%, 16.9%)	0 acres	3,895 acres (21.7%)	Large
Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	2,504 acres (0.2%, 0.2%)	23 acres (<0.1%)	85,592 acres (6.2%)	Small

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TABLE 11.4.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Semi-Desert Grassland: Consists of perennial bunchgrasses as dominants or co-dominants. Scattered shrubs or dwarf shrubs may also be present.	898 acres (10.5%, 15.6%)	0 acres	240 acres (2.8%)	Large
Great Basin Xeric Mixed Sagebrush Shrubland: Generally occurs on level plains, slopes, and ridges. The dominant shrub species are black sagebrush (*Artemisia nova*) or, at higher elevations, little sagebrush (*Artemisia arbuscula*), and co-dominants may be Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) or yellow rabbitbrush (*Chrysothamnus viscidiflorus*). Other shrub species may also be present as well as sparse perennial bunchgrasses.	479 acres (0.1%, 0.1%)	5 acres (<0.1%)	59,067 acres (11.2%)	Small
Inter-Mountain Basins Big Sagebrush Steppe: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), big sagebrush (*Artemisia tridentata xericensis*), threetip sagebrush (*Artemisia tripartita tripartita*), or antelope bitterbrush (*Purshia tridentata*), or a combination of these species. Other shrubs may be present. Perennial grasses are often abundant. The distribution of shrubs may be patchy, with grassland predominating.	130 acres (19.3%, 19.9%)	<1 acre (<0.1%)	103 acres (15.3%)	Large
Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs, and grasses and may include *Yucca* spp.	95 acres (<0.1%, <0.1%)	<1 acre (<0.1%)	4,527 acres (1.5%)	Small
Undifferentiated Barren Land: Occurs on dry foothills and lower mountain slopes. Gambel oak (*Quercus gambelii*) may be the only dominant species or share dominance with other shrubs.	25 acres (14.8%, 16.0%)	0 acres	12 acres (7.1%)	Large

TABLE 11.4.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b]: Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Introduced Upland Vegetation—Annual Grassland: Dominated by non-native annual grass species.	9 acres (0.3%, 0.4%)	<1 acre (<0.1%)	123 acres (4.1%)	Small
Sonora–Mojave Creosotebush–White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran Deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	5 acres (<0.1%, <0.1%)	0 acres	278 acres (0.4%)	Small
North American Arid West Emergent Marsh: Occurs in natural depressions, such as ponds, or bordering lakes or slow-moving streams or rivers. Alkalinity is highly variable. The plant community is characterized by herbaceous emergent, submergent, and floating leaved species.	2 acres (<0.1%, 0.2%)	0 acres	2 acres (<0.1 %)	Small
Great Basin Pinyon-Juniper Woodland: Occurs on low-elevation slopes and ridges. Singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), or both are the dominant species, generally associating with curl-leaf mountain mahogany (*Cercocarpus ledifolius*). Understory species include shrubs and grasses.	0 acres	0 acres	19,141 acres (1.3%)	Small

TABLE 11.4.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Cliff and Canyon: Includes barren and sparsely vegetated (generally <10% plant cover) steep cliff faces, narrow canyons, small rock outcrops, and scree and talus slopes. Composed of widely scattered coniferous trees and a variety of shrubs.	0 acres	0 acres	386 acres (1.6%)	Small
Introduced Upland Vegetation–Perennial Grassland and Forbland: Dominated by non-native perennial grass and forb species.	0 acres	0 acres	155 acres (1.5%)	Small
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland: Occurs on rocky outcrops and south-facing hill slopes ranging from canyons and foothills to ridgetops. Curl-leaf mountain mahogany is the dominant species. Trees or other shrubs may be present and scattered. Bunchgrasses are usually present.	0 acres	0 acres	114 acres (0.4%)	Small
Inter-Mountain Basins Montane Sagebrush Steppe: Occurs on flats, ridges, level ridgetops, and mountain slopes. Mountain big sagebrush (*Artemisia tridentata vaseyana*) and related taxa such as big sagebrush (*Artemisia tridentata spiciformis*) are typically the dominant species. Perennial herbaceous species, especially grasses, are usually abundant, although shrublands are also present.	0 acres	0 acres	108 acres (0.2%)	Small

TABLE 11.4.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland: Occurs on dry, rocky, exposed ridges and slopes. Dominants in the open tree canopy include limber pine (*Pinus flexilis*) or Great Basin bristlecone pine (*Pinus longaeva*), or both. Additional tree species are occasionally present. In some stands, an open shrub layer may be present. Sparse grasses may also be present.	0 acres	0 acres	79 acres (2.8%)	Small
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland: Composed of a mosaic of multiple tree-dominated communities with diverse shrubs. Sedges, rushes, perennial grasses, and mesic forbs are the dominant herbaceous species. Disturbed areas often include non-native grasses.	0 acres	0 acres	13 acres (0.1%)	Small
Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland: Occurs in cool, moist areas of ravine slopes, stream terraces, and north- or east-facing slopes. A dense layer of diverse deciduous shrubs is often present. A high diversity of herbaceous species, including grasses, sedges, and forbs are present.	0 acres	0 acres	7 acres (0.4%)	Small
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland: Occurs on montane slopes and plateaus. The tree canopy co-dominants are quaking aspen (*Populus tremuloides*) and conifers. Quaking aspen loses dominance in older stands. Shrubs and herbaceous species are often present.	0 acres	0 acres	2 acres (0.1%)	Small
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland: Occurs on all aspects of mountain slopes, ridges, canyon slopes, and plateaus. Consists of a mix of trees, as well as shrubs and grasses on dry to mesic soils.	0 acres	0 acres	2 acres (0.5%)	Small

TABLE 11.4.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
North American Warm Desert Lower Montane Riparian Woodland and Shrubland: Occurs along perennial and seasonally intermittent streams in mountain canyons and valleys. Consists of a mix of woodlands and shrublands.	0 acres	0 acres	1 acre (<0.1%)	Small

[a] Land cover descriptions are from USGS (2005a). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from USGS (2004).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region.

[d] For access road development, direct effects were estimated within a 7-mi (11-km) long, 60-ft (18-m) wide road ROW from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of the cover type within the 1-mi (1.6-km) wide road corridor. Impacts are for the area of the cover type within the assumed ROW, and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed access road corridor, where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project developments. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. Includes the area of the cover type within the indirect effects area and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[f] Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

[g] To convert acres to km^2, multiply by 0.004047.

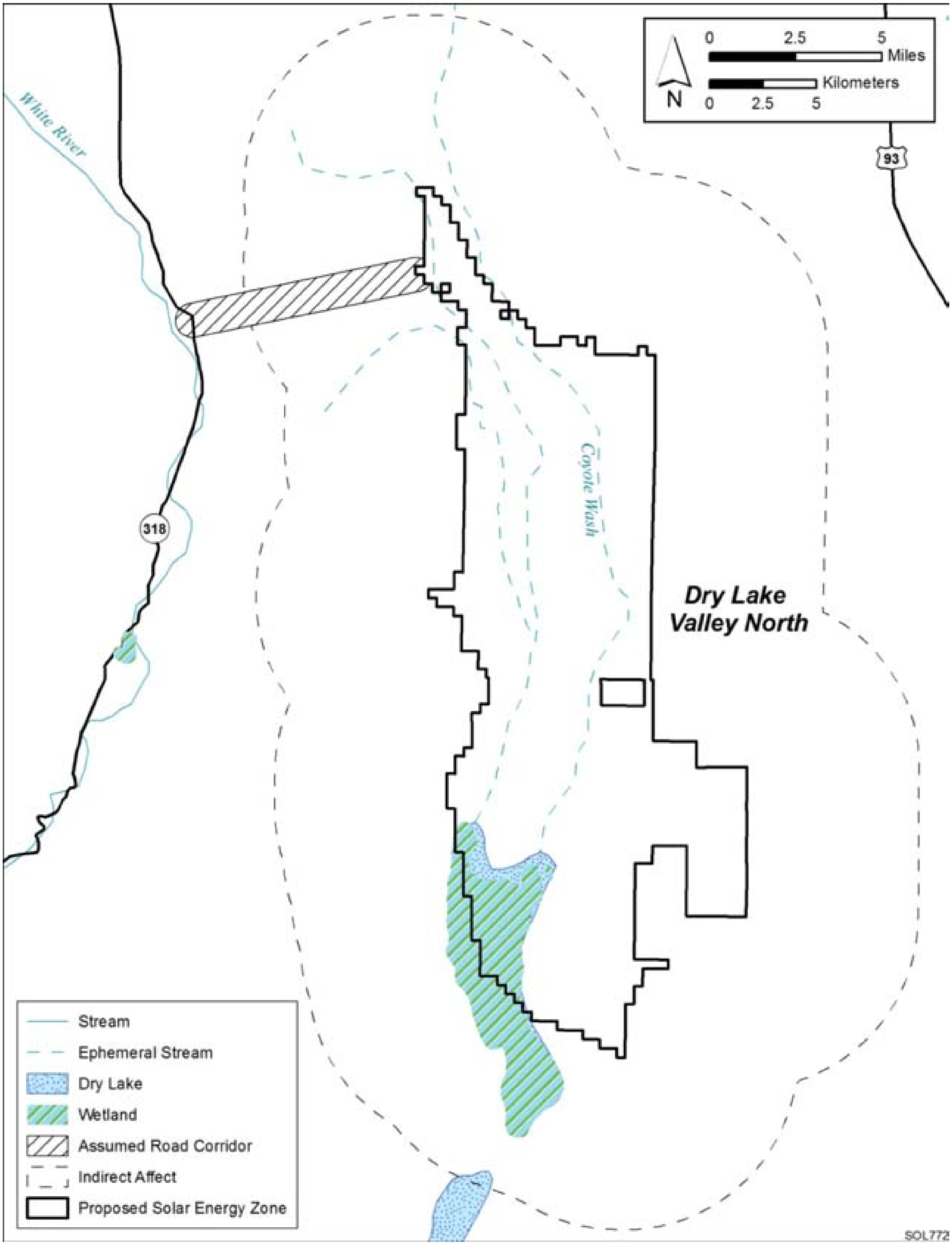

FIGURE 11.4.10.1-2 Wetlands within the Proposed Dry Lake Valley North SEZ (Source: USFWS 2009a)

washes occur within the SEZ, generally flowing to the south and terminating in the large playa. These washes typically do not support wetland or riparian habitats. Coyote Wash is a principal surface drainage on the SEZ. The dry washes and playas typically contain water for short periods during or following precipitation events.

Numerous springs occur in the vicinity of the SEZ, a number of which may support plant communities dependent on discharge from the Dry Lake Valley groundwater basin. Additional springs to the south of the SEZ may be associated with discharge from the Delamar Valley basin or other basins that receive groundwater flows from the Dry Lake Valley basin (see Section 11.4.9 for further discussion of groundwater basins).

The State of Nevada maintains an official list of weed species that are designated noxious species. Table 11.4.10.1-2 summarizes the noxious weed species regulated in Nevada that are known to occur in Lincoln County (USDA 2010; Creech et al. 2010), which includes the proposed Dry Lake Valley North SEZ. No species included in Table 11.4.10.1-2 were observed on the SEZ in August 2009. Cheatgrass (*Bromus tectorum*) and halogeton (*Halogeton glomeratus*), invasive species not regulated by Nevada, were observed on the SEZ in August 2009.

The Nevada Department of Agriculture classifies noxious weeds into one of three categories (NDA 2005):

- "Category A: Weeds not found or limited in distribution throughout the state; actively excluded from the state and actively eradicated wherever found;

TABLE 11.4.10.1-2 Designated Noxious Weeds of Nevada Occurring in Lincoln County

Common Name	Scientific Name	Category
Black henbane[a]	*Hyoscyamus niger*	A
Dalmatian Toadflax[a,b]	*Linaria dalmatica*	A
Diffuse knapweed[a]	*Centaurea diffusa*	B
Hoary cress[b]	*Cardaria draba*	C
Johnsongrass[a]	*Sorghum halepense*	C
Mayweed chamomile[b]	*Anthemis cotula*	A
Malta star thistle[a]	*Centaurea melitensis*	A
Puncture vine[b]	*Tribulus terrestris*	C
Sahara/African mustard[a]	*Brassica tournefortii*	B
Saltcedar[b]	*Tamarix* spp.	C
Spotted knapweed[a,b]	*Centaurea maculosa*	A
Water hemlock[a]	*Cicuta maculata*	C

[a] Creech et al. (2010).

[b] USDA (2010).

Source: NDA (2005).

actively eradicated from nursery stock dealer premises; control required by the state in all infestations."

- "Category B: Weeds established in scattered populations in some counties of the state; actively excluded where possible, actively eradicated from nursery stock dealer premises; control required by the state in areas where populations are not well established or previously unknown to occur."

- "Category C: Weeds currently established and generally widespread in many counties of the state; actively eradicated from nursery stock dealer premises; abatement at the discretion of the state quarantine officer."

11.4.10.2 Impacts

The construction of solar energy facilities within the proposed Dry Lake Valley North SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (61,499 acres [248.9 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for the purposes of this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (caused, for example, by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation within the SEZ are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required design features described in Appendix A, Section A.2.2 and from any additional mitigation applied. Section 11.4.10.2.3, below, identifies design features of particular relevance to the proposed Dry Lake Valley North SEZ.

11.4.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (<1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); a moderate impact (>1 but <10%) could affect an intermediate proportion of cover type; a large impact could affect greater than 10% of a cover type.

Solar facility construction and operation in the proposed Dry Lake Valley North SEZ would primarily affect communities of the Inter-Mountain Basins Mixed Salt Desert Scrub cover type. Additional cover types that would be affected within the SEZ include Inter-Mountain Basins Semi-Desert Shrub Steppe, Inter-Mountain Basins Greasewood Flat, Inter-Mountain Basins Playa, Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Grassland, Great Basin Xeric Mixed Sagebrush Shrubland, Inter-Mountain Basins Big Sagebrush Steppe, Mojave Mid-Elevation Mixed Desert Scrub, Undifferentiated Barren Land, Introduced Upland Vegetation–Annual Grassland, Sonora–Mojave Creosotebush–White Bursage Desert Scrub, and North American Arid West Emergent Marsh. Many of these also occur within the assumed access road corridor. The Undifferentiated Barren Land and Introduced Upland Vegetation–Annual Grassland cover types would likely have relatively minor populations of native species. Table 11.4.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed Dry Lake Valley North SEZ. Most of these cover types are relatively common in the SEZ region; however, several cover types are relatively uncommon, representing 1% or less of the land area within the SEZ region: Inter-Mountain Basins Greasewood Flat (1.0%), Inter-Mountain Basins Playa (0.4%), Inter-Mountain Basins Semi-Desert Grassland (0.2%), North American Arid West Emergent Marsh (0.1%), Introduced Upland Vegetation–Annual Grassland (0.06 %), Inter-Mountain Basins Big Sagebrush Steppe (0.01%), and Undifferentiated Barren Land (0.003%). Desert dry washes, playas, and wetlands are important sensitive habitats.

The construction, operation, and decommissioning of solar projects within the proposed Dry Lake Valley North SEZ would result in large impacts on Inter-Mountain Basins Mixed Salt Desert Scrub, Inter-Mountain Basins Playa, Inter-Mountain Basins Semi-Desert Grassland, Inter-Mountain Basins Big Sagebrush Steppe, and Undifferentiated Barren Land cover types. Solar project development within the SEZ would result in moderate impacts on Inter-Mountain Basins Semi-Desert Shrub Steppe and Inter-Mountain Basins Greasewood Flat cover types, and small impacts on the remaining cover types in the affected area.

Because of the arid conditions, reestablishment of shrub, shrub steppe, or grassland communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region. Damage to these crusts, as by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect impact area identified in Table 11.4.10.1-1.

Communities associated with playa habitats, greasewood flats communities, riparian habitats, marshes, or other intermittently flooded areas downgradient from solar projects in the

SEZ or assumed access road could be affected by ground-disturbing activities. Approximately 44 acres (0.2 km^2) of a scrub-shrub wetland and 3,691 acres (15 km^2) of lacustrine wetland occur within the SEZ and could be directly affected during project construction. In addition, a 2-acre (0.1-km^2) area mapped as Northern American Arid West Emergent Marsh could be affected in the southeast portion of the SEZ. Site clearing and grading could disrupt surface water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter playa or greasewood flats plant communities, including occurrences outside the SEZ, and affect community function. Increases in surface runoff from a solar energy project site could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect dry washes within the SEZ or access road footprint. Alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation.

Although the use of groundwater within the Dry Lake Valley North SEZ for technologies with high water requirements, such as wet-cooling systems, may be unlikely, groundwater withdrawals for such systems could reduce groundwater elevations in the Dry Lake Valley groundwater basin, Delamar Valley basin, or other hydrologically connected basins. Communities that depend on accessible groundwater, such as habitats associated with springs, could become degraded or lost as a result of lowered groundwater levels. The potential for impacts on springs would need to be evaluated by project-specific hydrological studies.

11.4.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

E.O. 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential effects of noxious weeds and invasive plant species that could result from solar energy facilities are described in Section 5.10.1. Noxious weeds and invasive species could inadvertently be brought to a project site by equipment previously used in infested areas, or they may be present on or near a project site. Despite required programmatic design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Dry Lake Valley North SEZ, and increase the probability that weeds could be transported into areas that were previously relatively weed free. This could result in reduced restoration success and possible widespread habitat degradation.

Invasive species, including cheatgrass and halogeton, occur on the SEZ. Additional species designated as noxious weeds in Nevada and those known to occur in Lincoln County are given in Table 11.4.10.1-2. Approximately 9 acres (0.04 km^2) of Introduced Upland Vegetation–Annual Grassland occur within the SEZ and 121 acres (0.5 km^2) in the indirect impact area; 155 acres (0.6 km^2) of Introduced Upland Vegetation–Perennial Grassland and Forbland occur in the indirect impact area. Disturbance associated with solar project development may promote the establishment and spread of invasive species that are associated with these cover types. Past or present land uses, such as grazing or OHV use, may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Disturbance associated with existing roads and transmission lines within the SEZ area of potential impacts also likely contributes to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

11.4.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to the programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While the specifics of some of these practices are best established when considering specific project details, some SEZ-specific design features can be identified at this time:

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as cheatgrass or halogeton. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- Dry washes, playas, and wetlands within the SEZ, and dry washes within the access road corridor, should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetlands, playas, and dry washes to reduce the potential for impacts.

- Appropriate engineering controls should be used to minimize impacts on dry wash, playa, marsh, scrub-shrub wetland, riparian, and greasewood flat habitats, including occurrences downstream of solar projects or assumed access road, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on habitats dependent on springs associated with the Dry lake Valley basin, Delamar Valley Basin, or other hydrologically connected basins. Potential impacts on springs should be determined through hydrological studies.

If these SEZ-specific design features are implemented in addition to other program design features, it is anticipated that a high potential for impacts from invasive species and impacts on dry washes, playas, springs, riparian habitats, and wetlands would be reduced to a minimal potential for impact.

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11.4.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Dry Lake Valley North SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 60-ft (18-m) wide portion of an assumed 7.0-mi (11.3-km) long access road corridor. The maximum developed area within the SEZ would be 61,499 acres (248.9 km^2).

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within a 1.0-mi (1.6-km) access road corridor where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the area of direct effect (e.g., surface runoff, dust, noise, lighting, and accidental spills in the SEZ or road construction area). Potentially suitable habitat within the SEZ greater than the maximum of 61,499 acres (248.9 km^2) of direct effect was also included as part of the area of indirect effects. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. The area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. These areas of direct and indirect effect are defined and the impact assessment approach is described in Appendix M.

The primary land cover habitat type within the affected area is Inter-Mountain Basins Mixed Salt Desert Scrub (see Section 11.4.10). Several ephemeral washes, wetlands, and a dry lake occur within the SEZ (see Figure 11.4.9.1-1).

11.4.11.1 Amphibians and Reptiles

11.4.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Dry Lake Valley North SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from the NNHP (NDCNR 2002) and range maps and habitat information available from SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

On the basis of species distributions within the area of the SEZ and habitat preferences of the amphibian species, the Great Basin spadefoot (*Spea intermontana*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). They would most likely occur in the portion of the SEZ that overlaps the dry lake and washes.

More than 25 reptile species occur within the area that encompasses the proposed Dry Lake Valley North SEZ (USGS 2007; Stebbins 2003). The desert tortoise (*Gopherus agassizii*) is a federal and state listed threatened species. This species is discussed in Section 11.4.12. Lizard species expected to occur within the SEZ include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), side-blotched lizard (*Uta stansburiana*), western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*). Snake species expected to occur within the SEZ are the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and nightsnake (*Hypsiglena torquata*). The sidewinder (*Crotalus cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 11.4.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Dry Lake Valley North SEZ. Special status amphibian and reptile species are addressed in Section 11.4.12.

11.4.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.4.11.1.3 identifies SEZ-specific design features of particular relevance to the proposed Dry Lake Valley North SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area as presented in Section 11.4.11.1.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 11.4.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the impacts on amphibians and reptiles summarized in Table 11.4.11.1-1, direct impacts on amphibian and reptile species would be moderate for the three amphibian species and for the desert horned lizard, Great Basin collared lizard, long-nosed leopard lizard, western fence lizard, zebra-tailed lizard, and nightsnake. Direct

TABLE 11.4.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Dry Lake Valley North SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Amphibians					
Great Basin spadefoot (*Spea intermontana*)	Sagebrush flats, semidesert shrublands, pinyon-juniper woodlands, and spruce-fir forests. Breeds in temporary and permanent waters, including rain pools, pools in intermittent streams, and flooded areas along streams. About 4,110,700 acres[h] of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	222,567 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	46 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,041 acres in area of indirect effect	Moderate overall impact. Avoid wash and playa habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Red-spotted toad (*Bufo punctatus*)	Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos; desert streams and oases; open grassland; scrubland oaks; and dry woodlands. About 2,491,600 acres of potentially suitable habitat occurs within the SEZ region.	61,496 acres of potentially suitable habitat lost (2.5% of available potentially suitable habitat) during construction and operations	83,391 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	19 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 1,688 acres in area of indirect effect	Moderate overall impact. Avoid wash and playa habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards					
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. About 3,204,500 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat) during construction and operations	246,792 acres of potentially suitable habitat (7.7% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 4,546 acres in area of indirect effect	Moderate overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Great Basin collared lizard (*Crotaphytus bicinctores*)	Usually inhabits alluvia, lava flows, mountain slopes, canyons, buttes, rock outcrops, washes, and rocky plains. Limiting factors are presence of large boulders and open/sparse vegetation. About 1,775,400 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (3.5% of available potentially suitable habitat) during construction and operations	147,471 acres of potentially suitable habitat (8.3% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 2,585 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefer areas with abundant rodent burrows that they occupy when inactive. About 2,060,300 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.2% of available potentially suitable habitat) during construction and operations	208,067 acres of potentially suitable habitat (7.3% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 4,083 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Side-blotched lizard (*Uta stansburiana*)	Low to moderate elevations in washes, arroyos, boulder-strewn ravines, rocky cliff bases, and flat shrubby areas in canyon bottoms. Often along sandy washes. Usually in areas with a lot of bare ground. About 1,933,300 acres of potentially suitable habitat occurs within the SEZ region.	998 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	24,530 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	0.5 acre of potentially suitable habitat lost (<0.0001% of available potentially suitable habitat) and 42.5 acres in area of indirect effect	Small overall impact. Wash habitats should be avoided.

TABLE 11.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Western fence lizard (*Sceloporus occidentalis*)	Disturbed areas, roadsides, gravel beds, rock quarries, lava flows, outcrops, talus slopes, shrublands, riparian areas, and coniferous woodlands. About 4,609,100 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	248,635 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,506 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Western whiptail (*Cnemidophorus tigris*)	Arid and semiarid habitats with sparse plant cover. About 2,889,000 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (2.1% of available potentially suitable habitat) during construction and operations	114,922 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	25 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,147 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Lizards (Cont.)					
Zebra-tailed lizard (*Callisaurus draconoides*)	Open, warm-desert habitats, especially dry washes and canyons with fine gravel and sand. About 1,480,400 acres of potentially suitable habitat occurs in the SEZ region.	61,068 acres of potentially suitable habitat lost (4.1% of available potentially suitable habitat) during construction and operations	122.363 acres of potentially suitable habitat (8.3% of available potentially suitable habitat)	24 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 2,123 acres in area of indirect effect	Moderate overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Snakes					
Coachwhip (*Masticophis flagellum*)	Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 3,910.500 acres of potentially suitable habitat occurs within the SEZ region.	13,092 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	185,025 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,861 acres in area of indirect effect	Small overall impact.

TABLE 11.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Glossy snake (*Arizona elegans*)	Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 1,827,800 acres of potentially suitable habitat occurs within the SEZ region.	12,194 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	107,529 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 2,423 acres in area of indirect effect	Small overall impact.
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 4,006,400 acres of potentially suitable habitat occurs in the SEZ region.	6,992 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	170,416 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,441 acres in area of indirect effect	Small overall impact.

TABLE 11.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Groundsnake (*Sonora semiannulata*)	Arid and semiarid regions with rocky to sandy soils. River bottoms, desert flats, sand hummocks, and rocky hillsides. About 4,076,700 acres of potentially suitable habitat occurs in the SEZ region.	9,887 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	185,882 acres of potentially suitable habitat (4.6% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,907 acres in area of indirect effect	Small overall impact.
Nightsnake (*Hypsiglena torquata*)	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, it seeks refuge underground, in crevices, or under rocks. About 2,584,400 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat) during construction and operations	110,968 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	24 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,105 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Sidewinder (*Crotalus cerastes*)	Windblown sand habitats near rodent burrows. Most common in areas of sand hummocks topped with creosote, mesquite, or other desert plants. About 376,300 acres of potentially suitable habitat occurs within the SEZ region.	100 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	4,764 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	0.5 acre of potentially suitable habitat lost (0.0001% of available potentially suitable habitat) and 42.5 acres in area of indirect effect	Small overall impact.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimated the amount of suitable habitat in the project area. A maximum of 61,499 acres of direct effect within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 61,499 acres of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

Footnotes continued on next page.

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TABLE 11.4.11.1-1 (Cont.)

[e] For access road development, direct effects were estimated within a 7-mi (11-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

impacts on these species, based on loss of potentially suitable habitats, would range from 1.3% for the western fence lizard to 4.1% for the zebra-tailed lizard (Table 11.4.11.1-1). Direct impacts on all other representative reptile species would be small, ranging from 0.05% for the side-blotched lizard to 0.7% for the glossy snake (Table 11.4.11.1-1). Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 8.3% of available habitat for the Great Basin collared lizard and zebra-tailed lizard). Indirect impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.4.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., washes and playas). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features are best established when considering specific project details, one design feature can be identified at this time:

- The dry lake and wash habitats should be avoided.

If this SEZ-specific design feature is implemented in addition to the programmatic design features, impacts on amphibian and reptile species could be reduced. However, as potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.4.11.2 Birds

11.4.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Dry Lake

Valley North SEZ. The list of bird species potentially present in the SEZ area was determined from the NNHP (NDCNR 2002) and range maps and habitat information available from the CWHRS (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

At least eight bird species that could occur on or in the affected area of the SEZ are considered focal species in the *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), and verdin (*Auriparus flaviceps*). Habitats for most of these species are described in Table 11.4.11.2-1. Because of its special species status, the burrowing owl is discussed in Section 11.4.12.

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.6.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state solar study area. However, within the proposed Dry Lake Valley North SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Playa and wash habitats within the SEZ may attract shorebird species, but the perennial stream and reservoir habitats within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) is the shorebird species most likely to occur within the SEZ.

Neotropical Migrants

As discussed in Section 4.6.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state solar energy study area. Species expected to occur within the proposed Dry Lake Valley North SEZ include the ash-throated flycatcher, Bewick's wren (*Thryomanes bewickii*), black-throated sparrow, cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker, Le Conte's thrasher, lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), northern mockingbird (*Mimus polyglottos*), phainopepla, rock wren (*Salpinctes obsoletus*), sage sparrow (*Amphispiza belli*), Say's phoebe (*Sayornis saya*), verdin, and western kingbird (*Tyrannus verticalis*) (USGS 2007).

TABLE 11.4.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Dry Lake Valley North SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Shorebirds					
Killdeer (*Charadrius vociferus*)	Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 35,800 acres[h] of potentially suitable habitat occurs within the SEZ region.	3,013 acres of potentially suitable habitat lost (8.4% of available potentially suitable habitat) during construction and operations	3,897 acres of potentially suitable habitat (10.9% of available potentially suitable habitat)	None	Moderate overall impact. Avoid dry lake and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants					
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats below 4,500 ft, including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 4,577,300 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	233,887 acres of potentially suitable habitat (5.1% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,083 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Bewick's wren (*Thryomanes bewickii*)	Generally associated with dense, brushy habitats. It is a permanent resident of lowland deserts and pinyon-juniper forests of southern Utah. Breeding occurs in brushy areas of open woodlands and other open habitats. It is a cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 4.086,000 acres of potentially suitable habitat occurs within the SEZ region.	15,205 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	188,782 acres of potentially suitable habitat (4.6% of available potentially suitable habitat)	39 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,855 acres in area of indirect effect	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 1,922,200 acres of potentially suitable habitat occurs within the SEZ region.	95 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat) during construction and operations	23,633 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	0.5 acre of potentially suitable habitat lost (<0.0001% of available potentially suitable habitat) and 42.5acres in area of indirect effect	Small overall impact. Mojave mid-elevation mixed desert scrub habitat should be avoided. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. About 414,900 acres of potentially suitable habitat occurs within the SEZ region.	95 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) during construction and operations	4,486 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	0.5 acre of potentially suitable habitat lost (0.0001% of available potentially suitable habitat) and 42.5 acres in area of indirect effect	Small overall impact. Mojave mid-elevation mixed desert scrub habitat should be avoided. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 4,323,200 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.4% of available potentially suitable habitat) during construction and operations	229,631 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	46 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,044 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 4,994,900 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	261,395 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,552 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oases. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 389,000 acres of potentially suitable habitat occurs within the SEZ region.	100 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	4,773 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	0.5 acre of potentially suitable habitat lost (0.0001% of available potentially suitable habitat) and 42.5 acres in area of indirect effect	Small overall impact. Avoid wash and Mojave mid-elevation mixed desert scrub and creosotebush-white bursage desert scrub habitats should be avoided. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,549,700 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.4% of available potentially suitable habitat) during construction and operations	227,594 acres of potentially suitable habitat (5.0% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,083 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 3,265,300 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat) during construction and operations	248,304 acres of potentially suitable habitat (7.6% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in Mojave and Colorado Deserts. Variety of habitats, including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 2,644,900 acres of potentially suitable habitat occurs within the SEZ region.	60,589 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat) during construction and operations	83,275 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	19 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 1,685 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Neotropical Migrants (Cont.)					
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 942,900 acres of potentially suitable habitat occurs in the SEZ region.	60,589 acres of potentially suitable habitat lost (6.4% of available potentially suitable habitat) during construction and operations	63,734 acres of potentially suitable habitat (6.8% of available potentially suitable habitat)	19 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 1,685 acres in area of indirect effect	Moderate overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water, including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 2,968,900 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (2.1% of available potentially suitable habitat) during construction and operations	208,067 acres of potentially suitable habitat (7.0% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,083 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally, open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 4,941,600 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	260,672 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,546 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Northern mockingbird (*Mimus polyglottos*)	Parkland, cultivated lands, second-growth habitats, desert scrub, and riparian areas at low elevations. Forages on ground in short, grassy to nearly barren substrates. About 4,967,800 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	267,812 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Rock wren (*Salpinctes obsoletus*)	Arid and semiarid habitats. It breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices and the nest entrance is paved with small rocks and stones. About 4,958,500 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	267,933 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Sage sparrow (*Amphispiza belli*)	Prefers shrubland, grassland, and desert habitats. The nest, constructed of twigs and grasses, is located either low in a shrub or on the ground. About 4,564,100 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	256,139 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,506 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 2,437,600 acres of potentially suitable habitat occurs within the SEZ region.	6,643 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	150,852 acres of potentially suitable habitat (6.2% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,444 acres in area of indirect effect	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Verdin (*Auriparus flaviceps*)	Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 386,400 acres of potentially suitable habitat occurs within the SEZ region.	100 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	4,764 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	0.5 acre of potentially suitable habitat lost (0.0001% of available potentially suitable habitat) and 42.5 acres in area of indirect effect	Small overall impact. Mojave mid-elevation mixed desert scrub and creosotebush-white bursage desert scrub habitats should be avoided. Dry lake and wash habitats should also be avoided. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Western kingbird (*Tyrannus verticalis*)	Occurs in a variety of habitats, including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. It migrates to Central America or the southeastern United States for the winter. About 3,346,400 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat) during construction and operations	233,958 acres of potentially suitable habitat (7.0% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey					
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 4,782,800 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	260,707 acres of potentially suitable habitat (5.5% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,956,800 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	260,913 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Great horned owl (*Bubo virginianus*)	Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 5,024,900 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	268,338 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,552 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-eared owl (*Asio otus*)	Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush-bursage flats, desert scrub, grasslands, and agricultural fields). About 4,868,300 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	260,514 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 2,571,100 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat) during construction and operations	175,594 acres of potentially suitable habitat (6.8% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 4,111 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 2,534,000 acres of potentially suitable habitat occurs in the SEZ region.	60,589 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat) during construction and operations	83,275 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	19 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 1,685 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Upland Game Birds					
Chukar (*Alectoris chukar*)	Steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds during the brooding period found within 0.25 mi (0.4 km) of water. About 4,886,100 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	254,095 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,552 acres in area of indirect effect	Moderate overall impact. Avoid dry lake and wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 2,791,300 acres of potentially suitable habitat occurs within the SEZ region.	13,187 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	170,275 acres of potentially suitable habitat (6.1% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,904 acres in area of indirect effect	Small overall impact. Avoid Dry lake and wash habitats.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Upland Game Birds (Cont.)					
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,409,000 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.4% of available potentially suitable habitat) during construction and operations	208,214 acres of 4.7% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,111 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
White-winged dove (*Zenaida asiatica*)	Nests in low to medium height trees with dense foliage and fairly open ground cover. Feeds on wild seeds, grains, and fruit. About 380,700 acres of potentially suitable habitat occurs within the SEZ region.	100 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	4,763 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	0.5 acre of potentially suitable habitat lost (0.0001% of available potentially suitable habitat) and 42.5 acres in area of indirect effect	Small overall impact. Mojave mid-elevation mixed desert scrub and creosotebush-white bursage desert scrub habitats should be avoided.

TABLE 11.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Upland Game Birds (Cont.)					
Wild turkey (*Meleagris gallopavo*)	Lowland riparian forests, foothill shrubs, pinyon-juniper woodlands, foothill riparian forests, and agricultural areas. About 3,954,800 acres of potentially suitable habitat occurs within the SEZ region.	12,668 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	185,500 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (<0.0013% of available potentially suitable habitat) and 2,861 acres in area of indirect effect	Small overall impact.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimated the amount of suitable habitat in the project area. A maximum of 61,499 acres of direct effect within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 61,499 acres of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

Footnotes continued on next page.

TABLE 11.4.11.2-1 (Cont.)

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[e] For access road development, direct effects were estimated within a 7-mi (11-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

Birds of Prey

Section 4.6.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state solar study area. Raptor species that could occur within the proposed Dry Lake Valley North SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*) (USGS 2007). Several other special status birds of prey are discussed in Section 11.4.12. These include the ferruginous hawk (*Buteo regalis*), northern goshawk (*Accipiter gentilis*), prairie falcon (*Falco mexicanus*), and burrowing owl.

Upland Game Birds

Section 4.6.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed Dry Lake Valley North SEZ include the chukar (*Alectoris chukar*), Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), white-winged dove (*Zenaida asiatica*), and wild turkey (*Meleagris gallopavo*) (USGS 2007).

Table 11.4.11.2-1 provides habitat information for representative bird species that could occur within the proposed Dry Lake Valley North SEZ. Special status bird species are discussed in Section 11.4.12.

11.4.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.4.11.2.3 identifies design features of particular relevance to the proposed Dry Lake Valley North SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 11.4.11.2.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 11.4.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), and from disturbance, injury, or mortality to individual birds. Table 11.4.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed Dry Lake Valley North SEZ. On the basis of the impacts on birds summarized in Table 11.4.11.2-1, direct impacts on representative bird species would be small (10 species) to moderate (22 species). Direct impacts on these species would range from less than 0.01% for the black-tailed gnatcatcher and black-throated sparrow to 8.4% for the killdeer (Table 11.4.11.2-1). Larger areas of potentially suitable habitats for the bird species occur within the area of potential indirect effects (e.g., up to 10.9% of available habitat for the killdeer). Indirect impacts on birds could result from noise (i.e., behavioral and physiological stresses; Section 5.10.2), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.4.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds, especially for those species that depend on habitat types that can be avoided (e.g., wash and playa habitats). Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important to reduce impacts on birds are best established when considering specific project details, some design features can be identified at this time:

- The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed.

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act.

- Dry lake and wash habitats should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on bird species could be reduced. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.4.11.3 Mammals

11.4.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Dry Lake Valley North SEZ. The list of mammal species potentially present in the SEZ area was determined from the NNHP (NDCNR 2002) and range maps and habitat information available from SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

More than 55 species of mammals have ranges that encompass the area of the proposed Dry Lake Valley North SEZ (NDCNR 2002; USGS 2007); however, suitable habitats for a number of these species are limited or nonexistent within the SEZ (USGS 2007). Similar to the overview of mammals provided for the six-state solar energy study area (Section 4.6.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share important habitats.

Big Game

The big game species that could occur within the area of the proposed Dry Lake Valley North SEZ include cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), Nelson's bighorn sheep (*Ovis canadensis nelsoni*), and pronghorn (*Antilocapra americana*) (USGS 2007). Because of its special species status, the Nelson's bighorn sheep is addressed in Section 11.4.12. Figure 11.4.11.3-1 shows the location of the SEZ relative to mapped elk habitat; Figure 11.4.11.3-2 shows the location of the SEZ relative to the mapped range of mule deer habitat; and Figure 11.4.11.3-3 shows the location of the SEZ relative to mapped pronghorn habitat.

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Dry Lake Valley North SEZ. Species that could occur within the area of the SEZ would include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and red fox (*Vulpes vulpes*) (USGS 2007).

The nongame (small) mammals include rodents, bats, and shrews. Representative species for which potentially suitable habitat occurs within the proposed Dry Lake Valley North SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), canyon

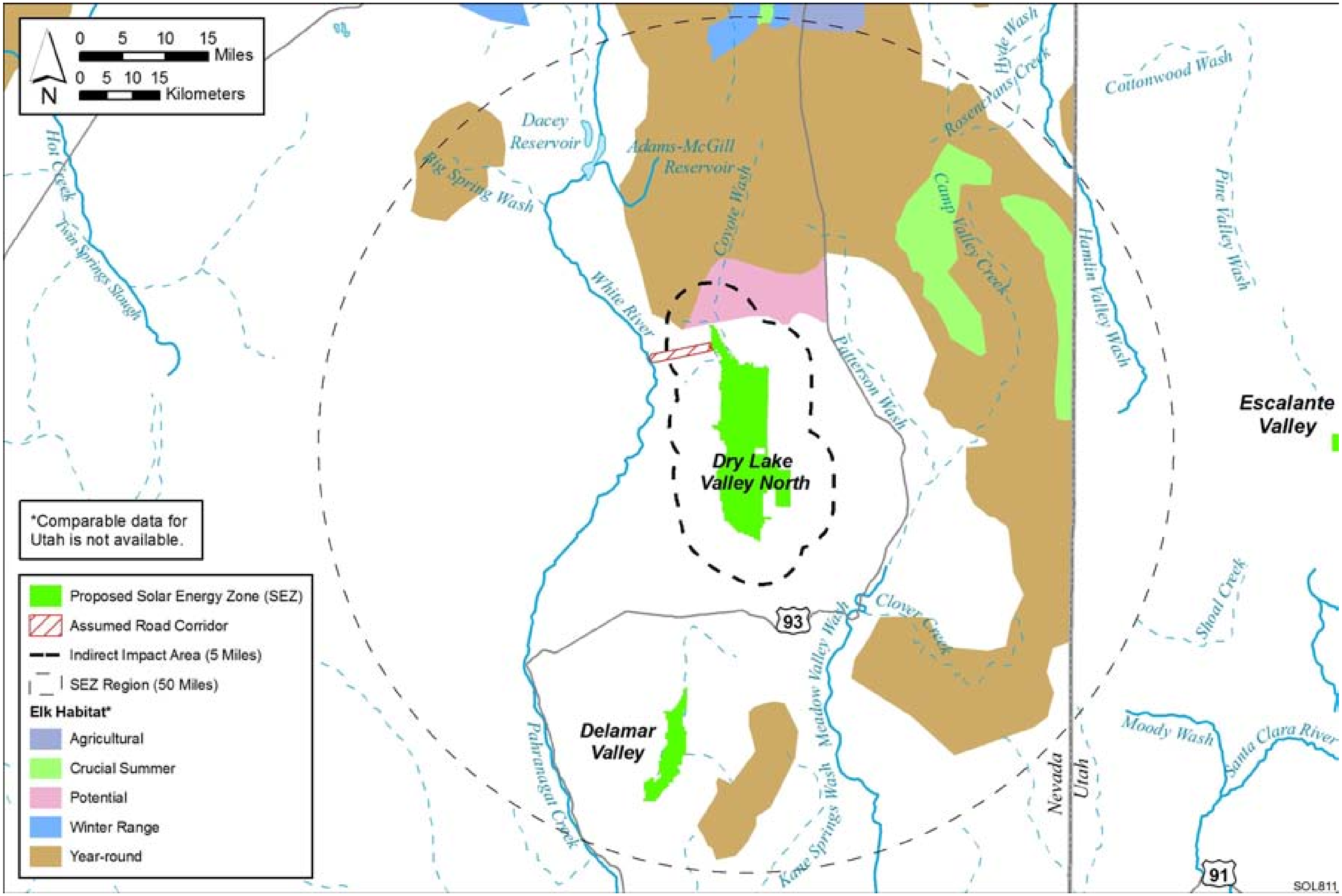

FIGURE 11.4.11.3-1 Location of the Proposed Dry Lake Valley North SEZ Relative to the Mapped Range of Elk (Source: NDOW 2010)

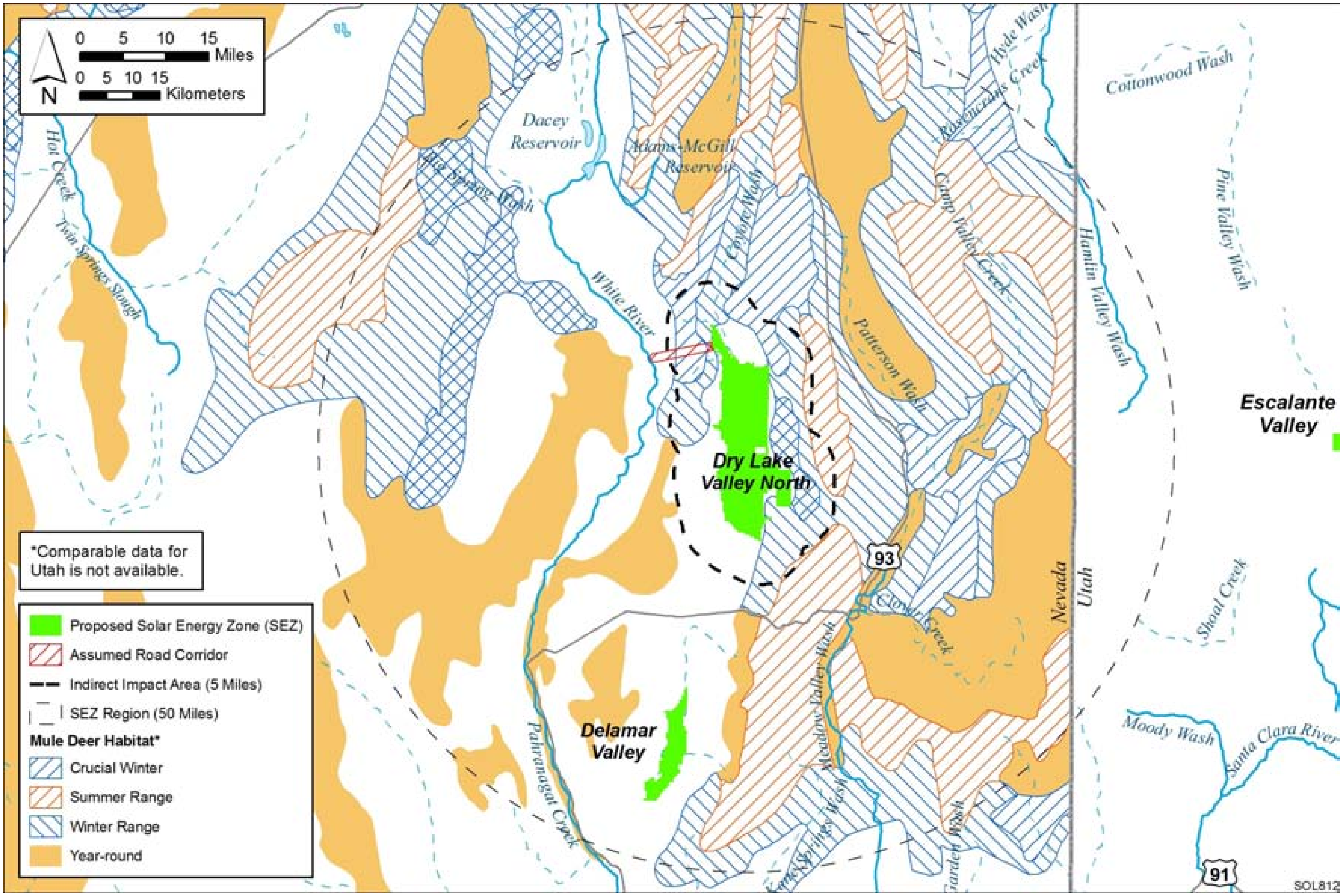

FIGURE 11.4.11.3-2 Location of the Proposed Dry Lake Valley North SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)

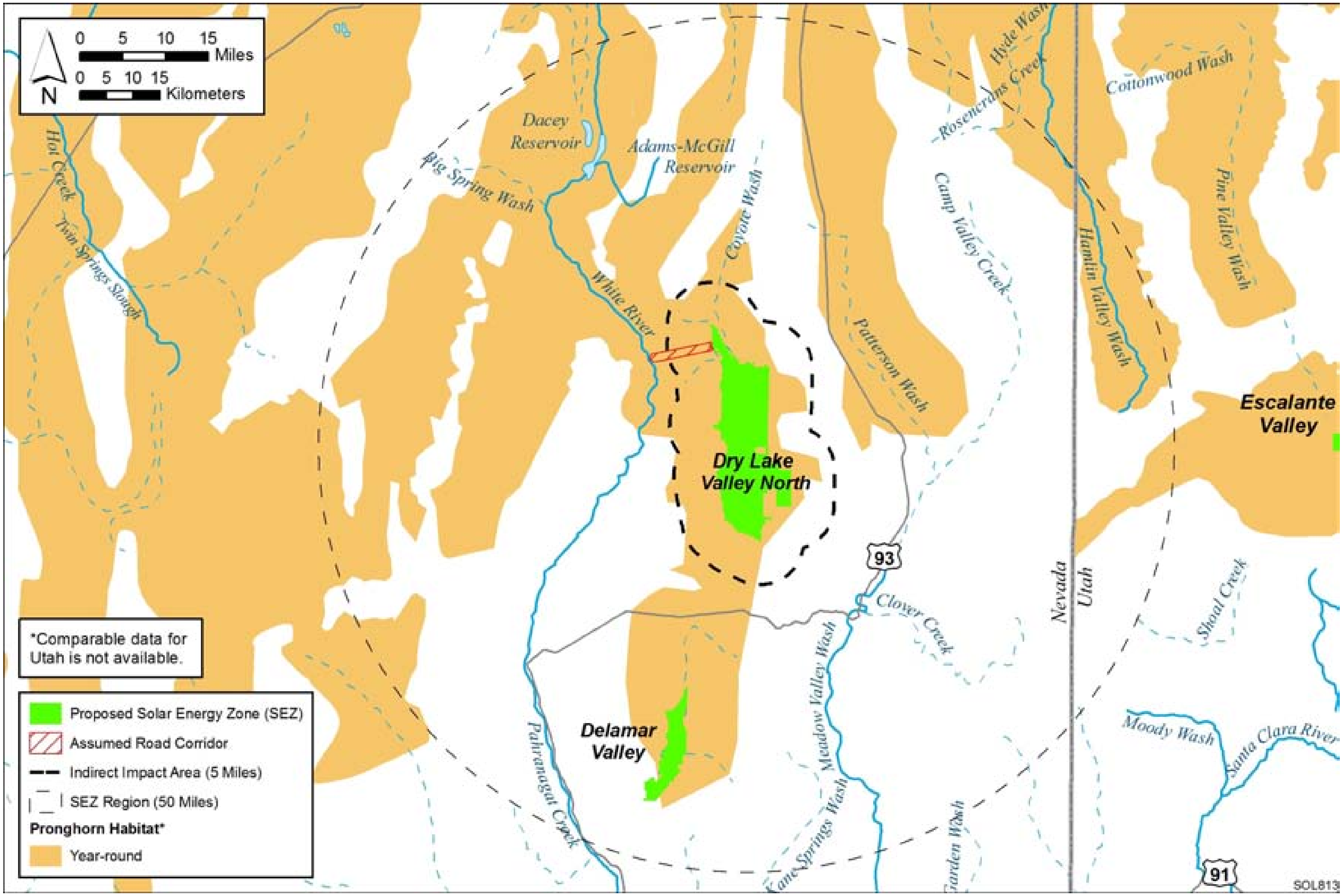

FIGURE 11.4.11.3-3 Location of the Proposed Dry Lake Valley North SEZ Relative to the Mapped Range of Pronghorn (Source: NDOW 2010)

mouse (*P. crinitis*), deer mouse (*P. maniculatus*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's pocket mouse (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), southern grasshopper mouse (*O. torridus*), western harvest mouse (*Reithrodontomys megalotis*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), little brown myotis (*M. lucifugus*), long-legged myotis (*M. volans*), silver-haired bat (*Lasionycteris noctivagans*), and western pipistrelle (*Parastrellus hesperus*) (USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ. Several other special status bat species that could occur within the SEZ area are addressed in Section 11.4.12.1.

Table 11.4.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Dry Lake Valley North SEZ. Special status mammal species are discussed in Section 11.4.12.

11.4.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.4.11.3.3 identifies design features of particular relevance to mammals for the proposed Dry Lake Valley North SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 11.4.11.3.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 11.4.11.3.3).

Table 11.4.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed Dry Lake Valley North SEZ.

Cougar. Up to 61,499 acres (248.9 km^2) of potentially suitable cougar habitat could be lost by solar energy development within the proposed Dry Lake Valley North SEZ. This represents about 1.2% of potentially suitable cougar habitat within the SEZ region. About 254,440 acres (1029.7 km^2) of potentially suitable cougar habitat occurs within the area of

TABLE 11.4.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Dry Lake Valley North SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Big Game					
Cougar *(Puma concolor)*	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,925,100 acres[h] of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	254,441 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Elk *(Cervis canadensis)*	Semi-open forest, mountain meadows, foothills, plains, valleys, and alpine tundra. Uses open spaces such as alpine pastures, marshy meadows, river flats, brushy clean cuts, forest edges, and semidesert areas. About 2,117,200 acres of potentially suitable habitat occurs in the SEZ region.	3,113 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	142,569 acres of potentially suitable habitat (6.7% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,401 acres in area of indirect effect	Small overall impact.

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TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Big Game (Cont.)					
Mule deer *(Odocoileus hemionus)*	Most habitats, including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provides abundant browse and cover. About 3,405,100 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat) during construction and operations	241,469 acres of potentially suitable habitat (7.1% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Pronghorn *(Antilocapra americana)*	Grasslands and semidesert shrublands on rolling topography that affords good visibility. Most abundant in shortgrass or midgrass prairies and least common in xeric habitats. About 2,395,500 acres of potentially suitable habitat occurs in the SEZ region.	13,087 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	165,220 acres of potentially suitable habitat (6.9% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,861 acres in area of indirect effect	Small overall impact.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers					
American badger *(Taxidea taxus)*	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 4,856,000 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	267,902 acres of potentially suitable habitat (5.5% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Black-tailed jackrabbit *(Lepus californicus)*	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,954,100 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	267,807 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Bobcat *(Lynx rufus)*	Most habitats except subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 4,330,800 acres of potentially suitable habitat occurs in the SEZ region.	16,330 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	193,231 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	3 acres of potentially suitable habitat lost (<0.0001% of available potentially suitable habitat) and 2,937 acres in area of indirect effect	Small overall impact.
Coyote *(Canis latrans)*	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 5023,700 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	268,338 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,552 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Desert cottontail *(Sylvilagus audubonii)*	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Tickets and patches of shrubs, vines, and brush also used as cover. About 4,602,200 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	255,742 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,503 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Gray fox *(Urocyon cinereoargenteus)*	Deserts, open forests and brush. Prefer wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 2,712,200 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat) during construction and operations	117,841 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	24 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,105 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Kit fox *(Vulpes macrotis)*	Desert and semidesert areas with relatively open vegetative cover and soft soils. Seek shelter in underground burrows. About 3,300,900 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat) during construction and operations	240,464 acres of potentially suitable habitat (7.3% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Red fox *(Vulpes vulpes)*	Most common in open woodlands, pasturelands, riparian areas, and agricultural lands. About 3,942,700 acres of potentially suitable habitat occurs in the SEZ region.	12,675 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	185,789 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,861 acres in area of indirect effect	Small overall impact.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals					
Big brown bat *(Eptesicus fuscus)*	Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 2,676,900 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat) during construction and operations	117,721 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	24 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,105 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Botta's pocket gopher *(Thomomys bottae)*	Variety of habitats, including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 2,526,200 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat) during construction and operations	184,437 acres of potentially suitable habitat (7.3% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 4,065acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Nongame (small) Mammals (Cont.)					
Brazilian free-tailed bat *(Tadarida brasiliensis)*	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 4,121,300 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	203,730 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,065 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Cactus mouse *(Peromyscus eremicus)*	Variety of areas, including desert scrub, semidesert chaparral, desert wash, semidesert grassland, and cliff and canyon habitats. About 2,257,900 acres of potentially suitable habitat occurs in the SEZ region.	10,206 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	47,145 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	6 acres of potentially suitable habitat lost (0.0002% of available potentially suitable habitat) and 505 acres in area of indirect effect	Small overall impact. Avoid wash habitats.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
California myotis *(Myotis californicus)*	Desertscrub, semidesert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 2,586,900 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat) during construction and operations	184,376 acres of potentially suitable habitat (7.1% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 4,065 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Canyon mouse *(Peromyscus crinitus)*	Associated with rocky substrates in a variety of habitats, including desert scrub, sagebrush shrublands, woodlands, cliffs and canyons, and volcanic rock and cinder lands. Source of free water not required. About 2,420,400 acres of potentially suitable habitat occurs in the SEZ region.	3,083 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	147,140 acres of potentially suitable habitat (6.1% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,441 acres in area of indirect effect	Small overall impact.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Deer mouse *(Peromyscus maniculatus)*	Tundra; alpine and subalpine grasslands;, plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran desert scrub habitats. About 4,894,000 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	260,656 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,546 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Desert shrew *(Notiosorex crawfordi)*	Usually in arid areas with adequate cover such as semiarid grasslands, shortgrass plains, desert scrub, chaparral slopes, shortgrass plains, oak savannas and woodlands, and alluvial fans. About 1,406,000 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (4.4% of available potentially suitable habitat) during construction and operations	102,801 acres of potentially suitable habitat (7.3% of available potentially suitable habitat)	25 acres of potentially suitable habitat lost (0.0021% of available potentially suitable habitat) and 2,147 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.3-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Desert woodrat *(Neotoma lepida)*	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,939,800 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.2% of available potentially suitable habitat) during construction and operations	261,016 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Hoary bat *(Lasiurus cinereus)*	Chaparral, shortgrass plains, scrub-grassland, desertscrub, forests and woodlands. Usually roosts in trees, also in caves, rock crevices, and houses. About 2,101,600 acres of potentially suitable habitat occurs in the SEZ region.	13,120 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	46,641 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	5 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 463 acres in area of indirect effect	Small overall impact.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Little brown myotis *(Myotis lucifugus)*	Various habitats, including pinyon-juniper woodlands, montane shrublands, and riparian woodlands. It uses man-made structures for summer roosting, although caves and hollow trees are also utilized. Winter hibernation often occurs in caves or mines, Most foraging activity occurs in woodlands over or near water. About 4,145,400 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	194,514 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,108 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Little pocket mouse *(Perognathus longimembris)*	Mostly sandy and gravelly soils, but also stony soils and rarely rocky sites. About 3,149,700 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat) during construction and operations	233,334 acres of potentially suitable habitat (7.4% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,546 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Long-legged myotis *(Myotis volans)*	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees are used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 2,739,600 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (2,2% of available potentially suitable habitat) during construction and operations	118,064 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	24 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,108 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-tailed pocket mouse *(Chaetodipus formosus)*	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 3,156,400 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat) during construction and operations	233,606 acres of potentially suitable habitat (7.4% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,546 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Merriam's kangaroo rat *(Dipodomys merriami)*	Plains grasslands, scrub-grasslands, desertscrub, shortgrass plains, oak and juniper savannahs, mesquite dunes, and creosote flats. About 3,299,100 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat) during construction and operations	248,159 acres of potentially suitable habitat (7.5% of available potentially suitable habitat)	52 acres of potentially suitable habitat lost (<0.0021% of available potentially suitable habitat) and 4,549 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Northern grasshopper mouse *(Onychomys leucogaster)*	Occurs in grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 4,277,200 acres of potentially suitable habitat occurs within the SEZ region.	9,757 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	185,903 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,904 acres in area of indirect effect	Small overall impact.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Nongame (small) Mammals (Cont.)					
Silver-haired bat *(Lasionycteris noctivagans)*	Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savannah and desertscrub habitats. Roosts under bark, in hollow trees, caves and mines. Forages over clearings and open water. About 4,063,000 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost 1.5% of available potentially suitable habitat) during construction and operations	196,166 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,065 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Southern grasshopper mouse *(Onychomys torridus)*	Low, arid, shrub and semiscrub vegetation of deserts. About 1,228,600 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (5.0% of available potentially suitable habitat) during construction and operations	99,116 acres of potentially suitable habitat (8.1% of available potentially suitable habitat)	25 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 2,147 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Western harvest mouse *(Reithrodontomys megalotis)*	Various habitats including scrub-grasslands, temperate swamps and riparian forests, salt marshes, shortgrass plains, oak savannah, dry fields, agricultural areas, deserts, and desertscrub. Grasses are the preferred cover. About 2,651,900 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat) during construction and operations	117,378 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	24 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,105 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Western pipistrelle *(Parastrellus hesperus)*	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 2,531,100 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat) during construction and operations	184,395 acres of potentially suitable habitat (7.3% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 4,065 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
White-tailed antelope squirrel *(Ammospermophilus leucurus)*	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends its nights and other periods of inactivity in underground burrows. About 1,917,600 acres of potentially suitable habitat occurs within the SEZ region.	61,499 acres of potentially suitable habitat lost (3.2% of available potentially suitable habitat) during construction and operations	162,024 acres of potentially suitable habitat (8.4% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 2,588 acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Yuma myotis *(Myotis yumanensis)*	Riparian areas, grasslands, semidesert shrubland, mountain brush, woodlands, and deserts. It occurs where there is open water, regardless of the habitat. Roosts in caves, mines, cliffs, crevices, buildings, and swallow nests. About 2,590,100 acres of potentially suitable habitat occurs in the SEZ region.	61,499 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat) during construction and operations	184,454 acres of potentially suitable habitat (7.1% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 4,065acres in area of indirect effect	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

Footnotes on next page.

TABLE 11.4.11.3-1 (Cont.)

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimated the amount of suitable habitat in the project area. A maximum of 61,499 acres of direct effect within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 61,499 acres of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] For access road development, direct effects were estimated within a 7-mi (11-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

indirect effect. This is about 5.2% of potentially suitable cougar habitat within the SEZ region. Overall, impacts on the cougar from solar energy development in the SEZ would be moderate.

Elk. Based on land cover analyses, up to 3,113 acres (12.6 km^2) of potentially suitable elk habitat could be lost by solar energy development within the proposed Dry Lake Valley North SEZ. This represents about 0.1% of potentially suitable elk habitat within the SEZ region. About 142,570 acres (577 km^2) of potentially suitable elk habitat occurs within the area of indirect effect. This is about 6.7% of potentially suitable elk habitat within the SEZ region. Based on mapped ranges, the closest year-round elk habitat is about 1.7 mi (2.7 km) from the SEZ, while potential habitat is adjacent to the northern tip of the SEZ (Figure 11.4.11.3-1). About 7,050 acres (28.5 km^2) of mapped year-round elk habitat and 17,645 acres (71.4 km^2) of potential elk range occurs within the area of indirect effect. Crucial summer and winter ranges are 20 mi (32 km) and 30 mi (48 km) from the SEZ, respectively (Figure 11.4.11.3-1). Overall, impacts on elk from solar energy development in the SEZ would be small.

Mule Deer. Based on land cover analyses, up to 61,499 acres (248.9 km^2) of potentially suitable mule deer habitat could be lost by solar energy development within the proposed Dry Lake Valley North SEZ. This represents about 1.8% of potentially suitable mule deer habitat within the SEZ region. About 241,470 acres (977.2 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effect. This is about 7.1% of potentially suitable mule deer habitat within the SEZ region. Based on mapped range, the closest year-round mule deer habitat is about 4.4 mi (7.1 km) from the SEZ (Figure 11.4.11.3-2). About 480 acres (1.9 km^2) of year-round mule deer habitat occurs within the area of indirect effect. This is only about 0.04% of the year-round mule deer habitat within the SEZ region. The closest summer range is 3.2 mi (5.1 km) from the SEZ (Figure 11.4.11.3-2). About 12,415 acres (50.2 km^2) of mule deer summer range occurs within the indirect effect area. About 1,150 acres (4.7 km^2) of winter range and 8 acres (0.03 km^2) of crucial winter range occur within the SEZ (Figure 11.4.11.3-2). These are about 0.09 and 0.002 % of the respective ranges within the SEZ region. These would be considered small direct effects on these mule deer ranges. An additional 4 acres (0.02 km^2) of winter range and 27 acres (0.1 km^2) of crucial winter range would be directly affected by access road development. More than 115,000 acres (465 km^2) of winter range and 57,580 acres (233 km^2) of crucial winter range occurs within the area of indirect effect. Overall, impacts on mule deer from solar energy development in the SEZ would be small (based on mapped range) to moderate (based on land cover).

Pronghorn. Based on land cover analyses, up to 13,087 acres (53.0 km^2) of potentially suitable pronghorn habitat could be lost by solar energy development within the proposed Dry Lake Valley North SEZ. This represents about 0.5% of potentially suitable pronghorn habitat within the SEZ region. About 165,220 acres (688.6 km^2) of potentially suitable pronghorn habitat occurs within the area of indirect effect. This is about 6.9% of potentially suitable pronghorn habitat within the SEZ region. Based on mapped range, up to 61,499 acres (248.9 km^2) year-round pronghorn habitat would be directly impacted by solar energy development within the SEZ (Figure 11.4.11.3-3). This is about 3.2% of the year-round habitat mapped within the SEZ region, which would be considered a moderate impact. An additional 52 acres (0.2 km^2) of year-round habitat could be directly affected by access road development. About 183,100 acres (741 km^2) of year-round pronghorn range occurs within the area of indirect effect (Figure 11.4.11.3-3. Overall, impacts on pronghorn from solar energy development in the SEZ would be small (based on land cover) to moderate (based on mapped range).

Other Mammals

Direct impacts on other representative mammal species would be small (6 species) to moderate (24 species) (Table 11.4.11.3-1). Direct impacts (percent loss of potentially available habitat) for these species would range from 0.1% for the canyon mouse to 5.0% for the southern grasshopper mouse (Table 11.4.11.3-1). Larger areas of potentially suitable habitats for these mammal species occur within the area of potential indirect effects (e.g., up to 8.4% of available habitat for the white-tailed antelope squirrel).

Summary

Overall, impacts on mammal species, based on land cover analyses, would be small to moderate (Table 11.4.11.3-1). Based on mapped ranges for big game, a moderate impact could occur to pronghorn. In addition to habitat loss, other direct impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences). Indirect impacts on mammals could result from noise (i.e., behavioral and physiological stresses; Section 5.10.2), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. Indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.4.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important for reducing impacts on mammals are best established when considering specific project details, design features that can be identified at this time are:

- The fencing around the solar energy development should not block the free movement of mammals, particularly big game species.

- Playa and wash habitats should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on mammals could be reduced. However, potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ; therefore, species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.4.11.4 Aquatic Biota

11.4.11.4.1 Affected Environment

This section addresses aquatic habitats and biota known to occur on the proposed Dry Lake Valley North SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. There are no perennial surface water bodies or perennial streams within the proposed Dry Lake Valley North SEZ or within the assumed new road corridor. As described in Section 11.4.9.1.1, 18 mi (29 km) of the intermittent/ephemeral Coyote Wash and 28 mi (45 km) of unnamed washes cross through the SEZ. These washes are typically dry and flow only after precipitation, at which time they carry water to an unnamed dry lake, 4,472 acres (18 km^2) of which are located within the SEZ. Other ephemeral washes may also cross the SEZ, but they typically do not support wetland or riparian habitats. As described in Section 11.4.9.1.1, the unnamed dry lake is classified as a lacustrine wetland by the NWI. However, wetlands associated with dry lakes in the desert southwest rarely have water (USFS 1998). Although aquatic habitat and communities are not likely to exist in the intermittent and ephemeral surface water features in the SEZ, opportunistic crustaceans and aquatic insect larvae adapted to desert conditions may be present even under dry conditions. More detailed site survey data would be needed to characterize the aquatic biota, if present.

There are no permanent surface water bodies or perennial streams within the area of indirect effects associated with the SEZ or the assumed new road corridor. There are 3,750 acres (15 km^2) of dry lake and associated wetlands and 21 mi (34 km) of intermittent washes located within the area of SEZ indirect effects, but none are within the area of indirect effects associated with the new road corridor. The intermittent/ephemeral nature of these features suggests aquatic habitat and biota are unlikely, although more detailed site survey data would be needed to characterize the aquatic biota, if present.

Outside of the potential indirect effects area, but within 50 mi (80 km) of the SEZ, there are several lakes, covering a total area of 57,748 acres (92,936 km^2). Of this total, 4,212 acres (6,778 km^2) are permanent lake (reservoirs formed from the White River) and 53,546 acres (86,174 km^2) are dry lake. There are 158 mi (254 km) of perennial stream and 378 mi (608 km) of intermittent stream located within 50 mi (80 km) of the SEZ. The White River, its tributaries, and spring-fed pools support populations of native and non-native fishes as well as several endangered fish species, including the White River spinedace (*Lepidomeda albivallis*) and the White River springfish (*Crenichthys baileyi baileyi*). Within the SEZ and the area of potential indirect effects, intermittent streams and dry lakes are the only surface water features present, representing approximately 18% of the amount of intermittent stream and 8% of the dry lake available within the overall analysis area. The proposed new road corridor boundary is less than 1 mi (1.6 km) from the perennial White River.

11.4.11.4.2 Impacts

Section 5.10.3 discusses in detail the types of impacts that could occur on aquatic habitats and biota due to the development of utility-scale solar energy facilities. Effects that are particularly relevant to aquatic habitats and communities include surface water and groundwater withdrawal and changes in water, sediment, and contaminant inputs associated with runoff.

No permanent water bodies or streams are present within the boundaries of the proposed Dry Lake Valley North SEZ, the assumed new access road, or the area of indirect effects. The nearest perennial surface water (White River) is located approximately 7 mi (11 km) from the SEZ and more than 1 mi (1.6 km) from the area of direct disturbance for the presumed new access road. In addition, the intermittent streams in the SEZ do not drain into any permanent surface waters. Therefore, no direct or indirect impacts on perennial surface water features are expected. Intermittent stream, wetland, and water body features are present in the area of direct and indirect effects, and ground disturbance for solar energy development within the SEZ could result in air- and waterborne sediment deposition into these habitats. However, these areas are typically dry and aquatic habitat is not likely to be present, although more detailed site surveys of these areas would be necessary to determine whether solar energy development activities would result in direct or indirect impacts to aquatic biota. The implementation of commonly used engineering practices to control water runoff and sediment deposition into intermittent surface waters would further minimize the potential for impacts on aquatic organisms.

As identified in Section 5.10.3, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning for a solar energy facility. There is the potential for contaminants within the SEZ to enter washes and the dry lake, especially if heavy machinery is used in or near these areas. Because of the relatively large distance from any permanent surface water features to the SEZ (minimum of 1 mi [1.6 km]), the potential for introducing contaminants into such water bodies would be small.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower facilities, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). Obtaining cooling water from groundwater or perennial surface water features in the region could affect water levels in surface water features outside of the SEZ and area of indirect effects, (Section 8.1.9.2.2) and, as a consequence, potentially reduce habitat size, connectivity, and create more adverse environmental conditions for aquatic organisms in those habitats. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

11.4.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features presented in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for effects on aquatic biota and aquatic habitats from development and operation of solar energy facilities. While some SEZ-specific design features are best established when specific project details are being considered, the following design feature can be identified at this time

- Appropriate engineering controls should be implemented to minimize the amount of contaminants and sediment entering Coyote Wash and the unnamed washes and dry lakes within the SEZ.

If this SEZ-specific design feature is implemented in addition to programmatic design features and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the Dry Lake Valley North SEZ would be negligible.

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11.4.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Dry Lake Valley North SEZ. Special status species include the following types of species[4]:

- Species listed as threatened or endangered under the ESA;
- Species that are proposed for listing, are under review, or are candidates for listing under the ESA;
- Species that are listed by the BLM as sensitive;
- Species that are listed by the State of Nevada5; and
- Species that have been ranked by the State of Nevada as S1 or S2 or species of concern by the State of Nevada or the USFWS, hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the Dry Lake Valley North SEZ (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the NNHP (NDCNR 2004, 2009a,b; Miskow 2009), SWReGAP (USGS 2004, 2005a, 2007), and the USFWS Environmental Conservation Online System (ECOS) (USFWS 2010a). Information reviewed consisted of county-level occurrences as determined from NatureServe, element occurrences provided by the NNHP, as well as modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from SWReGAP. The 50-mi (80-km) SEZ region intersects Lincoln and Nye Counties, Nevada, as well as Beaver, Iron, and Washington Counties, Utah; however, the affected area around the SEZ occurs entirely within Lincoln County, Nevada. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

11.4.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the Dry Lake Valley North SEZ, the area of direct effects included the SEZ and the portion of the road corridor where ground-disturbing activities are assumed to occur. Due to the proximity of

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4 See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008d). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

5 State-listed species for the state of Nevada are those protected under NRS 501.110 (animals) or NRS 527 (plants).

existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades (see Section 11.4.1.2 for development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and portions of the access road corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but did not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary land cover habitat type within the affected area is intermountain basin mixed desert scrub (see Section 11.4.10). Potentially unique habitats in the affected area in which special status species may reside include cliffs and rock outcrops, pinyon-juniper woodlands, and playa habitats. Aquatic habitats that occur in the affected area include Coyote Wash and other small ephemeral streams that drain into an unnamed dry lake, approximately 8,000 acres (32 km^2) in size, in the southwest portion of the SEZ and in the area of indirect effects. The assumed access road corridor for the SEZ is also within 1 mi (1.6 km) east of the White River (Figure 11.4.12.1-1).

All special status species known to occur within the Dry Lake Valley North SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats, in Appendix J. Of these species, 22 could be affected by solar energy development on the SEZ, based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 11.4.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped SWReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 km) from the SEZ.

Based on NNHP records and information provided by the USFWS, three special status species are known to occur within the affected area of the Dry Lake Valley North SEZ: Blaine fishhook cactus, Eastwood milkweed, and Desert Valley kangaroo mouse. There are no groundwater-dependent species in the vicinity of the SEZ based upon NNHP records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Dry Lake Valley North SEZ region (Section 11.4.9).

11.4.12.1.1 Species Listed under the ESA That Could Occur in the Affected Area

In its scoping comments on the proposed Dry Lake Valley North SEZ, the USFWS did not express concern for impacts of project development within the Dry Lake Valley North SEZ

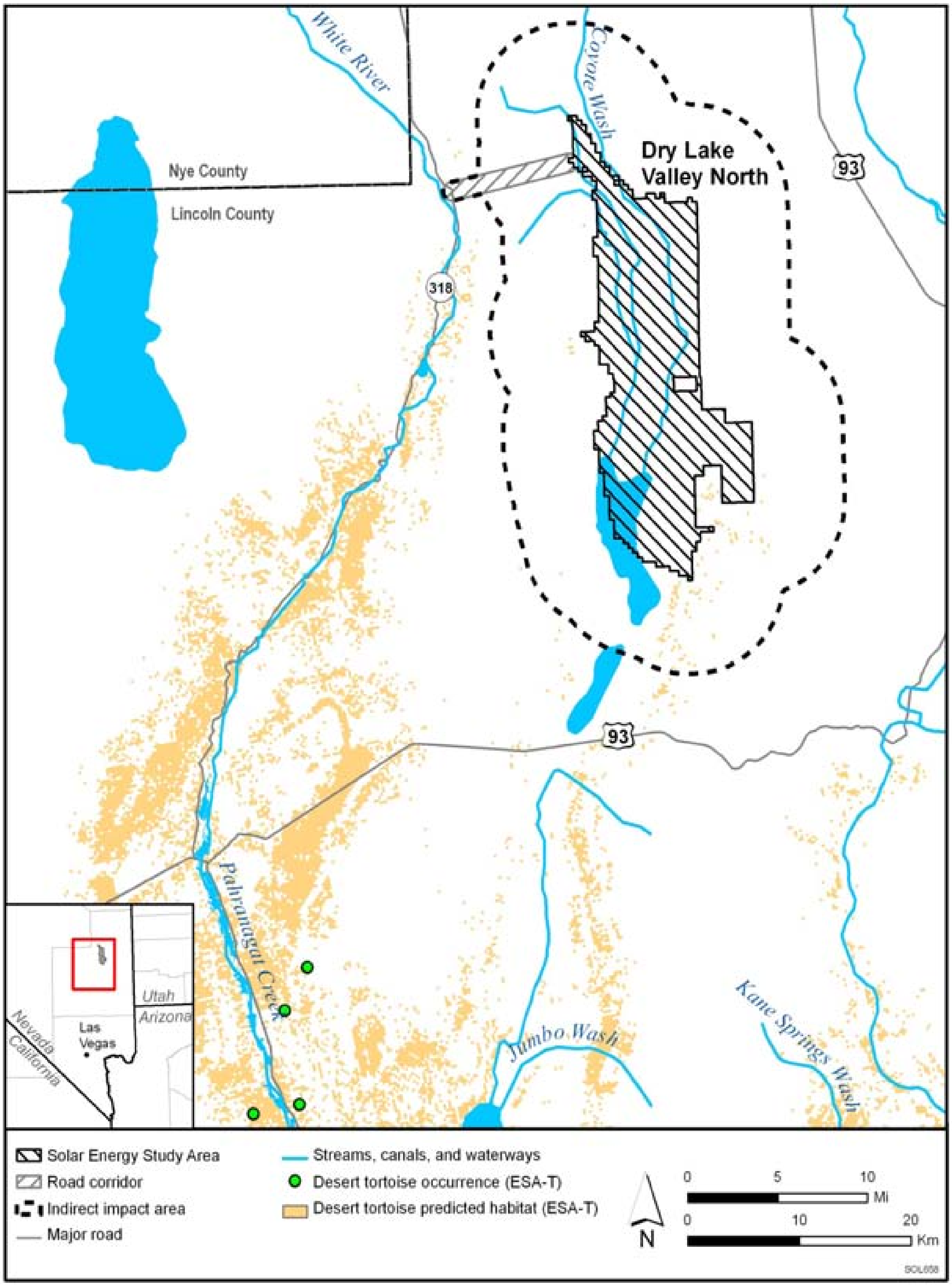

FIGURE 11.4.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA in the Affected Area of the Proposed Dry Lake Valley North SEZ (Sources: Miskow 2009; USFWS 2010a; USGS 2007)

TABLE 11.4.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Dry Lake Valley North SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants							
Blaine fishhook cactus[i]	***Sclerocactus blaneii***	BLM-S; NV-P; FWS-SC; NV-S1	Endemic to southeastern Nevada and southwestern Utah on alkaline substrates and volcanic gravels in valley bottoms. Elevation ranges between 5,100 and 5,300 ft.[j] There are only three known occurrences of this species. One of these occurrences is located in the Dry Lake Valley. About 20,150 acres[k] of potentially suitable habitat occurs within the SEZ region.	3,000 acres of potentially suitable habitat lost (15.0% of available potentially suitable habitat)	0 acres	3,875 acres of potentially suitable habitat (19.2% of available potentially suitable habitat)	Large overall impact. Avoiding or minimizing disturbance to playa habitat could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects; translocation of individuals from the area of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Eastwood milkweed	***Asclepias eastwoodiana***	BLM-S; FWS-SC; NV-S2	Endemic to Nevada on public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate, or basaltic gravels, or shale outcrops, generally barren and lacking competition. Frequently in small washes or other moisture-accumulating microsites at elevations between 4,700 and 7,100 ft. Known to occur on the SEZ. About 413,100 acres of potentially suitable habitat occurs within the SEZ region.	10,250 acres of potentially suitable habitat lost (2.5% of available potentially suitable habitat)	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	23,900 acres of potentially suitable habitat (5.8% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects; translocation of individuals from the area of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Long-calyx milkvetch	*Astragalus oophorus var. lonchocalyx*	BLM-S; FWS-SC; NV-S2	Regionally endemic to the Great Basin in western Utah and eastern Nevada in pinyon-juniper woodlands, sagebrush, and mixed shrub communities at elevations between 5,800 and 7,500 ft. Nearest recorded occurrence is 8 mi[l] east of the SEZ. About 4,351,850 acres of potentially suitable habitat occurs within the SEZ region.	63,550 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat)	40 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	228,650 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	Moderate overall impact. See Eastwood milkweed for a list of other potential mitigations.
Needle Mountains milkvetch	*Astragalus eurylobus*	BLM-S; FWS-SC; NV-S2	Gravel washes and sandy soils in alkaline desert and arid grasslands at elevations between 4,250 and 6,250 ft. Nearest recorded occurrence is 15 mi southeast of the SEZ. About 39,650 acres of potentially suitable habitat occurs within the SEZ region.	3,900 acres of potentially suitable habitat lost (9.9% of available potentially suitable habitat)	0 acres	4,250 acres of potentially suitable habitat (10.7% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to playa habitat could reduce impacts. In addition, see the Eastwood milkweed for a list of other potential mitigations.
Nevada willowherb	*Epilobium nevadense*	BLM-S; FWS-SC; NV-S2	Pinyon-juniper woodlands and oak/mountain mahogany communities, on talus slopes and rocky limestone outcrops. Elevation ranges between 5,000 and 8,800 ft. Nearest recorded occurrence is 20 mi south of the SEZ. About 1,578,650 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	19,200 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Pioche blazingstar	*Mentzelia argillicola*	BLM-S; NV-S1	Endemic to Nevada on dry, soft, silty clay soils on knolls and slopes with sparse vegetation consisting mainly of sagebrush. Nearest recorded occurrence is from Patterson Wash, approximately 12 mi east of the SEZ. About 2,869,000 acres of potentially suitable habitat occurs within the SEZ region.	73,700 acres of potentially suitable habitat lost (2.6% of available potentially suitable habitat)	46 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	228,300 acres of potentially suitable habitat (8.0% of available potentially suitable habitat)	Moderate overall impact. See Eastwood milkweed for a list of other potential mitigation.
Rock purpusia	*Ivesia arizonica* var. *saxosa*	BLM-S; NV-S1	Endemic to southern Nevada in crevices of cliffs and boulders on volcanic substrates in pinyon-juniper communities at elevations between 4,900 and 6,900 ft. Nearest recorded occurrence is 15 mi south of the SEZ. About 1,525,250 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	19,100 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.
Tiehm blazingstar	*Mentzelia tiehmii*	BLM-S; NV-S1	Endemic to Nevada on hilltops of white soil, sparsely vegetated white calcareous knolls and bluffs with scattered perennials. Nearest recorded occurrence is from the White River, approximately 7 mi west of the SEZ. About 2,326,100 acres of potentially suitable habitat occurs within the SEZ region.	73,200 acres of potentially suitable habitat lost (3.1% of available potentially suitable habitat)	40 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	169,350 acres of potentially suitable habitat (7.3% of available potentially suitable habitat)	Moderate overall impact. See Eastwood milkweed for a list of other potential mitigations.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
White River cat's-eye	*Cryptantha welshii*	BLM-S; FWS-SC	Endemic to southern Nevada on dry, open, sparsely vegetated outcrops and carbonate substrates at elevations between 4,500 and 6,600 ft. Nearest recorded occurrences are 12 mi east of the SEZ. About 33,100 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	385 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Reptiles							
Desert tortoise	*Gopherus agassizii*	ESA-T; NV-P; NV-S2	Mojave and Sonoran Deserts in desert creosote bush communities on firm soils for digging burrows, and often along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Nearest recorded occurrence is 30 mi southwest of the SEZ. About 227,100 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	1,550 acres of potentially suitable habitat (0.7% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Birds							
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident in grasslands, sagebrush and saltbrush habitats, as well as the periphery of pinyon-juniper woodlands. Nests in tall trees or on rock outcrops along cliff faces. Known to occur in Lincoln County, Nevada. About 2,071,600 acres of potentially suitable habitat occurs within the SEZ region.	6,300 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	25 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	148,900 acres of potentially suitable habitat (7.2% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Prairie falcon	*Falco mexicanus*	BLM-S	Year-round resident in open habitats in mountainous areas, steppe, grasslands, or cultivated areas. Typically nests in well-sheltered ledges of rocky cliffs and outcrops. Known to occur in Lincoln County, Nevada. About 1,690,150 acres of potentially suitable habitat occurs within the SEZ region.	67,500 acres of potentially suitable habitat lost (4.0% of available potentially suitable habitat)	26 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	139,800 acres of potentially suitable habitat (8.3% of available potentially suitable habitat)	Moderate overall impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Swainson's hawk	*Buteo swainsoni*	BLM-S; NV-P; NV-S2	Summer breeding resident in the SEZ region in savannas, open pine-oak woodlands, grasslands, and cultivated lands. Nests in solitary trees, bushes, or small groves. Known to occur in Lincoln County, Nevada. About 2,114,200 acres of potentially suitable habitat occurs within the SEZ region.	7,100 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	4 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	43,900 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; FWS-SC	Summer breeding resident in open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports. Nests in burrows constructed by mammals (especially prairie dogs and badgers). Known to occur in Lincoln County, Nevada. About 3,159,500 acres of potentially suitable habitat occurs within the SEZ region.	73,400 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	46 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	234,250 acres of potentially suitable habitat (7.4% of available potentially suitable habitat)	Moderate overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Western snowy plover	*Charadrius alexandrinus nivosus*	BLM-S; NV-P	Summer breeding resident on alkali flats around reservoirs and sandy shorelines. Nearest recorded occurrence is from the Adams-McGill Reservoir, approximately 23 mi northwest of the SEZ. About 66,000 acres of potentially suitable habitat occurs within the SEZ region.	6,950 acres of potentially suitable habitat lost (10.5% of available potentially suitable habitat)	0 acres	8,150 acres of potentially suitable habitat (12.4% of available potentially suitable habitat)	Large overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to playa habitats and other occupied habitats in the area of direct effects (particularly associated with the playa habitat in the southern portion of the SEZ) or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals							
Desert Valley kangaroo mouse	***Microdipodops megacephalus albiventer***	BLM-S; NV-P; FWS-SC; NV-S2	Endemic to central Nevada in desert areas at playa margins and in dune habitats. Known to occur on the SEZ in association with the dry lake along the southwestern portion of the SEZ. About 1,257,700 acres of potentially suitable habitat occurs within the SEZ region.	64,750 acres of potentially suitable habitat lost (5.1% of available potentially suitable habitat)	17 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	109,900 acres of potentially suitable habitat (8.7% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to playa habitats within the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Fringed myotis	*Myotis thysanodes*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in a wide range of habitats including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roosts in buildings and caves. Known to occur in Lincoln County, Nevada. About 4,645,300 acres of potentially suitable habitat occurs within the SEZ region.	73,300 of potentially suitable habitat lost (1.6% of available potentially suitable habitat)	42 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	221,700 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Moderate overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts. Rarely uses desert lowlands, but may use them as corridors for travel between mountain ranges. Known to occur in Lincoln County, Nevada. About 1,771,100 acres of potentially suitable habitat occurs within the SEZ region.	700 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	13 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	65,000 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to habitats within the SEZ and access road corridor could further reduce impacts.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Pahranagat Valley montane vole	*Microtus montanus fucosus*	BLM-S; NV-P; FWS-SC; NV-S2	Endemic to Lincoln County, Nevada, where it is restricted to springs in the Pahranagat Valley. Within that area, isolated populations utilize mesic montane and desert riparian patches. Nearest recorded occurrence is from Pahranagat Creek, approximately 27 mi southwest of the SEZ. About 23,900 acres of potentially suitable habitat occurs within the SEZ region.	900 acres of potentially suitable habitat lost (3.7% of available potentially suitable habitat)	0 acres	300 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to playas within the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.4.12.1-1 (Cont.)

				Maximum Area of Potential Habitat Affected[c]			
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Pygmy rabbit	*Brachylagus idahoensis*	BLM-S; NV-P	Sagebrush-shrubland habitats throughout the SEZ region. Prefers loose soils to dig burrows. Nearest recorded occurrence is from BLM-administered lands approximately 20 mi northwest of the SEZ. About 1,325,950 acres of potentially suitable habitat occurs within the SEZ region.	2,550 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	20 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	82,700 acres of potentially suitable habitat (6.2% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effect; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Spotted bat	*Euderma maculatum*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in forests and shrubland habitats. Uses caves and rock crevices for day roosting and winter hibernation. Nearest recorded occurrence is from the vicinity of Panaca, Nevada, approximately 13 mi east of the SEZ. About 3,952,400 acres of potentially suitable habitat occurs within the SEZ region.	66,000 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat)	37 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	174,200 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Moderate overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Western small-footed myotis	*Myotis ciliolabrum*	BLM-S; FWS-SC	Year-round resident in a variety of woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Known to occur in Lincoln County, Nevada. About 5,016,400 acres of potentially suitable habitat occurs within the SEZ region.	76,700 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat)	46 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	257,375 acres of potentially suitable habitat (5.1% of available potentially suitable habitat)	Moderate overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

Footnotes on next page.

TABLE 11.4.12.1-1 (Cont.)

[a] BLM-S = listed as a sensitive species by the BLM; ESA-E = listed as endangered under the ESA; ESA-T = listed as threatened under the ESA; ESA-UR = under review for listing under the ESA; FWS-SC = USFWS species of concern; NV-P = protected in the state of Nevada under NRS 501.110 (animals) or NRS 527 (plants); NV-S1 = ranked as S1 in the state of Nevada; NV-S2 = ranked as S2 in the state of Nevada.

[b] For plant species, potentially suitable habitat was determined by using SWReGAP land cover types. For terrestrial vertebrate species, potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] For access road development, direct effects were estimated within a 5-mi (8-km) long, 60-ft (18-m) wide road corridor from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of potentially suitable habitat within the 1-mi (1.6-km) wide road corridor.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portions of the road and transmission corridors where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from project developments. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Indirect effects on groundwater-dependent species were considered outside these defined areas.

[g] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[h] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[i] Species in bold text have been recorded or have designated critical habitat within 5 mi (8 km) of the SEZ boundary.

[j] To convert ft to m, multiply by 0.3048.

[k] To convert acres to km^2, multiply by 0.004047.

[l] To convert mi to km, multiply by 1.609.

on any species listed as threatened or endangered under the ESA (Stout 2009). However, the desert tortoise, listed as threatened under the ESA, may occur in the affected area. This species is discussed below, and information on its habitat is presented in Table 11.4.12.1-1. Additional basic information on life history, habitat needs, and threats to populations of the desert tortoise is provided in Appendix J.

The Mojave population of the desert tortoise is listed as threatened under the ESA and is known to occur in the SEZ region, although the USFWS determined that the species is not likely to occur on the SEZ because of lack of suitable habitat (Stout 2009). According to NNHP records, the desert tortoise occurs about 30 mi (48 km) southwest of the SEZ, and according to the SWReGAP habitat suitability model, approximately 1,500 acres (6 km^2) of potentially suitable habitat for this species occurs in the area of indirect effects and 227,000 acres (919 km^2) occurs in the SEZ region as a whole; no suitable habitat occurs on the SEZ itself or assumed access road corridor. The USGS desert tortoise model (Nussear et al. 2009) identifies the SEZ affected area as having low habitat suitability for desert tortoise (modeled suitability value ≤0.3 out of 1.0). The nearest potentially suitable habitat according to the USGS model is along Pahranagat Creek, approximately 30 mi (48 km) southwest of the SEZ, where the modeled suitability value is greater than or equal to 0.8 (out of 1.0). Designated critical habitat for this species does not occur in the SEZ affected area.

11.4.12.1.2 BLM-Designated Sensitive Species

A total of 21 BLM-designated sensitive species may occur in the affected area of the Dry Lake Valley North SEZ or may be affected by solar energy development on the SEZ (Table 11.4.12.1-1). These BLM-designated sensitive species include the following: (1) plants—Blaine fishhook cactus, Eastwood milkweed, long-calyx milkvetch, Needle Mountains milkvetch, Nevada willowherb, Pioche blazingstar, rock purpusia, Tiehm blazingstar, and White River cat's-eye; (2) birds—ferruginous hawk, prairie falcon, Swainson's hawk, western burrowing owl, and western snowy plover; and (3) mammals—Desert Valley kangaroo mouse, fringed myotis, Nelson's bighorn sheep, Pahranagat Valley montane vole, pygmy rabbit, spotted bat, and western small-footed myotis. Of the BLM-designated sensitive species with potentially suitable habitat in the affected area, only the Blaine fishhook cactus, Eastwood milkweed, and Desert Valley kangaroo mouse have been recorded within 5 mi (8 km) of the SEZ boundary. Habitats in which BLM-designated sensitive species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are presented in Table 11.4.12.1-1. These species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Blaine Fishhook Cactus

The Blaine fishhook cactus is a small cactus endemic to southeastern Nevada and southwestern Utah, where it occurs on alkaline substrates and volcanic gravels in valley bottoms. Only three occurrences of this species are currently known. One of these occurrences is in the

Dry Lake Valley (Stout 2009). Potentially suitable habitat for this species occurs on the Dry Lake Valley North SEZ and in other portions of the affected area (Table 11.4.12.1-1).

Eastwood Milkweed

The Eastwood milkweed is a perennial forb endemic to Nevada from public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties. It occurs in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, washes, or shale outcrops at elevations between 4,700 and 7,100 ft (1,430 and 2,150 m). The species is known to occur on the SEZ. Potentially suitable habitat for this species occurs on the Dry Lake Valley North SEZ and in other portions of the affected area (Table 11.4.12.1-1).

Long-Calyx Milkvetch

The long-calyx milkvetch is a perennial forb regionally endemic to the Great Basin in southwestern Utah and eastern Nevada. It occurs in pinyon-juniper woodlands, sagebrush, and mixed shrub communities at elevations between 5,800 and 7,500 ft (1,760 and 2,290 m). The species is known to occur 8 mi (13 km) east of the SEZ. Potentially suitable habitat for this species occurs on the Dry Lake Valley North SEZ and in other portions of the affected area (Table 11.4.12.1-1).

Needle Mountains Milkvetch

The Needle Mountains milkvetch is a perennial forb that occurs on gravel washes and sandy soils in alkaline desert and arid grasslands at elevations between 4,250 and 6,250 ft (1,295 and 1,900 m). The species is known to occur about 15 mi (24 km) southeast of the SEZ. Potentially suitable habitat for this species occurs on the Dry Lake Valley North SEZ and in other portions of the affected area (Table 11.4.12.1-1).

Nevada Willowherb

The Nevada willowherb is a perennial forb endemic to eastern Nevada and western Utah. It occurs in pinyon-juniper woodlands and oak/mountain mahogany communities and on talus slopes and rocky limestone outcrops at elevations between 5,000 and 8,800 ft (1,525 and 2,680 m). The species occurs about 20 mi (32 km) south of the SEZ. Potentially suitable habitat for this species does not occur on the SEZ but may occur in portions of the area of indirect effects (Table 11.4.12.1-1).

Pioche Blazingstar

The Pioche blazingstar is a perennial forb endemic to Nevada. It occurs on dry, soft, silty clay soils on knolls and slopes with sparse vegetation consisting mainly of sagebrush

(*Artemisia* spp.). Nearest known occurrences are from Patterson Wash, approximately 12 mi (19 km) east of the SEZ. Potentially suitable habitat for this species occurs on the Dry Lake Valley North SEZ and in other portions of the affected area (Table 11.4.12.1-1).

Rock Purpusia

The rock purpusia is a perennial forb endemic to southern Nevada. It inhabits crevices of cliffs and boulders on volcanic substrates in pinyon-juniper communities at elevations between 4,900 and 6,900 ft (1,490 and 2,100 m). The species occurs about 15 mi (24 km) south of the SEZ. Potentially suitable habitat for this species does not occur on the SEZ but may occur in portions of the area of indirect effects (Table 11.4.12.1-1).

Tiehm Blazingstar

The Tiehm blazingstar is a perennial forb endemic to Nevada. It occurs on hilltops, sparsely vegetated white calcareous knolls, and bluffs with other scattered perennial plant species. Nearest recorded occurrences are from the White River, approximately 7 mi (11 km) west of the SEZ. Potentially suitable habitat for this species occurs on the Dry Lake Valley North SEZ and in other portions of the affected area (Table 11.4.12.1-1).

White River Cat's-Eye

The White River cat's-eye is a perennial forb endemic to southern Nevada. It occurs on dry, open, sparsely vegetated outcrops on carbonate substrates at elevations between 4,500 and 6,600 ft (1,370 and 2,010 m). Nearest recorded occurrences are 12 mi (19 km) east of the SEZ. Potentially suitable habitat for this species does not occur on the SEZ but may occur in portions of the area of indirect effects (Table 11.4.12.1-1).

Ferruginous Hawk

The ferruginous hawk occurs as a winter resident in the Dry Lake Valley North SEZ affected area. The species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. This species occurs in Lincoln County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.4.12.1-1).

Prairie Falcon

The prairie falcon occurs throughout the western United States. According to the SWReGAP habitat suitability model for the prairie falcon, it is a year-round resident throughout the Dry Lake Valley North SEZ region. The species occurs in open habitats in mountainous areas, sagebrush-steppe, grasslands, or cultivated areas. Nests are typically constructed in well-sheltered ledges of rocky cliffs and outcrops. This species occurs in Lincoln County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable nesting habitat (rocky cliffs and outcrops) does not occur on the SEZ or access road corridor; however, approximately 385 acres (1.5 km^2) of this habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Swainson's Hawk

The Swainson's hawk occurs throughout the southwestern United States. According to the SWReGAP habitat suitability model for the Swainson's hawk, only summer breeding habitat occurs in the Dry Lake Valley North SEZ region. This species inhabits desert, savanna, open pine-oak woodland, grassland, and cultivated habitats. Nests are typically constructed in solitary trees, bushes, or small groves. This species occurs in Lincoln County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable nesting habitat (woodlands) does not occur on the SEZ or access road corridor; however, approximately 19,300 acres (78 km^2) of woodland habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Western Burrowing Owl

According to the SWReGAP habitat suitability model for the western burrowing owl, the species is a summer (breeding) resident of open, dry grasslands and desert habitats in the Dry Lake Valley North SEZ region. The species occurs locally in open areas with sparse vegetation, where it forages in grasslands, shrublands, and open disturbed areas and nests in burrows typically constructed by mammals. The species occurs in Lincoln County, Nevada, and potentially suitable summer breeding habitat is expected to occur in the SEZ and in other portions of the affected area (Table 11.4.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Western Snowy Plover

According to the SWReGAP habitat suitability model, the western snowy plover is a summer (breeding) resident throughout the Dry Lake Valley North SEZ region. This species breeds on alkali flats around reservoirs and sandy shorelines. The species is known to occur at Adams-McGill Reservoir, approximately 23 mi (37 km) northwest of the SEZ (Table 11.4.12.1-1). Suitable breeding habitat is expected to occur on the SEZ and in portions of the affected area, particularly associated with the playa habitat along the southwestern border of the SEZ and in the area of indirect effects.

Desert Valley Kangaroo Mouse

The Desert Valley kangaroo mouse is endemic to central Nevada, where it inhabits desert areas at playa margins and in dune habitats. According to the SWReGAP habitat suitability model for the kangaroo mouse, potentially suitable year-round habitat occurs within the SEZ and throughout the affected area, particularly associated with the periphery of the playa habitat in the southwestern portion of the SEZ. This species occurs along the playa habitat in the southwest portion of the SEZ (Table 11.4.12.1-1).

Fringed Myotis

The fringed myotis is a year-round resident in the Dry Lake Valley North SEZ region, where it occurs in a variety of habitats including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. The species roosts in buildings and caves. It is known to occur in Lincoln County, Nevada, and the SWReGAP habitat suitability model for the species indicates that potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (rocky cliffs and outcrops) does not occur on the SEZ or access road corridor; however, approximately 385 acres (1.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is a subspecies of bighorn sheep known to occur in the Dry Lake Valley North SEZ region. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats and may utilize desert valleys as corridors for travel between range habitats. It occurs in Lincoln County, Nevada, and the SWReGAP habitat suitability model for the species indicates that potentially suitable habitat occurs on the SEZ and in portions of the affected area (Table 11.4.12.1-1).

Pahranagat Valley Montane Vole

The Pahranagat Valley montane vole is endemic to Lincoln County, Nevada, where it is restricted to springs in the Pahranagat Valley. Within that area, isolated populations utilize mesic montane and desert riparian patches of habitat. The species occurs along Pahranagat Creek, approximately 27 mi (43 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat for this species occurs on the SEZ and in other portions of the affected area (Table 11.4.12.1-1).

Pygmy Rabbit

The pygmy rabbit is widespread in western North America where available sagebrush-shrubland habitats are present. The species primarily occurs in areas with loose soils for digging burrows. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat for this species occurs throughout the SEZ region. This species occurs about 20 mi (32 km) north of the SEZ (Table 11.4.12.1-1).

Spotted Bat

The spotted bat is a year-round resident in the Dry Lake Valley North SEZ region, where it occurs in a variety of forested and shrubland habitats. It roosts in caves and rock crevices. The species occurs in the vicinity of Panaca, Nevada, approximately 13 mi (21 km) east of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (rocky cliffs and outcrops) does not occur on the SEZ or access road corridor; however, approximately 385 acres (1.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects.

Western Small-Footed Bat

The western small-footed bat is widely distributed throughout the western United States. This species is a year-round resident in southern Nevada, where it occupies a wide variety of desert and nondesert habitats including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, tunnels, beneath boulders or loose bark, buildings, and other man-made structures. The species occurs in Lincoln County, Nevada, and according to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (rocky cliffs and outcrops) does not occur on the SEZ or access road corridor; however, approximately 385 acres (1.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects.

11.4.12.1.3 State-Listed Species

There are eight species listed by the State of Nevada that may occur in the Dry Lake Valley North SEZ affected area or may be affected by solar energy development on the SEZ (Table 11.4.12.1-1). These state-listed species include the following: (1) plant—Blaine fishhook cactus; (2) reptile—desert tortoise; (3) bird—Swainson's hawk; and (4) mammals—Desert Valley kangaroo mouse, fringed myotis, Pahranagat Valley montane vole, pygmy rabbit, and spotted bat. All these species are protected in the state of Nevada under NRS 501.110 (animals) or NRS 527 (plants). Each of these species has been previously discussed because of its known status under the ESA (Section 11.4.12.1.1) or the BLM (Section 11.4.12.1.3). Additional life history information for these species is provided in Appendix J.

11.4.12.1.4 Rare Species

A total of 20 rare species (i.e., state rank of S1 or S2 in the state of Nevada or a species of concern by the State of Nevada or USFWS) may be affected by solar energy development on the Dry Lake Valley North SEZ (Table 11.4.12.1-1). All these species have already been discussed as ESA-listed species (Section 11.4.12.1.1) or BLM-designated sensitive (Section 11.4.12.1.2). The habitats and known occurrences of these species relative to the SEZ are shown in Table 11.4.12.1-1. Additional life history information is provided in Appendix J.

11.4.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Dry Lake Valley North SEZ is presented in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 11.4.12.1 following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 11.4.12.3).

Solar energy development within the Dry Lake Valley North SEZ could affect a variety of habitats (see Sections 11.4.9 and 11.4.10). These impacts on habitats could in turn affect special status species dependent on those habitats. Based on NNHP records, three special status species are known to occur within 5 mi (8 km) of the Dry Lake Valley North SEZ boundary: Blaine fishhook cactus, Eastwood milkweed, and Desert Valley kangaroo mouse. These species are listed in bold in Table 11.4.12.1-1. Other special status species may occur on the SEZ or within the affected area based on the presence of potentially suitable habitat. As discussed in Section 11.4.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area and may therefore overestimate impacts on some special status species.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 11.4.1.2, a 5-mi (8-km) long access road corridor is assumed to be needed to serve solar facilities within this SEZ. Impacts of transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing transmission infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would be incurred only within the SEZ and the access road construction area where ground-disturbing activities are expected to occur. Indirect impacts could result from depletions of groundwater resources, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project development are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., dunes and playas). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce groundwater consumption, runoff, sedimentation, spills, and fugitive dust.

11.4.12.2.1 Impacts on Species Listed under the ESA

Impacts on the desert tortoise, the only ESA-listed species that may occur in the Dry Lake Valley North SEZ affected area or that may be affected by solar energy development on the SEZ, are discussed below. This assessment is based on the best information available, but discussions of potential impacts and mitigation options should be held in consultation with the USFWS.

The Mojave population of the desert tortoise is listed as threatened under the ESA and is known to occur about 30 mi (48 km) southwest of the SEZ (Figure 11.4.12.1-1). According to the USFWS (Stout 2009), desert tortoise populations are not likely to occur in the area of direct effects for the Dry Lake Valley North SEZ. The USGS desert tortoise habitat suitability model (Nussear et al. 2009) indicates low habitat suitability in the affected area (modeled suitability value ≤0.3 out of 1.0 throughout the affected area). However, approximately 1,550 acres (6 km^2) of potentially suitable habitat for this species occurs outside of the SEZ in the area of indirect effects (Table 11.4.12.1-1). The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered small, because there is no potentially suitable habitat for this species in the area of direct effects and design features are expected to reduce indirect effects to negligible levels.

Consultation with the UFWS should be conducted to address the potential for direct and indirect impacts and to determine the need for additional mitigation requirements, which may include development of a survey protocol, translocation actions, and compensatory mitigation.

11.4.12.2.2 Impacts on BLM-Designated Sensitive Species

BLM-designated sensitive species that may be affected by solar energy development on the Dry Lake Valley North SEZ and are not previously discussed as ESA-listed in Section 11.4.12.2.1 are discussed below.

Blaine Fishhook Cactus

The Blaine fishhook cactus is known to occur in the Dry Lake Valley. Approximately 3,000 acres (12 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 15% of potentially suitable habitat in the SEZ region. About 3,875 acres (16 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 19% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the Blaine fishhook cactus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered large, because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than or equal to 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to all playa habitat in the area of direct effects may be sufficient to reduce impacts on the Blaine fishhook cactus to small or negligible levels, but this would restrict development on a large portion of the SEZ. For this species and other special status plants, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ. If avoidance or minimization are not feasible options, plants could be translocated from areas of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory plan could be developed and implemented to mitigate direct effects on occupied habitats. The plan could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Eastwood Milkweed

The Eastwood milkweed is known to occur in the Dry Lake Valley. Approximately 10,250 acres (41 km^2) of potentially suitable habitat on the SEZ and 5 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 3% of potentially suitable habitat in the SEZ region. About 23,900 acres (97 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 6% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the Eastwood milkweed from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Eastwood milkweed because potentially suitable sagebrush and mixed shrubland habitat is widespread throughout the area of direct effects. Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ. If avoidance or minimization is not a feasible option, plants could be translocated from areas of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory plan could be developed and implemented to mitigate direct effects on occupied habitats. The plan could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Long-Calyx Milkvetch

The long-calyx milkvetch is not known to occur in the affected area of the Dry Lake Valley North SEZ; however, approximately 63,550 acres (257 km^2) of potentially suitable habitat on the SEZ and 40 acres (0.2 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 2% of potentially suitable habitat in the SEZ region. About 228,650 acres (925 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the long-calyx milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the long-calyx milkvetch is not feasible, because potentially suitable shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Eastwood milkweed. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Needle Mountains Milkvetch

The Needle Mountains milkvetch is not known to occur in the affected area of the Dry Lake Valley North SEZ; however, approximately 3,900 acres (16 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 10% of potentially suitable habitat in the SEZ region. About 4,250 acres (17 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 11% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the Needle Mountains milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered large, because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to playa and arid grassland habitats on the SEZ may be sufficient to reduce impacts on the Needle Mountains milkvetch to small or negligible levels, but this would restrict development on a large portion of the SEZ. In addition, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Eastwood milkweed. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Nevada Willowherb

The Nevada willowherb is not known to occur in the affected area of the Dry Lake Valley North SEZ, and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 19,200 acres (78 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the Nevada willowherb from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Pioche Blazingstar

The Pioche blazingstar is not known to occur in the affected area of the Dry Lake Valley North SEZ; however, approximately 73,700 acres (298 km^2) of potentially suitable habitat on the SEZ and 46 acres (0.2 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 3% of potentially suitable habitat in the SEZ region. About 228,300 acres (924 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 8% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the Pioche blazingstar from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Pioche blazingstar is not feasible, because potentially suitable shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Eastwood milkweed. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Rock Purpusia

The rock purpusia is not known to occur in the affected area of the Dry Lake Valley North SEZ, and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 19,100 acres (77 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the rock purpusia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Tiehm Blazingstar

The Tiehm blazingstar is not known to occur in the affected area of the Dry Lake Valley North SEZ; however, approximately 73,200 acres (296 km^2) of potentially suitable habitat on the SEZ and 40 acres (0.2 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 3% of potentially suitable habitat in the SEZ region. About 169,350 acres (685 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 7% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the Tiehm blazingstar from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Tiehm blazingstar is not feasible, because potentially suitable shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Eastwood milkweed. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White River Cat's-Eye

The White River cat's-eye is not known to occur in the affected area of the Dry Lake Valley North SEZ, and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 385 acres (2 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the White River cat's-eye from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Ferruginous Hawk

The ferruginous hawk occurs only as a winter resident in the vicinity of the Dry Lake Valley North SEZ, and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 6,300 acres (25 km^2) of potentially suitable foraging habitat on the SEZ and 25 acres (0.1 km^2) within the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents 0.3% of potentially suitable habitat in the SEZ region. About 148,900 acres (603 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 7% of the available suitable foraging habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible means of mitigating impacts on this species because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

Prairie Falcon

The prairie falcon is a year-round resident in the Dry Lake Valley North SEZ region, and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 67,500 acres (273 km^2) of potentially suitable habitat on the SEZ and 26 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents 4% of potentially suitable habitat in the SEZ region. About 139,800 acres (566 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 8% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1). Most of this area could serve as foraging habitat (open shrublands). On the basis of an evaluation of SWReGAP land cover types, potentially suitable nesting habitat (rocky cliffs and outcrops) does not occur on the SEZ or access road corridor; however, approximately 385 acres (1.5 km^2) of this habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the prairie falcon from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable foraging habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species. Avoidance of all potentially suitable foraging habitats to mitigate impacts on the prairie falcon is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effect and in other portions of the SEZ region.

Swainson's Hawk

The Swainson's hawk is considered a summer breeding resident within the Dry Lake Valley North SEZ region, and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 7,100 acres (29 km^2) of potentially suitable habitat on the SEZ and 4 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents 0.3% of potentially suitable habitat in the SEZ region. About 43,900 acres (178 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1). Most of this area could serve as foraging habitat (open shrublands). On the basis of an evaluation of SWReGAP land cover types, potentially suitable nesting habitat (woodlands) does not occur on the SEZ or access road corridor; however, approximately 19,300 acres (78 km^2) of woodland habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the Swainson's hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered small, because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging and nesting habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species. Avoidance of all potentially suitable foraging habitats to mitigate impacts on the Swainson's hawk is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effect and in other portions of the SEZ region.

Western Burrowing Owl

The western burrowing owl is considered a summer breeding resident within the Dry Lake Valley North SEZ region, and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 73,400 acres (297 km^2) of potentially suitable habitat on the SEZ and 46 acres (0.2 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents 2% of potentially suitable habitat in the SEZ region. About 234,250 acres (948 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 7% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable foraging and nesting habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the western burrowing owl, because potentially suitable shrubland habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. Impacts on the western burrowing owl could be reduced by implementing programmatic design features, conducting pre-disturbance surveys, and avoiding or minimizing disturbance to occupied burrows on the SEZ. If avoidance or minimization is not a feasible option, a compensatory plan could be developed and implemented to mitigate direct effects. The plan could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Western Snowy Plover

The western snowy plover is considered a summer breeding resident within the Dry Lake Valley North SEZ region, and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 6,950 acres (28 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents 11% of potentially suitable habitat in the SEZ region. About 8,150 acres (33 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 12% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1). Most of this area could serve as foraging and nesting habitat in and along playa margins. On the basis of an evaluation of SWReGAP land cover types, approximately 3,000 acres (12 km^2) of playa habitat exists on the SEZ that may be potentially suitable nesting or foraging habitat for this species. An additional 3,900 acres (16 km^2) of playa habitat that may be potentially suitable nesting or foraging habitat occurs in the area of indirect effects.

The overall impact on the western snowy plover from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered large, because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents greater than or equal to 10% of potentially suitable foraging and nesting habitat in the region.

Impacts on the western snowy plover could be reduced by implementing programmatic design features, conducting pre-disturbance surveys, and avoiding or minimizing disturbance to all playa habitats and other occupied habitats on the SEZ. If avoidance or minimization of playas and all occupied habitats is not a feasible option, a compensatory plan could be developed and implemented to mitigate direct effects. The plan could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy using one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programamtic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Desert Valley Kangaroo Mouse

The Desert Valley kangaroo mouse is endemic to Nevada and is known to occur on the Dry Lake Valley North SEZ. Approximately 64,750 acres (262 km^2) of potentially suitable habitat on the SEZ and 17 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents 5% of potentially suitable habitat in the SEZ region. About 109,900 acres

(445 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 9% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the Desert Valley kangaroo mouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels.

Despite the apparent widespread availability of potentially suitable habitat in the affected area, the complete avoidance of all playa habitats in the SEZ could reduce impacts on this species. However, this would restrict development on a large portion of the SEZ. Consistent with the mitigation recommendations provided by the USFWS (Stout 2009), pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization is not a feasible option, a compensatory plan could be developed and implemented to mitigate direct effects on occupied habitats. The plan could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Fringed Myotis

The fringed myotis is a year-round resident within the Dry Lake Valley North SEZ region. Suitable roosting habitats (caves and buildings) are not expected to occur on the SEZ, but the availability of suitable roosting sites in the area of indirect effects has not been determined. Approximately 73,300 acres (297 km^2) of potentially suitable foraging habitat on the SEZ and 42 acres (0.2 km^2) of potentially suitable foraging habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 2% of potentially suitable foraging habitat in the region. About 221,700 acres (897 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 5% of the available suitable foraging habitat in the region (Table 11.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (rocky cliffs and outcrops) does not occur on the SEZ or access road corridor; however, approximately 385 acres (1.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects.

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species. However, avoidance of all potentially suitable foraging habitats to mitigate impacts on the fringed myotis is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effect.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is not known to occur in the affected area of the Dry Lake Valley North SEZ. However, approximately 700 acres (3 km^2) of potentially suitable habitat within the SEZ and 13 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents less than 0.1% of potentially suitable habitat in the region. About 65,000 acres (263 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 4% of the available suitable foraging habitat in the region (Table 11.4.12.1-1).

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of the potentially suitable habitat in the region. The implementation of programmatic design features are expected to be sufficient to reduce indirect impacts on this species.

Direct impacts on the Nelson's bighorn sheep could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats and important movement corridors on the SEZ. If avoidance or minimization is not a feasible option, a compensatory plan could be developed and implemented to mitigate direct effects on occupied habitats. The plan could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Pahranagat Valley Montane Vole

The Pahranagat Valley montane vole is endemic to Lincoln County, Nevada, near the Pahranagat Creek. The species is not known to occur in the affected area of the Dry Lake Valley North SEZ; however, approximately 900 acres (4 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents 4% of potentially suitable habitat in the SEZ region. About 300 acres (1 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1% of the potentially suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the Pahranagat Valley montane vole from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoiding or minimizing disturbance to all mesic habitats in the SEZ (e.g., playas) could reduce impacts on this species, but this would restrict development on a large portion of the SEZ. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization are not feasible options, a compensatory plan could be developed and implemented to mitigate direct effects on occupied habitats. The plan could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Pygmy Rabbit

The pygmy rabbit is considered to be a year-round resident within the Dry Lake Valley North SEZ region, where it is known to occur in sagebrush habitats. Approximately 2,550 acres (10 km^2) of potentially suitable habitat on the SEZ and 20 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 0.2% of available suitable habitat in the SEZ region. About 82,700 acres (335 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 6% of the available suitable habitat in the SEZ region (Table 11.4.12.1-1).

The overall impact on the pygmy rabbit from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels.

The avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the pygmy rabbit, because potentially suitable sagebrush habitats are widespread throughout the area of direct effects. However, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization are not feasible options, a compensatory plan could be developed and implemented to mitigate direct effects on occupied habitats. The plan could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Spotted Bat

The spotted bat is a year-round resident within the Dry Lake Valley North SEZ region. Suitable roosting habitats (caves and rock outcrops) are not expected to occur on the SEZ, but the availability of suitable roosting sites in the area of indirect effects has not been determined. Approximately 66,000 acres (267 km^2) of potentially suitable foraging habitat on the SEZ and

37 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 2% of potentially suitable foraging habitat in the region. About 174,200 acres (705 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 4.4% of the potentially suitable foraging habitat in the region (Table 11.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (rocky cliffs and outcrops) does not occur on the SEZ or access road corridor; however, approximately 385 acres (1.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects.

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species. Avoidance of all potentially suitable foraging habitats to mitigate impacts on the prairie falcon is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effect and in other portions of the SEZ region.

Western Small-Footed Bat

The western small-footed bat is a year-round resident within the Dry Lake Valley North SEZ region. Suitable roosting habitats (caves, rock outcrops, and buildings) are not expected to occur on the SEZ, but the availability of suitable roosting sites in the area of indirect effects has not been determined. Approximately 76,700 acres (310 km^2) of potentially suitable foraging habitat on the SEZ and 46 acres (0.2 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.4.12.1-1). This direct effects area represents about 2% of potentially suitable foraging habitat in the region. About 257,375 acres (1,041 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 5% of the potentially suitable foraging habitat in the region (Table 11.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (rocky cliffs and outcrops) does not occur on the SEZ or access road corridor; however, approximately 385 acres (1.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects.

The overall impact on the western small-footed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Dry Lake Valley North SEZ is considered moderate, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species. However, avoidance of all potentially suitable foraging habitats to mitigate impacts on the prairie falcon is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effect and in other portions of the SEZ region.

11.4.12.2.3 Impacts on State-Listed Species

Eight species listed by the State of Nevada may occur in the Dry Lake Valley North SEZ affected area or may be affected by solar energy development on the SEZ (Table 11.4.12.1-1). These state-listed species include the following: (1) plant—Blaine fishhook cactus; (2) reptile—desert tortoise; (3) bird—Swainson's hawk; and (4) mammals—Desert Valley kangaroo mouse, fringed myotis, Pahranagat Valley montane vole, pygmy rabbit, and spotted bat. Impacts on each of these species have been previously discussed because of their known or pending status under the ESA (Section 11.4.12.2.1) or their designation by the BLM as a sensitive species (Section 11.4.12.2.2). State-listed species known to occur within 5 mi (8 km) of the Dry Lake Valley North SEZ include the Blaine fishhook cactus and Desert Valley kangaroo mouse.

11.4.12.2.4 Impacts on Rare Species

A total of 20 rare species (state rank of S1 or S2 in Nevada or a species of concern by the State of Nevada or the USFWS) may be affected by solar energy development on the Dry Lake Valley North SEZ. All these species have already been discussed as ESA-listed (Section 11.4.12.2.1) or BLM-designated sensitive (Section 11.4.12.2.2). Rare species that are known to occur within 5 mi (8 km) of the Dry Lake Valley North SEZ include the Blaine fishhook cactus, Eastwood milkweed, and Desert Valley kangaroo mouse.

11.4.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when specific project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ and access road corridor (i.e., area of direct effects) to determine the presence and abundance of special status species, including those identified in Table 11.4.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Avoiding or minimizing disturbance of playa habitat on the SEZ could reduce or eliminate impacts on the Blaine fishhook cactus, Needle Mountains milkvetch, western snowy plover, Desert Valley kangaroo mouse, and Pahranagat Valley montane vole.

- Consultation with the USFWS should be conducted to address the potential for impacts (primarily indirect impacts) on the desert tortoise, a species listed as threatened under the ESA. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species could be reduced.

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11.4.13 Air Quality and Climate

11.4.13.1 Affected Environment

11.4.13.1.1 Climate

The proposed Dry Lake Valley North SEZ is located in southeastern Nevada, in the north central portion of Lincoln County. Nevada lies on the eastern lee side of the Sierra Nevada Range, which markedly influences the climate of the state under the prevailing westerlies (NCDC 2010a). In addition, the mountains east and north of Nevada act as a barrier to the cold arctic air masses, and thus long periods of extremely cold weather are uncommon. The SEZ lies at an average elevation of about 4,760 ft (1,450 m) in the south-central portion of the Great Basin Desert, which has a high desert climate marked by year-round pleasant weather (mild winters and warm summers), large daily temperature swings due to dry air, scant precipitation, low relative humidity, and abundant sunshine. Meteorological data collected at the Ely Yelland Field, about 82 mi (132 km) north of the Dry Lake Valley North SEZ boundary, and at Caliente, about 14 mi (23 km) southeast, are summarized below.

A wind rose from the Ely Yelland Field, Nevada, for the 5-year period 2005 to 2009, taken at a level of 33 ft (10 m), is presented in Figure 11.4.13.1-1 (NCDC 2010b).[6] During this period, the annual average wind speed at the airport was about 9.2 mph (4.1 m/s); the prevailing wind direction was from the south (about 24.4% of the time) and secondarily from the south–southeast (about 16.0% of the time). Winds blew predominantly from the south every month throughout the year (about 52% in wind directions ranging from south–southeast clockwise to south–southwest inclusive). Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 10% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were relatively uniform; they were highest in spring at 9.7 mph (4.3 m/s), lower in summer and fall at 9.2 mph (4.1 m/s), and lowest in winter at 8.7 mph (3.9 m/s).

For the 1903 to 2009 period, the annual average temperature at Caliente was 53.4°F (11.9°C) (WRCC 2010c).[7] January was the coldest month, with an average minimum temperature of 17.8°F (−7.9°C), and July was the warmest month, with an average maximum of 95.4°F (35.2°C). In summer, daytime maximum temperatures were frequently in the 90s, and minimums were in the 50s. The minimum temperatures recorded were below freezing (≤32°F [0°C]) during the colder months (most days from November through March), but subzero

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[6] Although the Ely Yelland Field is rather far from the Dry Lake Valley North SEZ, it was chosen to be representative of the SEZ, considering the similar north–south orientation of valley and mountain ranges.

[7] Pioche is closer (about 12 mi [19 km]) to the Dry Lake Valley North SEZ than Caliente (14 mi [23 km]) but at a higher elevation, about 1,800 ft (550 m) and 1,400 ft (430 m), than Caliente and the SEZ, respectively, Temperatures at Caliente are about few degrees higher than those at Pioche, while precipitation and snowfall at Caliente are about two-thirds and one-third of those at Pioche, respectively.

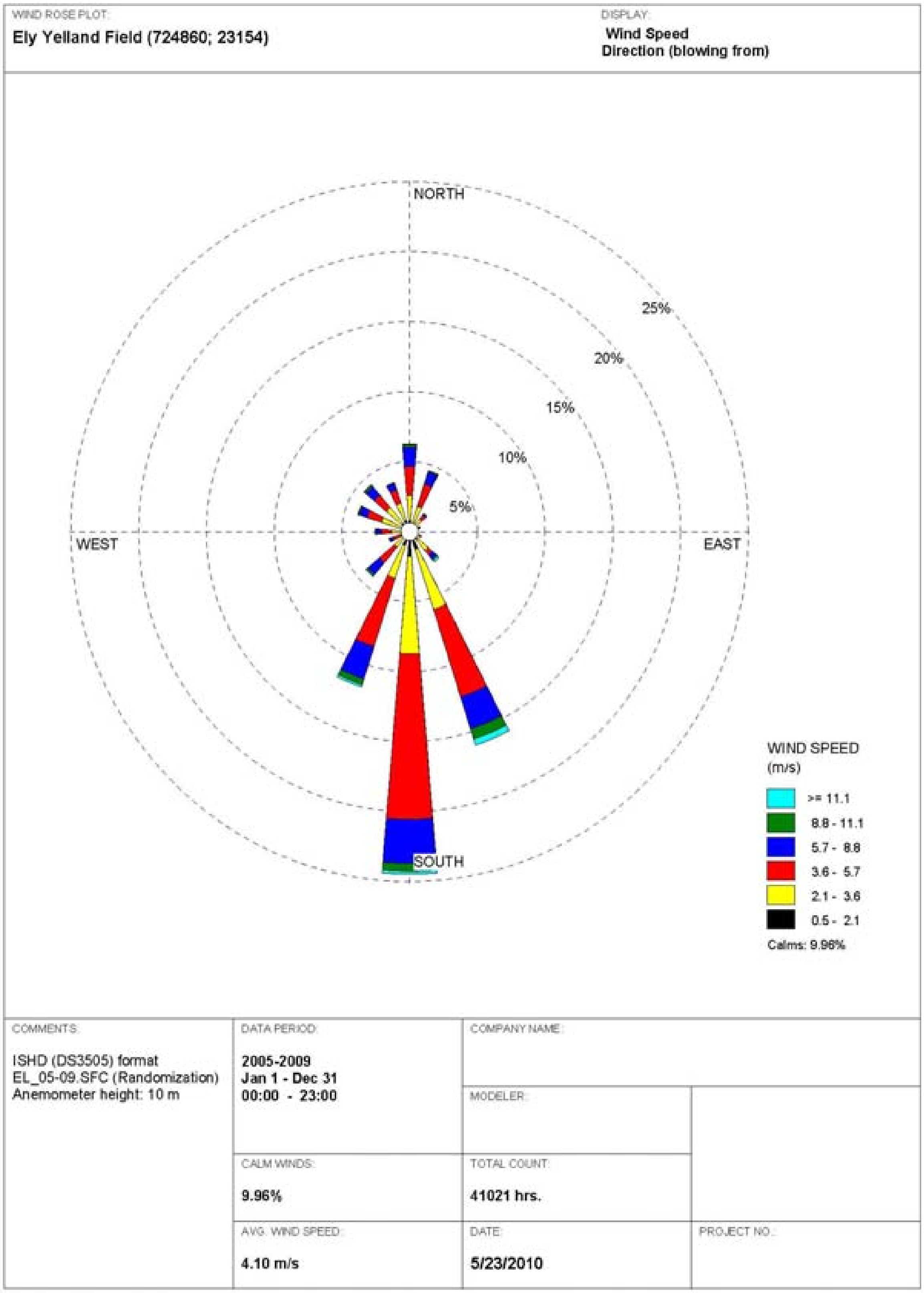

FIGURE 11.4.13.1-1 Wind Rose at 33 ft (10 m) at Ely Yelland Field, Nevada, 2005–2009 (Source: NCDC 2010b)

temperatures were recorded about 3 days per year from December to February. During the same period, the highest temperature, 110°F (43.3°C), was reached in July 1915, and the lowest, −31°F (−35.0°C), in January 1937. In a typical year, about 78 days had a maximum temperature of greater than or equal to 90°F (32.2°C), while about 158 days had minimum temperatures at or below freezing.

For the 1903 to 2009 period, annual precipitation at Caliente averaged about 8.74 in. (22.2 cm) (WRCC 2010c).[2] On average, there are 45 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). Precipitation is relatively evenly distributed by season. Snow falls as early as October and continues as late as April; most of it falls from December through February. The annual average snowfall at Caliente is about 11.2 in. (28.4 cm); the highest monthly snowfall recorded was 31.0 in (78.7 cm) in January 1930.

Because the area surrounding the proposed Dry Lake Valley North SEZ is far from major water bodies (more than 330 mi [531 km]) and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as thunderstorms and tornadoes, are rare.

In Nevada, flooding can occur from melting of heavy snowpack. On occasion, heavy summer thunderstorms also cause flooding of local streams, usually in sparsely populated mountainous areas, but are seldom destructive (NCDC 2010a). Since 1996, 18 floods (17 flash floods and 1 flood) were reported in Lincoln County, most of which occurred in the nestled mountain communities and some of which caused property damage. In January 2005, heavy rain and rapid snow melt caused extensive flooding in southern Lincoln and northeast Clark Counties, which brought about significant property damage.

In Lincoln County, seven hail events have been reported since 1981, none of which caused property damage (NCDC 2010c). Hail measuring 1.5 in (3.8 cm) in diameter was reported in 1981. In Lincoln County, 22 high wind events have been reported since 1995, which caused some property damage. Such events, with a maximum wind speed of up to 83 mph (37 m/s), have occurred any time of the year with a peak during spring months. In addition, four thunderstorm wind events have been reported since 1964. Thunderstorm winds, with a maximum wind speed of up to 69 mph (31 m/s) occurred mostly during summer months; one of these caused minor property damage.

In Lincoln County, no dust storm event was reported (NCDC 2010c). However, about 71% the SEZ is covered with silty to fine sandy loams, which have moderate dust storm potential. On occasion, high winds and dry soil conditions could result in blowing dust in Lincoln County. Dust storms can deteriorate air quality and visibility and have adverse effects on health.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes never hit Nevada. Historically, one tropical depression passed within 100 mi (160 km) of the proposed Dry Lake Valley North SEZ (CSC 2010). Tornadoes in Lincoln County, which encompasses the proposed Dry Lake Valley North SEZ, occur infrequently. In the period 1950 to July 2010, a total of six tornadoes (0.1 per year) were reported in Lincoln County (NCDC 2010c). However, all tornadoes occurring in Lincoln County were relatively weak (i.e., one was uncategorized; four were F0; and one was F1 on the Fujita tornado scale). None of these tornadoes caused injuries or deaths, but one of them caused some property damage. All tornadoes in Lincoln County were reported far from the proposed Dry Lake Valley North SEZ.

11.4.13.1.2 Existing Air Emissions

Lincoln County has several industrial emission sources scattered over the county, but their emissions are relatively small. No emission sources are located around the proposed Dry Lake Valley North SEZ. Because of the sparse population, only a handful of major roads exist in Lincoln County, such as U.S. 93 and State Routes 318, 319, and 375. Thus, onroad mobile source emissions are not substantial. Data on annual emissions of criteria pollutants and VOCs in Lincoln County are presented in Table 11.4.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total SO_2 and NO_x emissions (about 56% and 57%, respectively). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions contributed primarily to CO emissions (about 56%) and secondarily to NO_x emissions (about 22%), and accounted for most of the VOC emissions (about 99%). Fire sources were primary contributors to PM_{10} and $PM_{2.5}$ emissions (about 60% and 83%, respectively) and secondary contributors to SO_2 and CO emissions (41% and 33%, respectively). Area sources accounted for about 37% of PM_{10} and 13% of $PM_{2.5}$. In Lincoln County, point sources were minor contributors to criteria pollutants and VOCs.

TABLE 11.4.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Lincoln County, Nevada, Encompassing the Proposed Dry Lake Valley North SEZ, 2002[a]

Pollutant	Emissions (tons/yr)
SO_2	230
NO_x	3,453
CO	47,458
VOCs	172,491
PM_{10}	2,586
$PM_{2.5}$	1,604

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

Source: WRAP (2009).

In 2005, Nevada produced about 56.3 MMt of *gross*[8] carbon dioxide equivalent (CO_2e)[9] emissions, which is about 0.8% of total U.S. GHG emissions in that year (NDEP 2008). Gross GHG emissions in Nevada increased by about 65% from

[8] Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

[9] A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

1990 to 2005 because of Nevada's rapid population growth, compared to 16.3% growth in U.S. GHG emissions during the same period. In 2005, electrical generation (48%) and transportation (30%) were the primary contributors to gross GHG emission sources in Nevada. Fuel use in the residential, commercial, and industrial sectors combined accounted for about 12% of total state emissions. Nevada's *net* emissions were about 51.3 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in Nevada. Its estimate of CO_2 emissions from fossil fuel combustion was 49.6 MMt, which was comparable to the state's estimate. Electric power generation and transportation accounted for about 52.7% and 33.6% of the CO_2 emissions total, respectively, while the residential, commercial, and industrial sectors accounted for the remainder (about 13.7%).

11.4.13.1.3 Air Quality

The EPA set NAAQS for six criteria pollutants (EPA 2010a): SO_2, NO_2, CO, O_3, PM (PM_{10} and $PM_{2.5}$), and Pb. Nevada has its own SAAQS, which are similar to the NAAQS with some differences (NAC 445B.22097). In addition, Nevada has set standards for 1-hour H_2S, which are not addressed by the NAAQS. The NAAQS and Nevada SAAQS for criteria pollutants are presented in Table 11.4.13.1-2.

Lincoln County is located administratively within the Nevada Intrastate AQCR, along with 10 other counties in Nevada, with the exception of the Las Vegas Intrastate AQCR (Clark County only), which encompasses Las Vegas, and the Northwest Nevada Intrastate AQCR (five northwest counties), which encompasses Reno. Currently, the area surrounding the proposed SEZ is designated as being in unclassifiable/attainment of NAAQS for all criteria pollutants (40 CFR 81.329).

Because of Lincoln County's low population density, it has no significant emission sources of its own and only minor mobile emissions along major highways. Accordingly, ambient air quality in Lincoln County is relatively good. There are no ambient air-monitoring stations in Lincoln County. To characterize ambient air quality around the SEZ, one monitoring station in Clark County was chosen: Apex in the northeast corner of North Las Vegas in Clark County, about 93 mi (150 km) south of the SEZ. The Apex station, which is downwind of the Las Vegas area along with predominant southwesterly winds but upwind of the SEZ, can be considered representative of the proposed SEZ. Ambient concentrations of NO_2, O_3, PM_{10}, and $PM_{2.5}$ are recorded at the Apex station. CO concentrations at the East Tonopah station in Las Vegas, which is the farthest downwind station of Las Vegas, were presented. The East Sahara Avenue station, which is on the outskirts of Las Vegas, has only one SO_2 monitor in the area. No Pb measurements have been made in the state of Nevada because of low Pb concentration levels after the phaseout of leaded gasoline. The background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 11.4.13.1-2 (EPA 2010b). Monitored concentration levels were lower than their respective standards (up to 65%), except O_3, which approaches the 1-hour NAAQS/SAAQS but exceeds the 8-hour NAAQS. However, ambient concentrations around the SEZ are anticipated to be lower than those presented in the table, except PM_{10} and $PM_{2.5}$, which can be either higher or lower.

TABLE 11.4.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed Dry Lake Valley North SEZ in Lincoln County, Nevada, 2004 to 2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	SAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	75 ppb[d]	–[e]	–	–
	3-hour	0.5 ppm	0.5 ppm	0.009 ppm (1.8%)	Las Vegas, Clark County, 2005
	24-hour	0.14 ppm	0.14 ppm	0.008 ppm (5.7%)	Las Vegas, Clark County, 2005
	Annual	0.030 ppm	0.030 ppm	0.006 ppm (20%)	Las Vegas, Clark County, 2005
NO_2	1-hour	100 ppb[f]	–	–	–
	Annual	0.053 ppm	0.053 ppm	0.006 ppm (11%)	North Las Vegas, Clark County, 2007
CO	1-hour	35 ppm	35 ppm	5.7 ppm (16%)	Las Vegas, Clark County, 2004
	8-hour	9 ppm	9 ppm[g]	3.9 ppm (43%)	Las Vegas, Clark County, 2005
O_3	1-hour	0.12 ppm[h]–	0.12 ppm[i]	0.104 ppm (87%)	North Las Vegas, Clark County, 2005
	8-hour	0.075 ppm	–	0.081 ppm (108%)	North Las Vegas, Clark County, 2007
PM_{10}	24-hour	150 $\mu g/m^3$	150 $\mu g/m^3$	97 $\mu g/m^3$ (65%)	North Las Vegas, Clark County, 2006
	Annual	–	50 $\mu g/m^3$	22 $\mu g/m^3$ (44%)	North Las Vegas, Clark County, 2008
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	–	10.2 $\mu g/m^3$ (29%)	North Las Vegas, Clark County, 2005
	Annual	15.0 $\mu g/m^3$	–	4.05 $\mu g/m^3$ (27%)	North Las Vegas, Clark County, 2005
Pb	30-day	–	1.5 $\mu g/m^3$	–	–
	Calendar quarter	1.5 $\mu g/m^3$	–	–	–
	Rolling 3-month	0.15 $\mu g/m^3$ [j]	–	–	–

a Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 µm; PM_{10} = particulate matter with a diameter of ≤10 µm; and SO_2 = sulfur dioxide.

b Monitored concentrations are the second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5;}$ and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

c Values in parentheses are background concentration levels as a percentage of NAAQS or SAAQS. Calculation of 1-hour SO_2 and NO_2 to NAAQS was not made, because no measurement data based on new NAAQS are available.

d Effective August 23, 2010.

e Not applicable or not available.

f Effective April 12, 2010.

g CO standard for the area less than 5,000 ft (1,524 m) above mean sea level. CO standard for the area at or greater than 5,000 ft (1,524 m) above mean sea level is 6 ppm.

h The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

i O_3 standard for the Lake Tahoe Basin, #90, is 0.10 ppm.

j Effective January 12, 2009.

Sources: EPA (2010a,b); NAC 445B.22097.

The PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, EPA recommends that the permitting authority notify the federal land managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. There are several Class I areas around the Dry Lake Valley North SEZ, none of which is situated within the 62-mi (100-km) distance in Arizona, Nevada, and Utah. The nearest Class I area is Zion NP in Utah (40 CFR 81.405), about 81 mi (131 km) east–southeast of the Dry Lake Valley North SEZ. This Class I area is not located downwind of prevailing winds at the Dry Lake Valley North SEZ (Figure 11.4.13.1-1). The next nearest Class I area is Grand Canyon NP in Arizona, which is about 120 mi (193 km) southeast of the SEZ.

11.4.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using heat transfer fluids [HTFs], fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities could displace air emissions that would otherwise be released from fossil fuel power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Dry Lake Valley North SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.4.13.3 below identifies SEZ-specific design features of particular relevance to the Dry Lake Valley North SEZ.

11.4.13.2.1 Construction

The Dry Lake Valley North SEZ has a relatively flat terrain; thus only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[10] However, no receptors were modeled for PSD analysis at the nearest Class I area, Zion NP in Utah, because it is about 81 mi (131 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the Zion NP were selected as surrogates for the PSD analysis. For the Dry Lake Valley North SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions of 3,000 acres (12.1 km^2) each and 9,000 acres (36.4 km^2) in total, in the southeastern portion of the SEZ, close to the nearest communities (Caselton and Prince) and the nearby towns of Caliente, Panaca, and Pioche,

- Surface hourly meteorological data from the Ely Yelland Field[11] and upper air sounding data from the Mercury/Desert Rock Airport for the 2005 to 2009 period, and

- A regularly spaced receptor grid over a modeling domain of 62 × 62 mi (100 km × 100 km) centered on the proposed SEZ, and additional discrete receptors at the SEZ boundaries.

Results

The modeling results for concentration increments and total concentrations (modeled plus background concentrations) for both PM_{10} and $PM_{2.5}$ that would result from construction-related fugitive emissions are summarized in Table 11.4.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 399 $\mu g/m^3$, which far

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[10] To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/SAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

[11] The number of missing hours at the Ely Yelland Field amounts to about 17.7% of the total hours, which may not be acceptable for regulatory applications, because that percentage exceeds the 10% limit defined by the EPA. However, because the wind patterns at Ely Yelland Field are more representative of wind at the Dry Lake Valley North SEZ than the wind patterns at other airports (which have more complete data but are located in different topographic features), the former values were used for the screening analysis.

TABLE 11.4.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Dry Lake Valley North SEZ

			Concentration ($\mu g/m^3$)				Percentage of NAAQS/SAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ SAAQS	Increment	Total
PM_{10}	24 hours	H6H	399	97	496	150	266	331
	Annual	–[d]	58.8	22	80.8	50	118	162
$PM_{2.5}$	24 hours	H8H	21.3	10.2	31.5	35	61	90
	Annual	–	5.9	4.1	9.9	15.0	39	66

[a] $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

[b] Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

[c] See Table 11.4.13.1-2.

[d] Not applicable.

exceeds the relevant standard level of 150 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 496 $\mu g/m^3$ would also exceed the standard level at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 15 $\mu g/m^3$ at Caliente and Panaca (about 14 mi [23 km] southeast and east-southeast from the SEZ, respectively) and 3 $\mu g/m^3$ at the nearest communities (Caselton and Prince, about 10 mi [16 km]) east of the SEZ), Pioche, and Hiko. Due to high mountain ranges to the direction of the SEZ, concentration levels at the nearest communities are predicted to be much lower than those at Caliente and Panaca. Annual average modeled concentration increments and total concentrations (increment plus background) for PM_{10} at the SEZ boundary would be about 58.8 $\mu g/m^3$ and 80.8 $\mu g/m^3$, respectively, which are higher than the SAAQS level of 50 $\mu g/m^3$. Annual PM_{10} increments would be much lower, less than 0.1 $\mu g/m^3$, at all nearby towns. Total 24-hour $PM_{2.5}$ concentrations would be 31.5 $\mu g/m^3$ at the SEZ boundary, which is lower than the NAAQS level of 35 $\mu g/m^3$; modeled increments contribute about two times more than background concentration to this total. The total annual average $PM_{2.5}$ concentration would be 9.9 $\mu g/m^3$, which is below the NAAQS level of 15.0 $\mu g/m^3$. At Caliente, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 0.3 and less than 0.01 $\mu g/m^3$, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—Zion NP in Utah—would be about 4.0 and 0.09 $\mu g/m^3$, or 50% and

2.2% of the PSD increments for the Class I area, respectively. These surrogate receptors are more than 42 mi (67 km) from the Zion NP, and thus predicted concentrations in Zion NP would be much lower than the above values (about 25% and 1% of the PSD increments for 24-hour and annual PM_{10}, respectively), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} concentration levels could exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Predicted total concentrations for 24-hour and annual $PM_{2.5}$ would be below the respective standard level. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area (Zion NP in Utah). Construction activities are not subject to the PSD program, and the comparison provides only a screen for gauging the size of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust from heavy equipment and vehicles have the potential to cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearby federal Class I area. However, SO_x emissions from engine exhaust would be very low, because programmatic design features would require ultra-low-sulfur fuel with a sulfur content of 15 ppm. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 69-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

11.4.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology if wet cooling were implemented (drift comprises low-level PM emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Appendix M.13.4.

Potential air emissions displaced by solar project development at the Dry Lake Valley North SEZ are presented in Table 11.4.13.2-2. Total power generation capacity ranging from 6,833 to 12,300 MW is estimated for the Dry Lake Valley North SEZ for various solar technologies (see Section 11.4.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). If the Dry Lake Valley North SEZ were fully developed, it is expected that emissions avoided could be substantial. Development of solar power in the SEZ could result in avoided air emissions ranging from 32 to 57% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada (EPA 2009c). Avoided emissions could be up to 12% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities could displace up to 46% of SO_2, 17% of NO_x, and 31% of CO_2 emissions in the state of Nevada (EPA 2009a; WRAP 2009). These emissions could be up to

TABLE 11.4.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Dry Lake Valley North SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
76,874	6,833–12,300	11,972–21,549	16,891–30,404	14,488–26,078	0.096–0.17	9,298–16,737
Percentage of total emissions from electric power systems in Nevada[d]			32–57%	32–57%	32–57%	32–57%
Percentage of total emissions from all source categories in Nevada[e]			26–46%	9.6–17%	–[f]	17–31%
Percentage of total emissions from electric power systems in the six-state study area[d]			6.7–12%	3.9–7.1%	3.3–5.9%	3.5–6.4%
Percentage of total emissions from all source categories in the six-state study area[e]			3.6–6.5%	0.54–1.0%	–	1.1–2.0%

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

[b] A capacity factor of 20% was assumed.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.82, 2.42, 1.6×10^{-5}, and 1,553 lb/MWh, respectively, were used for the state of Nevada.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] Not estimated.

Sources: EPA (2009a,c); WRAP (2009).

6.5% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for about 93% of the total electric power generated in Nevada for which contribution of natural gas and coal combustion is comparable (EPA 2009c). Thus, solar facilities to be built in the Dry Lake Valley North SEZ could be more important than those built in other states in terms of reducing fuel combustion–related emissions.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for high-voltage lines during rain or very humid conditions. Since the Dry Lake Valley North SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

11.4.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but are on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

11.4.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Dry Lake Valley North SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

11.4.14 Visual Resources

11.4.14.1 Affected Environment

The proposed Dry Lake Valley North SEZ is located in Lincoln County in eastern Nevada. The SEZ is 33 mi (53 km) west of the Utah border. The SEZ occupies 78,874 acres (319.19 km^2) within the Dry Lake Valley, extending about 8.6 mi (13.8 km) east to west and 25 mi (40 km) north to south.

The proposed SEZ is located within the Central Basin and Range Level III ecoregion (Bryce et al. 2003), typified by northerly trending fault-block ranges and intervening drier basins. Valleys, lower slopes, and alluvial fans within this ecoregion are either shrub and grass covered or shrub covered. Flat basins form broad expanses of barren plains, generally with low scrub and grass vegetation and expansive views. The proposed SEZ encompasses areas within the Carbonate Sagebrush Valleys, Shadscale-Dominated Saline Basins, and the Salt Deserts Level IV ecoregions.

The SEZ ranges in elevation from 4,620 ft (1,408 m) in the central portion to 5,400 ft (1,646 m) in the northern portion. The SEZ and surrounding lands are shown in Figure 11.4.14.1-1.

The SEZ occupies the central portion of the relatively broad and very flat Dry Lake Valley, with the flat valley floor, the strong horizon line, and the forms of surrounding mountain ranges being the dominant visual features. The SEZ is framed by mountain ranges on the east and west, with more open views to the north and south. The North Pahroc range rises about 6 mi (10 km) west of the SEZ. Several mountain ranges occur east of the SEZ: West Range, Bristol Range, Highland Range, Ely Springs Range, Black Canyon Range, and Burnt Springs Range. These ranges include peaks generally between 5,000 and 6,000 ft (1,520 and 1,830 m) in elevation, but with some peaks over 8,000 feet (2,440 m) high. From the northwest to the southeast, the Dry Lake Valley extends more than 34 mi (55 km) and is about 10 mi (16 km) wide.

Vegetation is generally sparse in much of the SEZ, with large areas of low grasses and low scrubland. The adjacent areas support Joshua Tree-sagebrush habitat. During an August 2009 site visit, the sparse, medium-to-fine textured vegetation presented a limited range of light greens, grays, and light browns against a backdrop of fine-textured, very light brown soils.

No permanent surface water occurs within the SEZ; however, the far southwestern portion of the SEZ occupies part of a dry lakebed. A very large wash on the north side of the SEZ provides strong color and texture contrasts due to the lack of vegetative cover and the exposed very light soil color within the wash.

Cultural disturbances visible within the SEZ include roads, fences, livestock ponds, and a transmission line. The land is used primarily for grazing. There is evidence of damage from OHV use. Overall, there is a low level of cultural disturbance; from most locations within the SEZ, the landscape is generally natural in appearance.

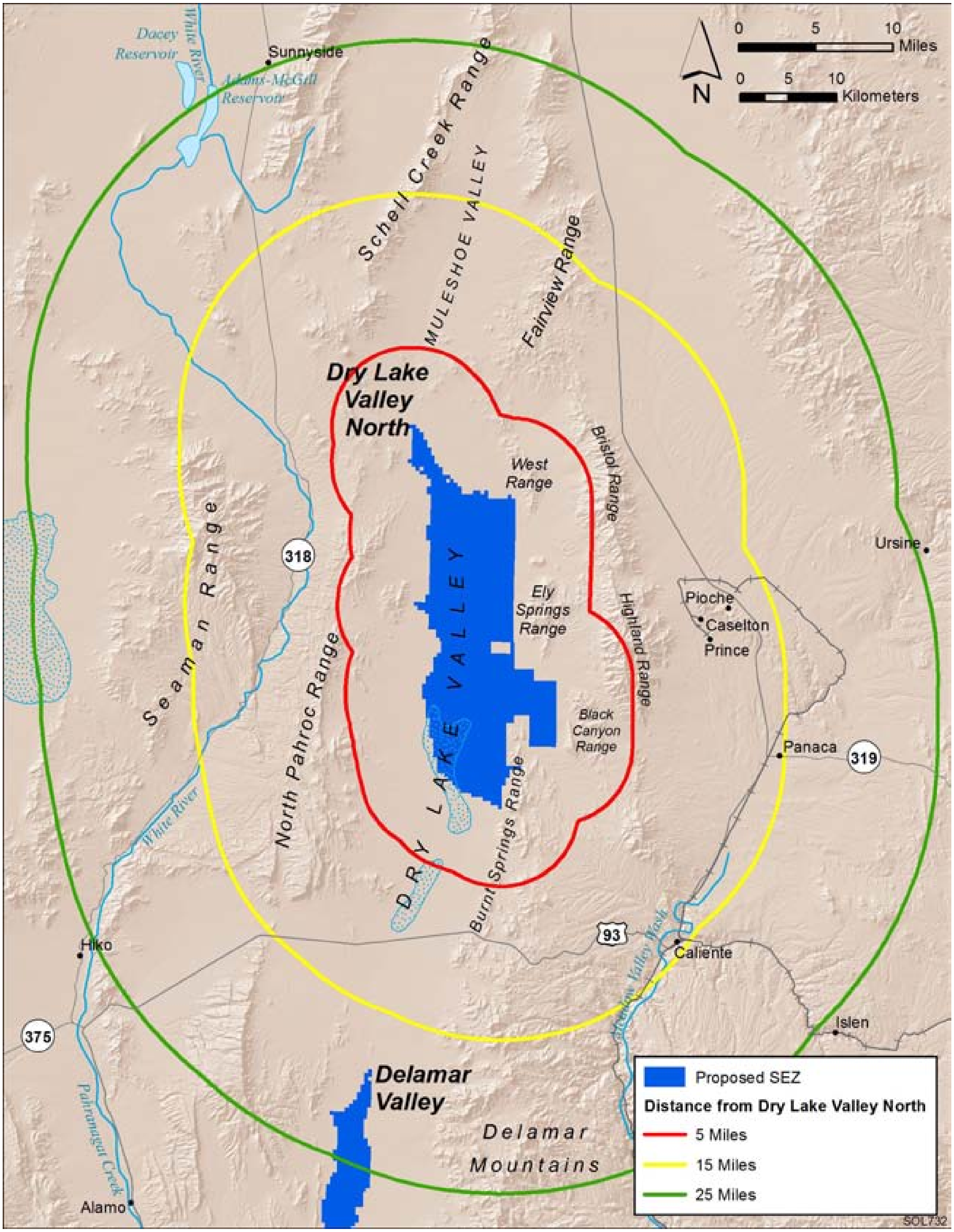

FIGURE 11.4.14.1-1 Proposed Dry Lake Valley North SEZ and Surrounding Lands

The SEZ itself is of low scenic quality because of the general lack of topographic relief, water, variety, or other distinctive visual features. The adjacent mountains add somewhat to the scenic quality, particularly when viewed from nearby locations within the SEZ. The mountain slopes and peaks to the east and west of the SEZ are, in general, visually pristine. Panoramic views of the SEZ are shown in Figures 11.4.14.1-2, 11.4.14.1-3 and 11.4.14.1-4.

The Silver State Trail is a 240-mi (386-km) long multiuse trail that encircles the SEZ and allows visitors access to the mountain ranges that surround Dry Lake Valley. Portions of the Silver State Trail are in the viewshed of the SEZ. No inhabited communities occur within the viewshed of the SEZ, and there are few, if any, residences.

The BLM conducted a VRI for the SEZ and surrounding lands in 2004. The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or KOPs. Based on these three factors, BLM-administered lands are placed into one of four VRI Classes, which represent the relative value of the visual resources. Class I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is presented in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI values for the SEZ and immediate surroundings are VRI Class 4, indicating low relative visual values (BLM 2009f). The BLM conducted a new VRI for the SEZ and surrounding lands in 2010; however, the VRI was not completed in time for the new data to be included in the Draft PEIS. The new VRI data will be incorporated into the analyses presented in the Final PEIS.

The *Ely District Record of Decision and Approved Resource Management Plan* (BLM 2008a) indicate that the SEZ is managed as VRM Class IV, which permits major modification of the existing character of the landscape. More information about the BLM VRM program is presented in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

11.4.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Dry Lake Valley North SEZ and surrounding lands, as well as the impacts of related developments (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information on the location of a project and a relatively complete and accurate description of its major components and their layout, it is

FIGURE 11.4.14.1-2 Approximately 180° Panoramic View of the Proposed Dry Lake Valley North SEZ, from Southern Portion, Looking West toward North Pahroc Range

FIGURE 11.4.14.1-3 Approximately 120° Panoramic View of the Proposed Dry Lake Valley North SEZ, from East–Central Portion, Looking North toward Schell Creek and West Ranges

FIGURE 11.4.14.1-4 Approximately 120° Panoramic View of the Proposed Dry Lake Valley North SEZ, from Far Northwestern Portion, Looking Southeast toward West and Ely Springs Ranges (Foreground) and Bristol and Highland Ranges (Background)

not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology used for the visual impact assessment presented in this PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint-and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of the PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

11.4.14.2.1 Impacts on the Proposed Dry Lake Valley North SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities utilizing highly reflective surfaces or major light-emitting components (solar dish, parabolic trough, and power tower technologies). These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby. Additional, and potentially large impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 11.4.22.4.13 of this PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as seen from nearby KOPs, which permits major modification of the existing character of the landscape. As noted above, the entire SEZ is currently managed as VRM Class IV. More information about impact determination using the BLM VRM program is presented in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

11.4.14.2.2 Impacts on Lands Surrounding the Proposed Dry Lake Valley North SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ are visible from the SEZ (see Appendix M for important information on assumptions and limitations of the methods used). Four viewshed analyses were run, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are presented in Appendix N.

Figure 11.4.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers in the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in the PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]), and transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas. Figure 11.4.14.2-2 shows the results of a GIS analysis that overlays selected federal, state, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds in order to illustrate which of these sensitive visual resource areas would have views of (and potentially be subject to visual impacts from) solar facilities within the SEZ. Distance zones that correspond with BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown to indicate the effect of distance from the SEZ on impact levels. The scenic resources included in the analysis were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

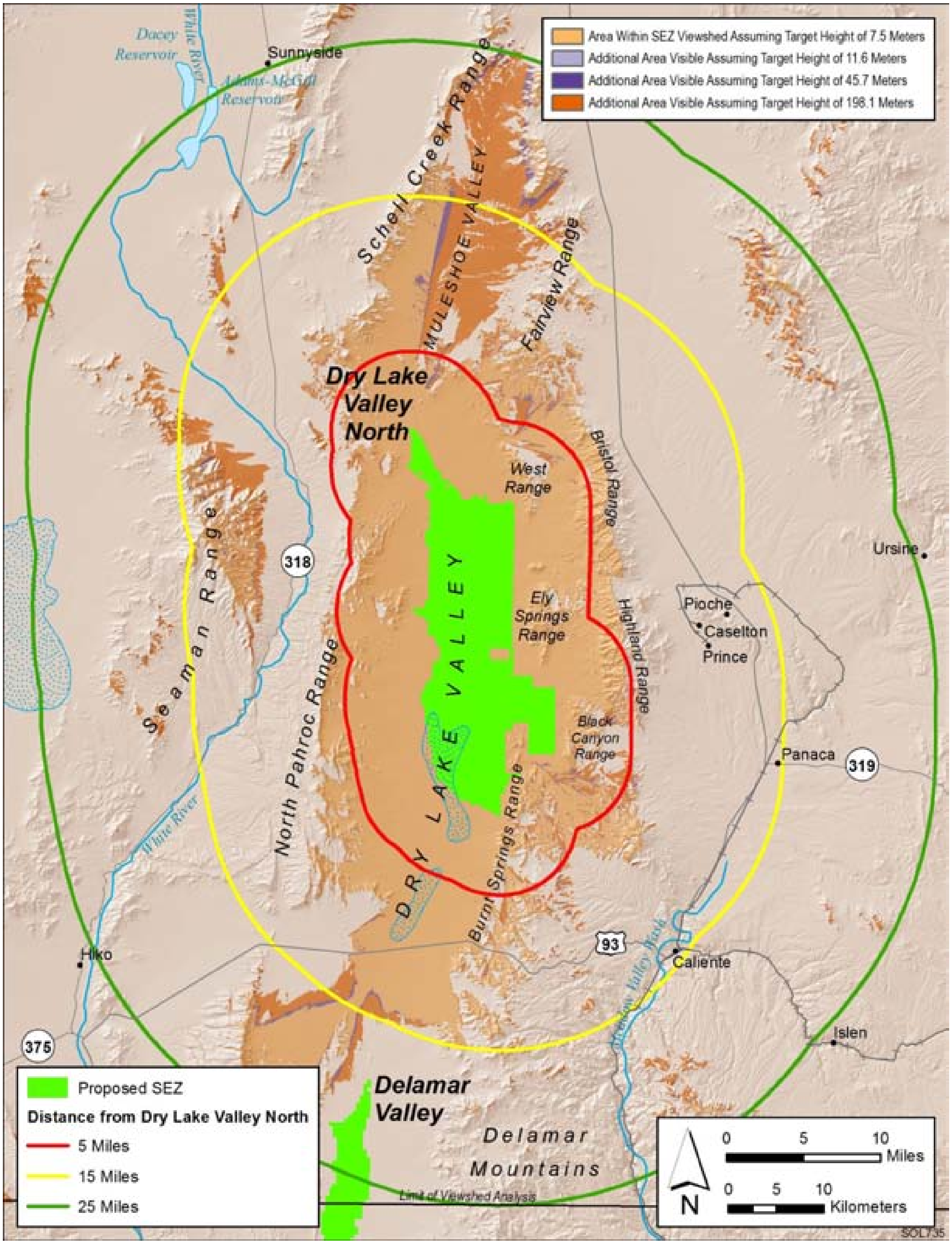

FIGURE 11.4.14.2-1 Viewshed Analyses for the Proposed Dry Lake Valley North SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

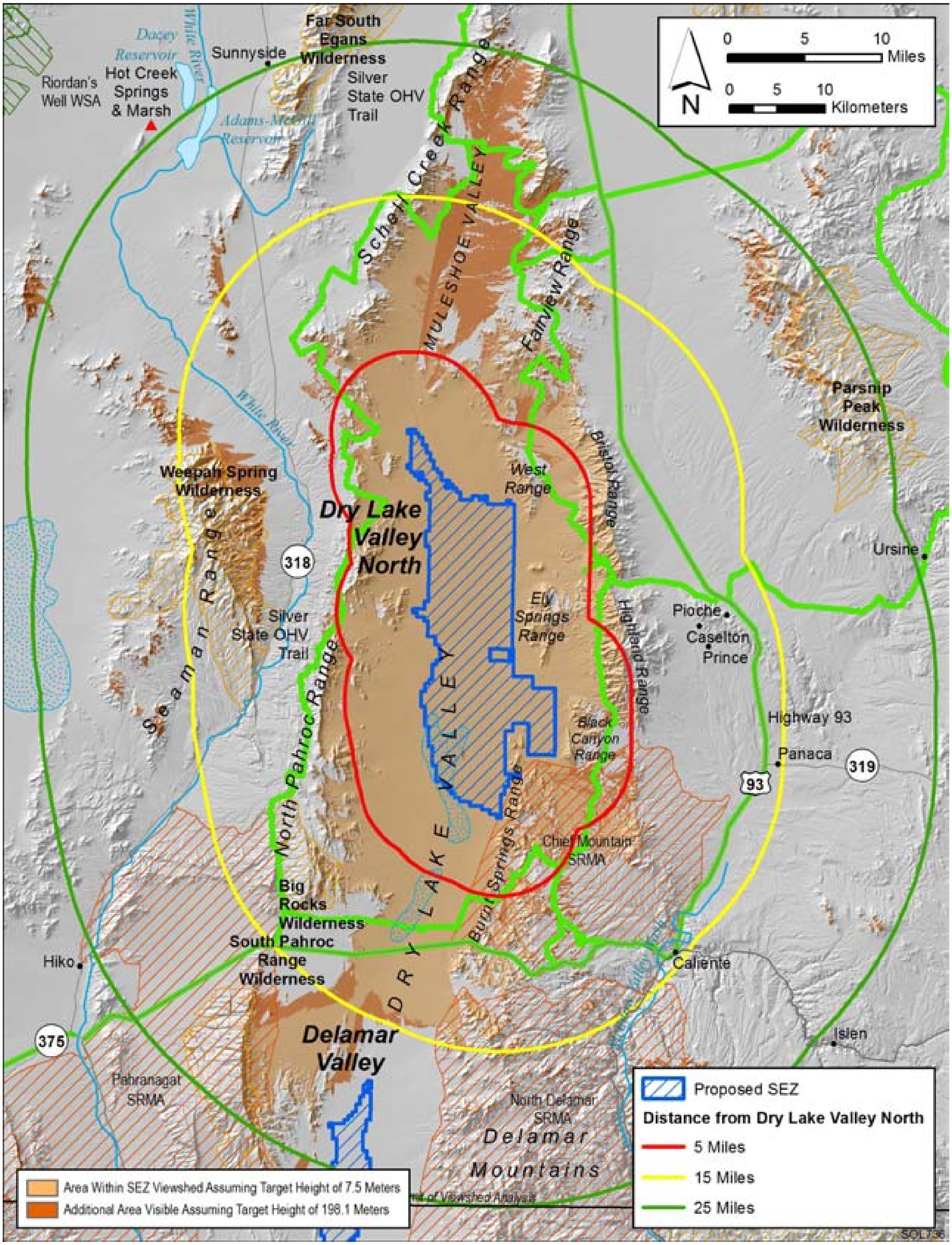

FIGURE 11.4.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Dry Lake Valley North SEZ

- National Historic Landmarks and National Natural Landmarks;

- All-American Roads, National Scenic Byways, State Scenic Highways; and BLM- and USFS-designated scenic highways/byways;

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Dry Lake Valley North SEZ are discussed below. The results of this analysis are also summarized in Table 11.4.14.2-1. Further discussion of impacts on these areas is presented in Sections 11.4.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 11.4.17 (Cultural Resources) of this PEIS. The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the seen landscape, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations where the project might be viewed from; and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

TABLE 11.4.14.2-1 Selected Potentially Affected Sensitive Visual Resources within the 25-mi (40-km) Viewshed of the Proposed Dry Lake Valley North SEZ, Assuming a Target Height of 650 ft (198.1 m)[a]

Feature Type	Feature Name (Total Acreage/ Linear Distance)[a]	Feature Area or Linear Distance[b]		
		Visible within 5 mi	Visible between 5 mi and 15 mi	Visible between 15 mi and 25 mi
WA	Big Rocks (12,929 acres)	0 acres	1,590 acres (12%)	0
	Clover Mountains (85,621 acres)	0 acres	0 acres	26 acres (0.03%)
	Far South Egans (36,297 acres)	0 acres	0 acres	454 acres (1%)
	Parsnip Peak (43,485 acres)	0 acres	0 acres	1,833 acres (4%)
	South Pahroc Range (25,674 acres)	0 acres	0 acres	2,391 acres (9%)
	Weepah Spring (51,309 acres)	0 acres	13,468 acres (26%)	132 acres (0.3%)
Scenic Highway	U.S. 93	0 acres	10 mi	0
	Silver State	35 mi	(50 mi)	(15 mi)
SRMA	Chief Mountain (111,151 acres)	23,387 acres (21%)	15,689 acres (14%)	0
	Delamar North (202,839 acres)	0 acres	4,009 acres (2%)	2,377 acres (1%)
	Pahranagat (298,567 acres)	0 acres	0 acres	8,403 acres (3%)

[a] To convert acres to km^2, multiply by 0.004047. To convert mi to km multiply by 1.609.

[b] Percentage of total feature acreage or road length viewable.

Wilderness Areas

- *Big Rocks*—Big Rocks is a 12,929-acre (52.322-km^2), congressionally designated WA located 8.2 mi (13.2 km) southwest of the SEZ. Recreational opportunities include climbing, bouldering, camping, hiking, backpacking, hunting, and horseback riding. Little Boulder Spring hiking trail is 2 mi (3 km) long and begins on the east side of the wilderness area. This trail winds its way up to a peak with views of the South Pahroc Range and the SEZ.

As shown in Figure 11.4.14.2-2, solar energy facilities within the SEZ could be visible from the southeastern portion of the WA (approximately 1,590 acres [6.435 km^2] in the 650-ft [198.1-m] viewshed, and 1,397 acres [5.654 km^2] in the 24.6-ft [7.5-m] viewshed, or 11% of the total WA acreage). The visible area of the WA extends from approximately 9.1 mi (14.6 km) to 12 mi (19 km) from the southwestern boundary of the SEZ.

Figure 11.4.14.2-3 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the southeastern portion of the WA, approximately 9.6 mi (15.5 km) from the nearest point on the southwest boundary of the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aide for assessing the approximate size and viewing angle of utility-scale solar facilities.

The receiver towers depicted in the visualization are properly scaled models of a 459-ft (139.9-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing approximately 100 MW of electric generating capacity. Three groups of four models were placed in the SEZ for this and other visualizations shown in this section of the PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint is from an unnamed peak in the North Pahroc Range, at an elevation of approximately 6,980 ft (2,130 m), 9.6 mi (15.5 km) from the nearest point in the SEZ. The viewpoint is approximately 2,400 ft (730 m) higher in elevation than the nearest point in the SEZ, and from this height and view orientation, the SEZ occupies most of the horizontal field of view. At the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would likely appear as a moderately wide band of contrasting forms, textures, and colors beneath the mountain ranges that border the eastern side of the SEZ.

Despite the nearly 10-mi (16-km) distance from the viewpoint to the SEZ, the elevation difference between the viewpoint and the SEZ is great enough that the tops of collector/reflector arrays for solar facilities in the southern portions of the SEZ would be visible, which would increase the visible surface area of the facilities, and make their strong regular geometry more apparent, tending to increase visual contrast.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting

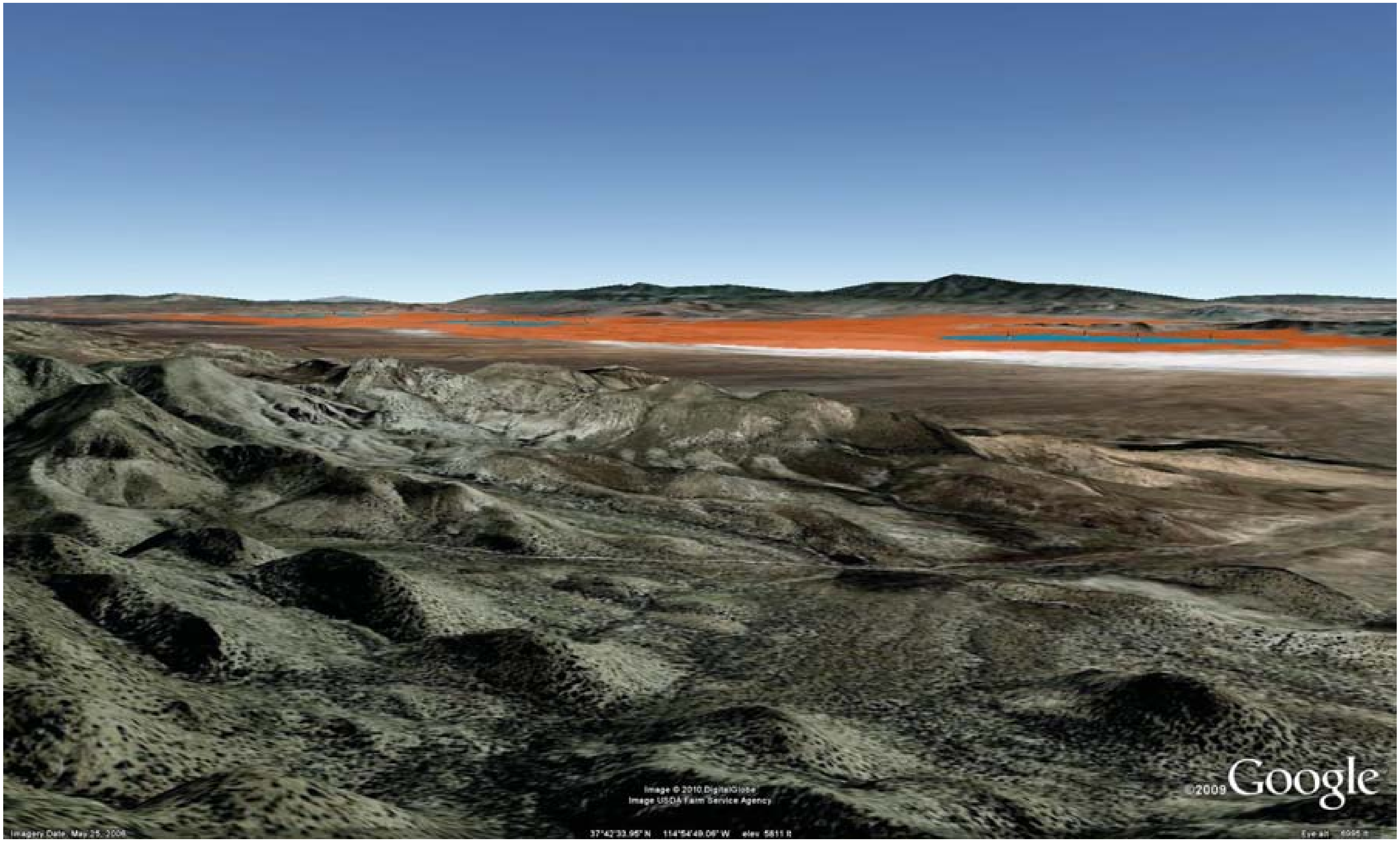

FIGURE 11.4.14.2-3 Google Earth Visualization of the Proposed Dry Lake Valley North SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Unnamed Peak in Big Rocks WA

above the collector/reflector arrays. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

If power tower facilities were located in the SEZ, when operating, the receivers would likely be visible as bright points of light atop discernable tower structures, against a backdrop of the valley floor. At night, if more than 200 ft (61 m) tall, power towers would have hazard navigation lights that could potentially be visible from this location. The lights could be red flashing lights or red or white strobe lights, and the light could be visible for long distances. Other lighting associated with solar facilities could be visible as well.

Visual contrasts associated with solar facilities within the SEZ would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other visibility factors. From this viewpoint, under the 80% development scenario analyzed in this PEIS, solar development within the SEZ would be expected to dominate views from this location, and strong visual contrasts would be expected to result.

From some lower elevation viewpoints in portions of the WA within the SEZ viewshed, partial topographic screening of the SEZ would occur because the mountains within and outside the WA block views of portions of the SEZ. However, the vertical angle of view is great enough that in most of these partially screened areas, at least weak levels of visual contrast would be expected, and where views of the SEZ are unobstructed, moderate levels of visual contrast would be expected. Overall, under the 80% development scenario, weak to strong visual contrasts would be expected from solar energy facilities within the SEZ, as viewed from portions of the Big Rocks WA within the SEZ viewshed.

- *Clover Mountains*—Clover Mountains is an 85,621-acre (346.50-km^2) congressionally designated WA located 24 mi (39 km) at the point of closest approach southeast of the SEZ. Hiking, camping, climbing, and rock scrambling, as well as horseback riding opportunities are, outstanding because of the variety of scenic topography in the WA.

  As shown in Figure 11.4.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from a very small area at the northernmost tip of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total approximately 26 acres (0.11 km^2) in the 650-ft (198.1-m) viewshed, or 0.03% of the total WA acreage, and 16 acres [0.07 km^2] in the 24.6-ft (7.5-m) viewshed, or 0.02% of the total WA acreage. The visible area of the WA extends close to 25 mi (40 km) from the southern boundary of the SEZ.

The area of the WA within the SEZ viewshed is near the summit of a 7,272-ft (2,217-m) peak near Ella Mountain, close to 25 mi (40 km) from the SEZ. The area is partially wooded, and vegetation may screen some views from within the area. Mountains between the viewpoint and the SEZ screen most of the SEZ from view. Because of the very long distance to the SEZ, the angle of view is very low, and except for power towers, solar facilities within the Dry Lake Valley North SEZ would likely not be visible from the WA. The upper portions of sufficiently tall power towers placed within certain portions of the SEZ might be visible as distant points of light on the northwestern horizon during the day and, if more than 200 ft (61 m) tall, would have navigation warning lights at night that could potentially be visible from the WA. Under the 80% development scenario analyzed in this PEIS, minimal levels of visual contrast would be expected.

- *Far South Egans*—Far South Egans is a 36,297-acre (146.89-km^2) congressionally designated WA located 21 mi (34 km) at the point of closest approach north to northwest of the SEZ. Hiking, camping, and backpacking are demanding because of the terrain. Technical rock climbers may find challenges all along the western side of the wilderness area.

  As shown in Figure 11.4.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the highest elevations on southeast facing ridges and from some peak sat the far southern end of the Egan Range within the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total about 454 acres (1.84 km^2) in the 650-ft (198.1-m) viewshed, or 1% of the total WA acreage, and 292 acres [1.18 km^2] in the 24.6-ft (7.5-m) viewshed, or 0.8% of the total WA acreage. The visible area of the WA is about 24 mi (39 km) from the northern boundary of the SEZ.

  Figure 11.4.14.2-4 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from Whipple Peak (elevation 8,828 ft [2,690 m]) near the south end of the Egan Range, about 23 mi (38 km) from the northernmost point of the SEZ. The visualization suggests that even though intervening mountains partially screen the view of the SEZ, because of the 3,700-ft (1,130-m) elevation difference between the viewpoint and the SEZ, a substantial portion of the SEZ is visible. However, the SEZ is so distant that it occupies a small portion of the horizontal field of view, and the angle of view is low. Solar facilities within the SEZ would be seen nearly on edge, tending to repeat the line of the horizon, which would reduce visual contrast. The receivers of power towers within the SEZ could be visible as distant points of light just under the southwest horizon, against the backdrop of the distant valley floor. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location. Under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected.

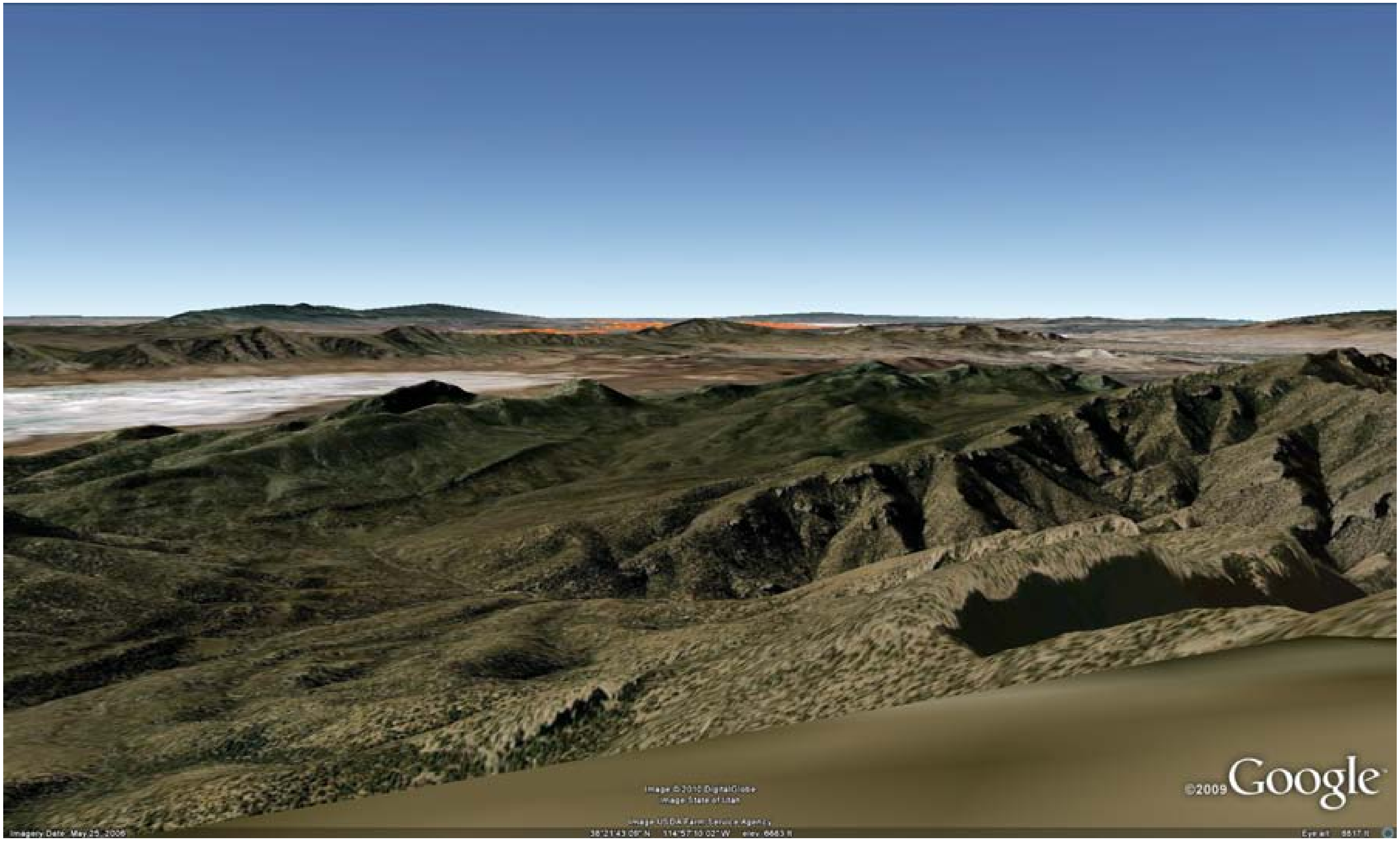

FIGURE 11.4.14.2-4 Google Earth Visualization of the Proposed Dry Lake Valley North SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Whipple Peak in Far South Egans WA

In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location within the WA, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, where there were unobstructed views, contrasts would be expected to be minimal to weak.

- *Parsnip Peak*—Parsnip Peak is a 43,485-acre (175.98 km^2) congressionally designated WA located 19 mi (31 km) at the point of closest approach northeast of the SEZ. Parsnip Peak WA is good for hiking, camping, backpacking, horseback riding, rock climbing, hunting and trapping, plus the study of archaeology and geology. The wilderness area provides excellent opportunities for solitude, particularly in the thick stands of aspen along the eastern side of Parsnip Peak (8,916 feet [2,718 m]).

  As shown in Figure 11.4.14.2-2, within 25 mi (40 km), solar energy facilities within the SEZ could be visible from the far northwestern portion of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total approximately 1,833 acres (7.418 km^2) in the 650-ft (198.1-m) viewshed, or 4% of the total WA acreage, and 505 acres (2.04 km^2) in the 24.6-ft (7.5-m) viewshed, or 1% of the total WA acreage. The visible area of the WA extends to about 23 mi (37 km) from the eastern boundary of the SEZ.

  The Bristol and Highland ranges screen most of the Dry Lake Valley North SEZ from view from within the WA. Only the relatively small, far northern part of the SEZ would be visible from within the WA. The visible portion of the SEZ would occupy a small portion of the horizontal field of view. Despite the elevated viewpoints within the WA, because of the long distance to the SEZ the angle of view is low, and the collector/reflector arrays of solar facilities within the SEZ would be seen edge on. This would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the strong horizon line, thereby reducing potential levels of visual contrast. The receivers of power towers placed within the visible portion of the SEZ might be visible as distant points of light on the western horizon, and could be visible at night if tall enough to require hazard navigation lighting.

  In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location within the WA, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, where there were unobstructed views, contrasts would be expected to be minimal to weak.

- *South Pahroc Range*—The South Pahroc Range is a 25,674-acre (103.90-km^2) congressionally designated WA located 18 mi (29 km) southwest of the SEZ. Hiking, backpacking, horseback riding, and camping opportunities are good throughout the South Pahroc Range Wilderness. Climbers and rock scramblers will find challenging routes that culminate in scenic overlooks atop gargantuan geologic features. Vantage points for hikers provide views of vast desert valleys, interrupted by intervening chains of more distant mountains.

As shown in Figure 11.4.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the eastern edge of the South Pahroc Range, including Hyko Peak, which at an elevation of 7,950 ft (2,423 m) is the high point within the WA. A few small, isolated areas with SEZ visibility occur farther west at high elevations within the WA. The viewshed encompasses about 2,391 acres (9.676 km^2) in the 650-ft (198.1-m) viewshed, or 9% of the total WA acreage, and 2,209 acres (8.940 km^2) in the 24.6-ft (7.5-m) viewshed, or 9% of the total WA acreage. The visible area of the WA extends from the point of closest approach to beyond 25 mi (40 km) from the southwestern boundary of the SEZ.

Figure 11.4.14.2-5 is a Google Earth visual of the SEZ (highlighted in orange) as seen from Hyko Peak in the south–central portion of the South Pahroc Range, approximately 23 mi (38 km) from the southern boundary of the SEZ. The visualization suggests that even though intervening mountains partially screen the view of the northern end of the SEZ, most of the SEZ is visible, and it would occupy a substantial portion of the horizontal field of view. However, the SEZ is so distant that the angle of view is low. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would likely appear as a narrow band of contrasting form and color beneath the mountain ranges that border the eastern side of the SEZ. Solar facilities within the SEZ would be seen nearly on edge. This would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the strong horizon line, thereby reducing potential levels of visual contrast. The receivers of power towers placed within the visible portion of the SEZ might be visible as distant points of light against the backdrop of the distant valley floor, and could be visible at night if tall enough to require hazard navigation lighting. Under the 80% development scenario analyzed in the PEIS, weak levels of visual contrast would be expected.

From lower elevations within the WA, intervening terrain screens more of the SEZ, and in some areas very little of the SEZ is visible. The angle of view is lower as well, so that the SEZ would be seen as a very narrow band of contrasting line and color. In these areas, weak visual contrasts would be expected from solar energy development within the SEZ.

- *Weepah Spring*—Weepah Spring is a 51,309-acre (207.64-km^2) congressionally designated WA located 8.4 mi (13.5 km) at the point of closest approach west of the SEZ. The Weepah Spring WA provides excellent opportunities for solitude among the forested slopes or in one of the many

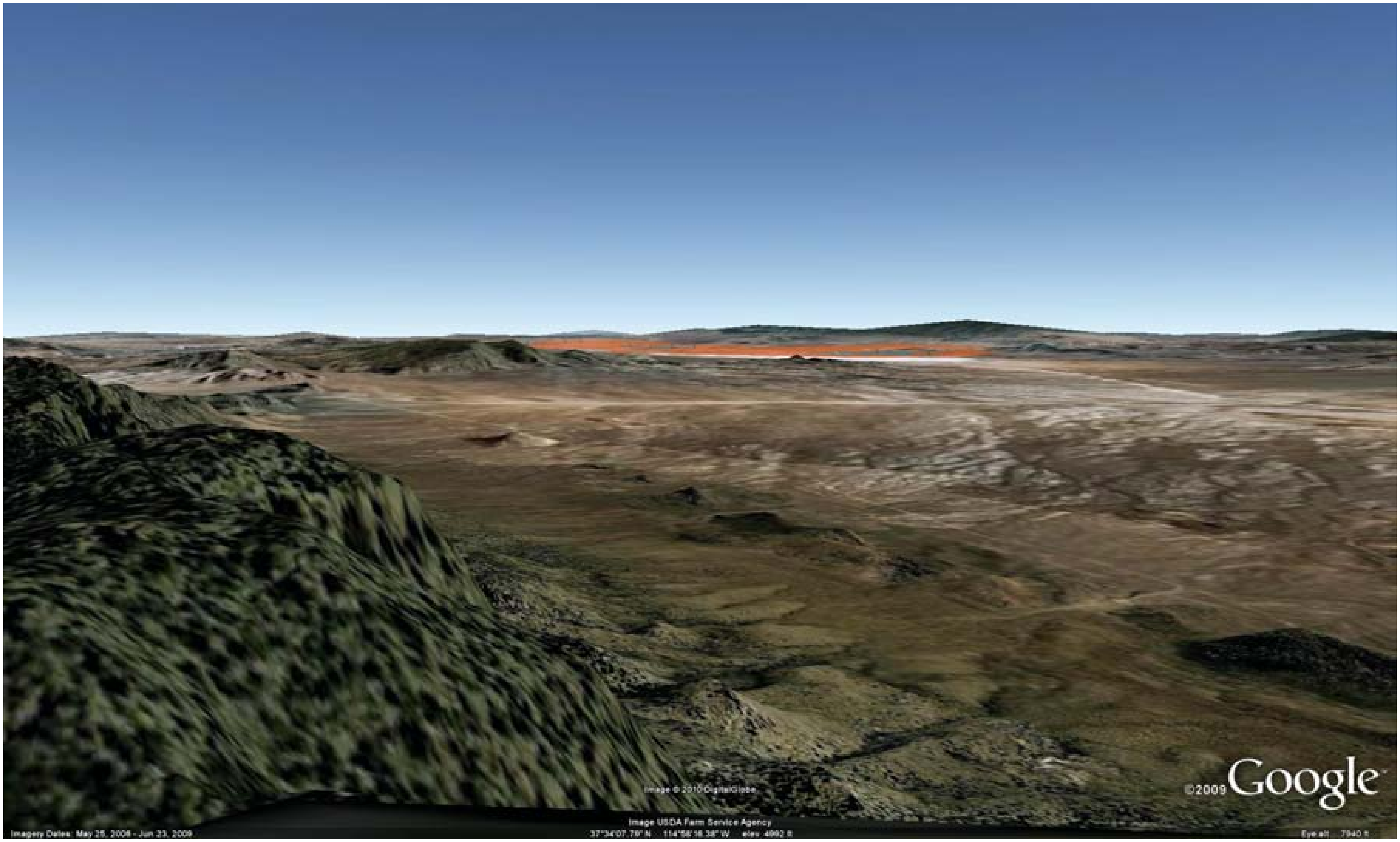

FIGURE 11.4.14.2-5 Google Earth Visualization of the Proposed Dry Lake Valley North SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Hyko Peak in South Pahroc WA

meandering washes and canyons. Recreational pursuits include camping, hiking, backpacking, hunting, and horseback riding.

As shown in Figure 11.4.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from much of the eastern half of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total approximately 13,600 acres (55.037 km^2) in the 650-ft (198.1-m) viewshed, or 27% of the total WA acreage, and 8,105 acres (32.800 km^2) in the 24.6-ft (7.5-m) viewshed, or 16% of the total WA acreage. The visible area of the WA extends to approximately 15 mi (24 km) from the western boundary of the SEZ.

Figure 11.4.14.2-6 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak on Timber Mountain in the central portion of the Seaman Range, about 14 mi (23 km) from the nearest point on the western boundary of the SEZ. The viewpoint elevation is about 8,100 ft (2,470 m), 3,240 ft (990 m) above the nearest point in the SEZ. The viewpoint area contains some open stands of trees, which could provide partial screening of views of the SEZ. From this height and view orientation directly west of the SEZ, the SEZ occupies most of the horizontal field of view. At the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would likely appear as a thin band of contrasting forms, textures, and colors beneath the mountain ranges that border the eastern side of the SEZ. The elevation difference between the viewpoint and the SEZ is great enough that the tops of collector/reflector arrays for solar facilities in the SEZ would be visible, which would increase the visible surface area of the facilities, and make their strong regular geometry more apparent, tending to increase visual contrast.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and could create visual contrasts with the strongly horizontal and regular geometry of the arrays.

If power tower facilities were located in the SEZ, when operating, the receivers would likely be visible as bright points of light atop discernable tower structures, against a backdrop of the valley floor. At night, if more than 200 ft (61 m) tall, power towers would have hazard navigation lights that could potentially be visible from this location.

Visual contrasts associated with solar facilities within the SEZ would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other visibility factors. From this viewpoint, under the 80% development scenario analyzed in this PEIS, strong visual contrasts would be expected from solar energy facilities within the SEZ.

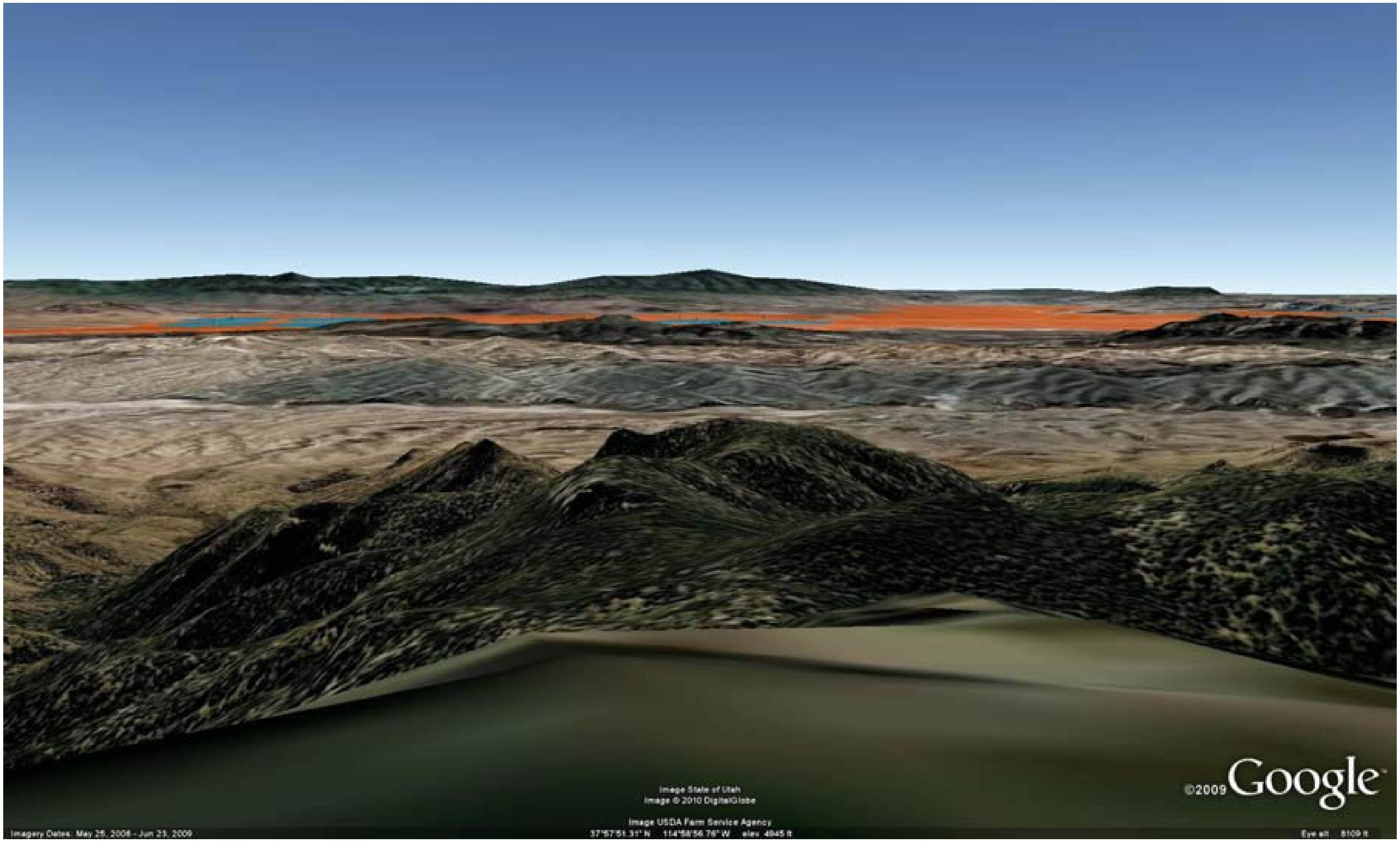

FIGURE 11.4.14.2-6 Google Earth Visualization of the Proposed Dry Lake Valley North SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Weepah Spring WA

From some lower elevation viewpoints in portions of the WA within the SEZ viewshed, partial topographic screening of the SEZ would occur because the mountains between the WA and the SEZ block views of portions of the SEZ. In some locations, screening would block most of the SEZ from view, and weak levels of visual contrast would be expected; however, there are areas where gaps in the intervening mountain ranges are sufficient that moderate levels of visual contrast might result. Overall, under the 80% development scenario, weak to strong visual contrasts would be expected from solar energy facilities within the SEZ, as viewed from portions of the Weepah Spring WA within the SEZ viewshed. The highest contrast levels would be expected at the highest elevations in the central portion of the WA, with lower levels of contrast expected for lower elevations, particularly in the eastern and southern portions of the WA, where the low elevations and proximity of intervening mountains would decrease visibility of the SEZ.

BLM-Designated Special Recreation Management Areas

- *Chief Mountain*—The 111,151-acre (449.812-km^2) Chief Mountain SRMA is located adjacent to portions of the southeast boundary of the SEZ. The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 39,076 acres (158.135 km^2), or 35% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes 73 acres (0.30 km^2), or 0.07% of the total SRMA acreage. The visible area extends from the point of closest approach adjacent to the SEZ boundary to 10 mi (16 km) into the SRMA from the southeast boundary of the SEZ.

  As shown in Figure 11.4.14.2-2, the northwest portion of the SRMA is within the SEZ viewshed. Figure 11.4.14.2-7 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from a jeep trail near the western boundary of the SRMA, about 1.3 mi (2.1 km) southeast of the southernmost tip of the SEZ. The viewpoint is less than 100 ft (30 m) higher in elevation than the nearest point in the SEZ.

  Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would stretch across most of the horizontal field of view. Because the viewpoint is so close in elevation to the nearby SEZ, the vertical angle of view between the viewpoint and the SEZ is very low, and the collector/reflector arrays of solar facilities within the SEZ would be seen edge on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the strong horizon line, all of which would tend to decrease visual contrasts. If facilities were located in the closest parts of the SEZ, however, the array components could be so close to the viewer that their individual forms could be apparent, and they might not appear as a line against the horizon.

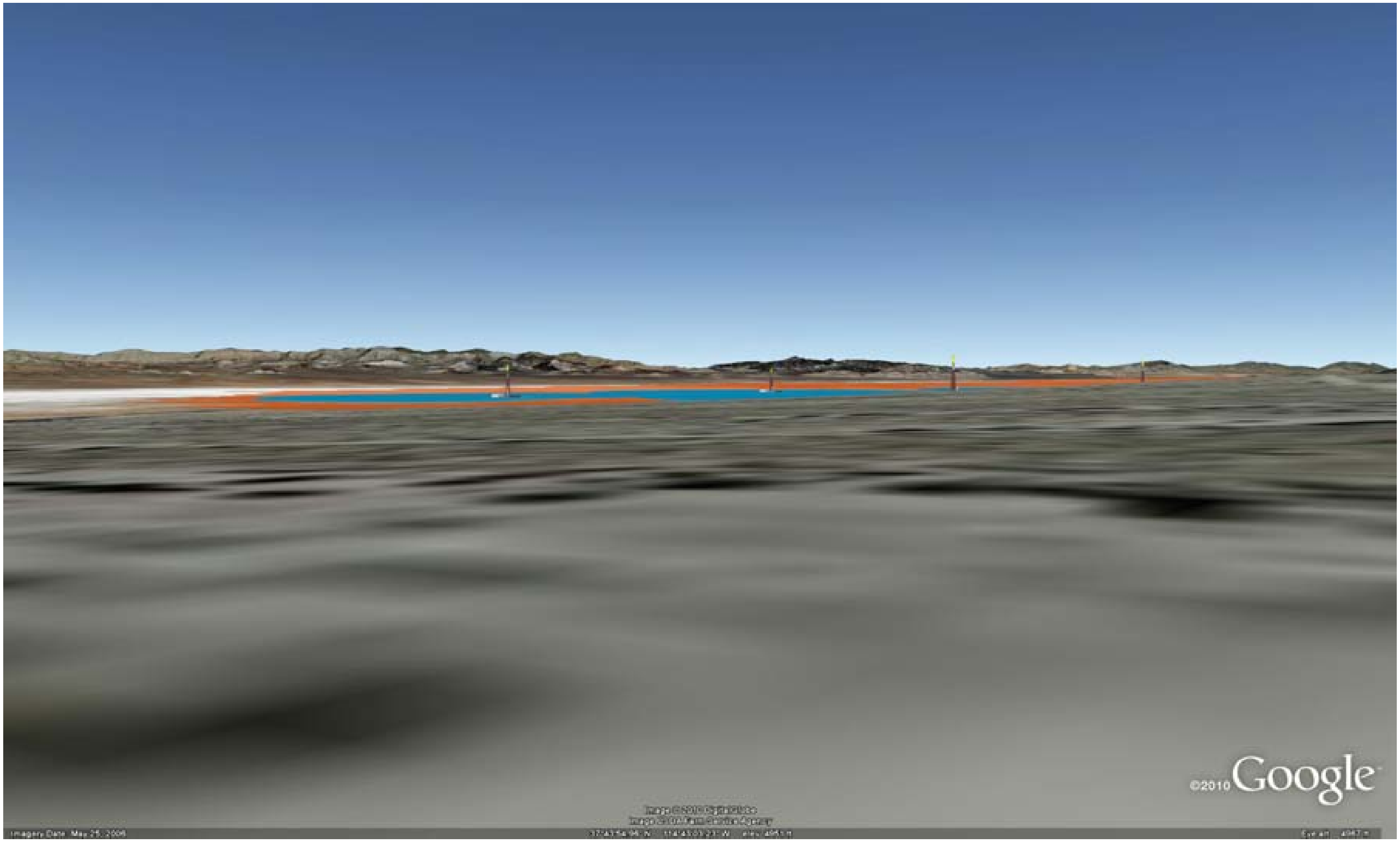

FIGURE 11.4.14.2-7 Google Earth Visualization of the Proposed Dry Lake Valley North SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Jeep Road in Western Portion of Chief Mountain SRMA

Taller ancillary facilities, such as buildings, transmission structures, cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays. The structural details of nearby facilities could be evident. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

The receivers of operating power towers in the closest parts of the SEZ would likely appear as brilliant white non-point light sources atop tower structures with clearly discernable structural details, while those farther from the viewpoint would have diminished brightness and less detail visible. Also, under certain viewing conditions, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). At night, sufficiently tall power towers could have flashing red or white hazard lighting that could be visible for long distances, and would likely be visually conspicuous from this viewpoint, given the dark night skies of this remote valley. Other light sources associated with the solar facilities within the SEZ would likely be visible as well.

Because the SEZ would occupy most of the horizontal field of view, and because of the potentially very close proximity of solar facilities to this location, strong visual contrasts from solar energy development within the SEZ would be expected at this viewpoint. However, the actual contrast levels experienced would depend on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors.

Figure 11.4.14.2-8 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the summit of Chief Mountain, in the interior of the SRMA, about 7.6 mi (12.2 km) southeast of the southern portion of the SEZ. The viewpoint is 2,600 ft (790 m) higher in elevation than the SEZ.

Despite the greatly increased distance, under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would still stretch across most of the horizontal field of view. Because the viewpoint is so much higher in elevation than the SEZ, the vertical angle of view between the viewpoint and the SEZ is high enough that the tops of collector/reflector arrays of solar facilities within the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, which would tend to increase visual contrasts.

Taller ancillary facilities, such as buildings, transmission structures, cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays. The structural details of nearby facilities could be evident. The ancillary facilities could create form and line contrasts

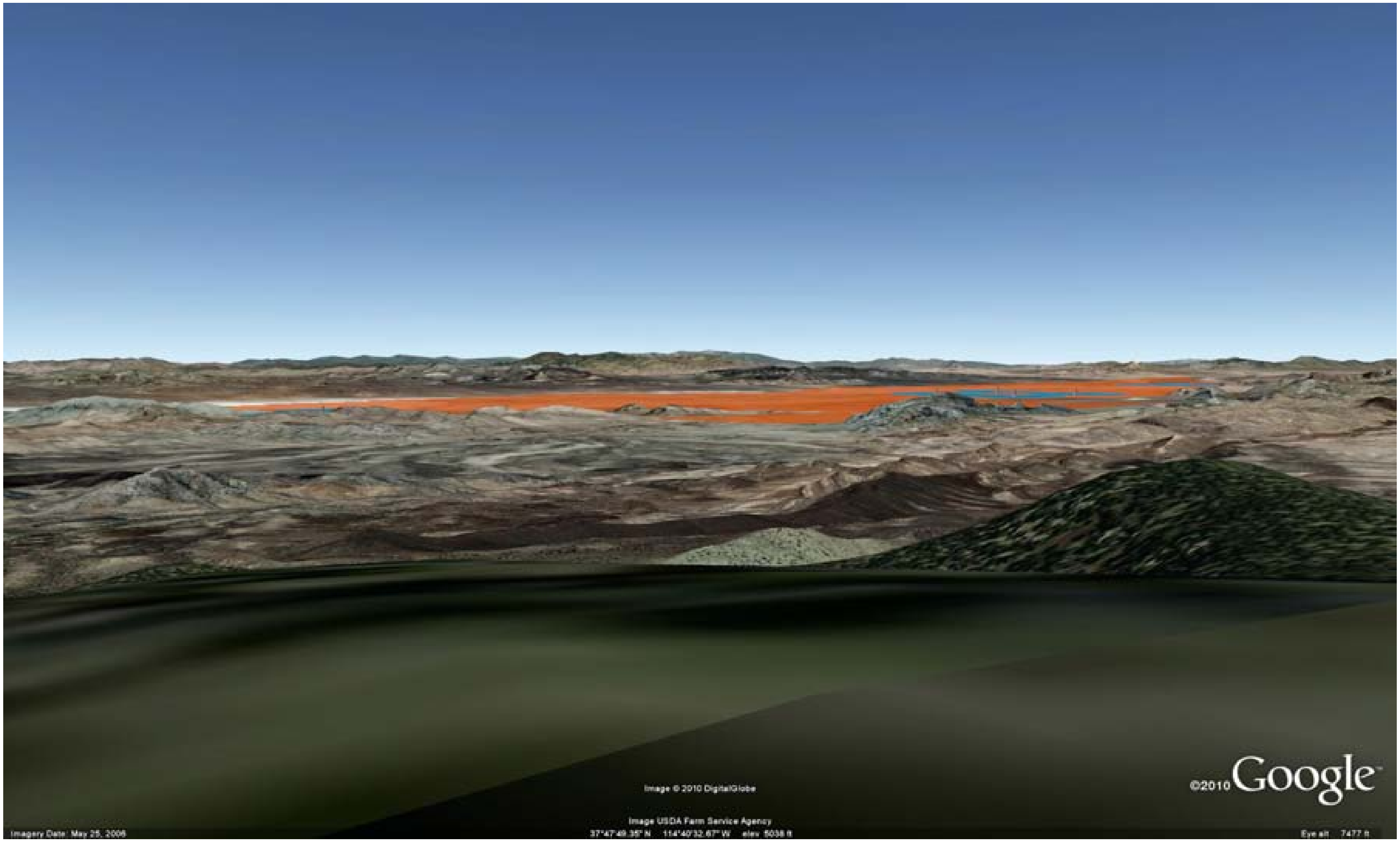

FIGURE 11.4.14.2-8 Google Earth Visualization of the Proposed Dry Lake Valley North SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Summit of Chief Mountain in Chief Mountain SRMA

with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

The receivers of operating power towers in the closest parts of the SEZ would likely appear as points of light atop barely discernable tower structures, while those farther from the viewpoint would have diminished brightness and less detail visible. At night, sufficiently tall power towers could have flashing red or white hazard lighting that would likely be visible from this viewpoint, and could be conspicuous, given the dark night skies of this remote valley.

Because the SEZ would occupy so much of the horizontal field of view and because of the elevated viewpoint, strong visual contrasts from solar energy development within the SEZ would be expected at this viewpoint. However, the actual contrast levels experienced would depend on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors.

At lower elevations in the interior of the SRMA screening would block most or all of the SEZ from view, and much weak levels of visual contrast would be expected; however, there are areas where gaps in the intervening mountain ranges are sufficient that moderate levels of visual contrast might result. Overall, under the 80% development scenario, weak to strong visual contrasts would be expected from solar energy facilities within the SEZ, as viewed from portions of the Chief Mountain SRMA within the SEZ viewshed. The highest contrast levels would be expected at higher elevations in the western portion of the SRMA, with lower levels of contrast expected for lower elevations, particularly in the eastern and southern portions of the SRMA, where the low elevations and proximity of intervening mountains would decrease visibility of the SEZ.

- *North Delamar*—The 202,839 acre (820.860 km^2) North Delamar SRMA is located about 11 mi (18 km) south of the SEZ, and the far northwestern portion of the SRMA is within the SEZ viewshed. The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 6,386 acres (25.84 km^2), or 3% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes 3,983 acres (16.12 km^2), or 2% of the total SRMA acreage. The visible area extends from the point of closest approach to 22 mi (35 km) into the SRMA from the southern boundary of the SEZ.

  As shown in Figure 11.4.14.2-2, scattered areas across the northern portion of the SRMA are within the SEZ viewshed, with the main area having potential visibility of solar facilities within the SEZ being the far northwest corner of the SRMA, at a distance of about 11 mi (18 km). Views of the SEZ are nearly completely screened by mountains in the Burnt Springs Range north of the SRMA, but a very small portion of the southwest corner of the SEZ could be seen from the SRMA. Because of the extensive screening of views toward the SEZ, the SEZ would occupy a very small portion of the horizontal field of view, and visual contrasts from solar facilities within the SEZ would be expected to be weak for viewpoints within the North Delamar SRMA.

- *Pahranagat*—The 298,567-acre (1,208.26-km^2) Pahranagat SRMA is located approximately 11 mi (18 km) southwest of the SEZ at the point of closest approach. The primary recreational values for Pahranagat SRMA include heritage tourism and motorized recreation (BLM 2007e).

  Approximately 8,403 acres (34.01 km^2), or 3% of the SRMA, are within the 650-ft (198.1-m) viewshed of the SEZ, and 6,397 acres (25.89 km2), 2% of the SRMA, are within the 24.6-ft (7.5-m) viewshed. The portions of the SRMA within the viewshed extend from 17 mi (27 km) southwest of the SEZ to beyond 25 mi (40 km) of the SEZ.

  As shown in Figure 11.4.14.2-2, the eastern slopes and bajada of the South Pahroc Range within the SRMA are within the SEZ viewshed. Lower elevation views of the SEZ are largely screened by intervening hills; however, the highest elevations in the South Pahroc Range have more open views of the southern end of the SEZ, and from some locations, the SEZ would occupy a moderate amount of the field of view. The distance to the SEZ is far enough that despite elevated viewpoints, the vertical angle of view to the SEZ is quite low, and collector/reflector arrays of solar facilities in the SEZ would be seen edge-on which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the strong line of the horizon, substantially reducing visual contrasts. In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, because of the long distance to the SEZ, low angle of view and partial screening of the SEZ, contrasts would be expected to be minimal to weak for viewpoints in the Pahranagat SRMA.

Scenic Highways

- *Highway 93*—U.S. 93 is a Nevada State Scenic Byway that is within 8.1 mi (13 km) east and south of the SEZ. It is 149 mi (240 km) long, with some of the highlights located between Caliente and Crystal Springs.

  Approximately 9.5 mi (15.3 km) of the byway are within the 650-ft (198.1-m) viewshed of the SEZ, and 9.3 mi (15.0 km) are within the 24.6-ft (7.5-m) viewshed. Solar facilities within the SEZ would be in full view from U.S. 93

as travelers approached from both directions. For travelers approaching the SEZ from Caliente, southeast of the SEZ, the SEZ would come into view briefly about 13 mi (21 km) west of Caliente, and about 9 mi (14 km) from the SEZ, disappear from view briefly, then become visible again about 1 minute later, at 10 mi (17 km) from Caliente, and would remain in view for about 10 minutes as travelers moved westward.

Figure 11.4.14.2-9 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from U.S. 93 at about 9.2 mi (14.8 km) south-southwest of the southernmost point in the SEZ. Within the viewshed, U.S. 93 is at the same or slightly higher elevation than the southern end of the SEZ, so the angle of view between the highway and the SEZ is very low. The visualization suggests that the SEZ would occupy a substantial portion of the horizontal field of view, but because of the low viewing angle, the SEZ would appear as a very narrow band just under the line of mountains north and east of the SEZ. Solar facilities located within the SEZ would be seen edge on and would repeat the line of the horizon, which would tend to reduce visual contrast.

Facilities utilizing STGs might have plumes and other infrastructure projecting above the arrays, and transmission lines and associated infrastructure would be visible above the array as well. If power tower facilities were located within the southern portion of the SEZ, the tower structures and light sources atop the towers would be visible. The light from the power tower receivers would likely appear as bright starlike points of light against the backdrop of the distant mountain slopes. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that would likely be visible from the roadway. Other lighting associated with solar facilities could be visible as well.

Travelers approaching the SEZ from the west would have similar visual experiences to those just described for westbound travelers; however, the SEZ would come into view about 19 mi (31 km) east of the intersection of U.S. 93 and State Route 375 south of Hiko, 12 mi (19 km) southwest of the SEZ. Under the 80% development scenario, up to moderate levels of visual contrast would be expected from solar facilities within the SEZ, as seen from U.S. 93.

- *Silver State Trail*—Silver State Trail is a congressionally and BLM-designated scenic byway that encircles much of the SEZ, in some areas at less than 3 mi (5 km) from the SEZ. Approximately 100 mi (160 km) of the byway are within the 650-ft (198.1-m) viewshed of the SEZ, and about 75 mi (120 km) are within the 24.6-ft (7.5-m) viewshed. About 35 mi of the trail are within 5 mi (8 km) of the SEZ, while the farthest point on the trail within the SEZ 25 mi (40 km) viewshed are about 20 mi (32 km) from the SEZ, thus contrast levels associated with solar facilities in the SEZ would vary widely, with strong contrasts at the closest distances, especially where the trail was

FIGURE 11.4.14.2-9 Google Earth Visualization of the Proposed Dry Lake Valley North SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on U.S. 93, 9.2 mi South of the SEZ

elevated with respect to the SEZ, and minimal to weak contrasts at the longest distances.

Under the 80% development scenario analyzed in this PEIS, at or near the points on the trail closest to the SEZ, solar facilities within the SEZ would stretch across most or all of the horizontal field of view. In many places, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Because the viewpoints would be close in elevation to the nearby SEZ, the vertical angle of view between the viewpoint and the SEZ would be low, and the collector/reflector arrays of solar facilities within the SEZ would be seen edge on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the strong horizon line, all of which would tend to decrease visual contrasts. In some locations, however, if facilities were located in the closest parts of the SEZ, however, the array components could be so close to the viewer that their individual forms could be apparent, and they might not appear as a line against the horizon.

Taller ancillary facilities, such as buildings, transmission structures, cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays. The structural details of nearby facilities could be evident. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/ reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

From many points on the trail, the receivers of operating power towers in the closest parts of the SEZ would likely appear as brilliant white non-point light sources atop tower structures with clearly discernable structural details, while those farther from the viewpoint would have diminished brightness and less detail visible. Also, under certain viewing conditions, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). At night, sufficiently tall power towers could have flashing red or white hazard lighting that could be visible for long distances, and would likely be very conspicuous from many points on the trail, given the dark night skies of this remote valley. Other light sources associated with the solar facilities within the SEZ would likely be visible as well.

Because the SEZ would occupy most or all of the horizontal field of view, and because of the potentially very close proximity of solar facilities to the trail, strong visual contrasts from solar energy development within the SEZ would be expected for many locations in the portions of the trail closest to the SEZ. However, the actual contrast levels experienced would depend on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors.

For those portions of the trail much farther from the SEZ (especially north of the SEZ) the SEZ would occupy less of the horizontal field of view, but in general, only for those portions of the trail north of the SEZ would contrasts fall to weak levels, and for much of the trail, contrasts would not be expected to fall to even moderate levels.

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other nonfederal sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected nonfederal lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. Currently a 69-kV transmission line is located within the proposed SEZ, so construction and operation of a transmission line outside the proposed SEZ would not be required; however, within the SEZ, transmission lines would have to be constructed to connect facilities to the existing line. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 69-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades.

Depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.12.1. A detailed site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

Other impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

11.4.14.2.3 Summary of Visual Resource Impacts for the Proposed Dry Lake Valley North SEZ

Under the 80% development scenario analyzed in the PEIS, the SEZ would contain multiple solar facilities utilizing differing solar technologies, as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal landscape of the flat valley in which the SEZ is located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development because of major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within the SEZ.

The SEZ is in an area of low scenic quality, with some cultural disturbances already present. Local residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads.

Large segments of the Silver State Trail Scenic Byway are within the viewshed of the SEZ at distances less than 5 mi (8 km), and therefore would be subject to strong visual contrasts associated with the development of solar facilities in the SEZ under the 80% development scenario analyzed in this PEIS. No other highly sensitive visual resource areas are located within 5 mi (8 km) of the SEZ. However, utility-scale solar energy development within the proposed Dry Lake Valley North SEZ is likely to result in strong visual contrasts for some viewpoints within the Big Rocks and Weepah Spring WAs and the Chief Mountain SRMA. Moderate visual contrasts would be expected for some viewpoints along U.S. 93, a state-designated scenic byway. Weak visual contrasts would be expected for other highly sensitive visual resource areas within 25 mi (40 km) of the SEZ.

11.4.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified to protect visual resources for the proposed Dry Lake Valley North SEZ. As noted in Section 5.12, the presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of design features intended to reduce visual impacts (described in Appendix A, Section A.2.2, of this PEIS) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large-scale, reflective surfaces, strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

11.4.15 Acoustic Environment

11.4.15.1 Affected Environment

The proposed Dry Lake Valley North SEZ is located in southeastern Nevada, in the north central portion of Lincoln County. Neither the State of Nevada nor Lincoln County has established quantitative noise-limit regulations.

U.S. 93 runs east–west as close as about 8 mi (13 km) to the south and runs south–north as close as about 8 mi (13 km) to the east of the proposed Dry Lake Valley North SEZ. State Route 318 runs south–north as close as 8 mi (13 km) to the west of the SEZ. Numerous dirt roads cross the SEZ or access livestock facilities in the area. The nearest railroad runs about 14 mi (23 km) southeast of the SEZ. Nearby airports include Lincoln County Airport in Panaca and Alamo Landing Field in Alamo, which are about 13 mi (21 km) south–southeast of and 35 mi (56 km) southwest of the SEZ. No industrial activities except grazing are located around the SEZ. Large-scale irrigated agricultural lands are situated around the SEZ but more than 12 mi (19 km) from the SEZ boundary. Private land on the east central side of the SEZ has a few ranch buildings. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist around the proposed Dry Lake Valley North SEZ. No human receptors are located around the SEZ. The closest communities include Caselton and Prince, about 10 mi (16 km) east of the SEZ. The nearby population centers with schools are Pioche, about 12 mi (19 km) east of the SEZ; Panaca, about 14 mi (23 km) east–southeast; and Caliente, about 14 mi (23 km) southeast. Accordingly, noise sources around the SEZ include road traffic, aircraft flyover, and cattle grazing. Other noise sources are associated with current land use around the SEZ, including outdoor recreation and OHV use. The proposed Dry Lake Valley North SEZ is isolated and undeveloped, the overall character of which is considered wilderness to rural. To date, no environmental noise survey has been conducted around the proposed Dry Lake Valley North SEZ. On the basis of the population density, the day-night average noise level (L_{dn} or DNL) is estimated to be 18 dBA for Lincoln County, well below the range of 33 to 47 dBA L_{dn} typical of a rural area (Eldred 1982; Miller 2002).[12]

11.4.15.2 Impacts

Potential noise impacts associated with solar projects in the Dry Lake Valley North SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment on the nearest residences at Caselton and Prince (about 10 mi [16 km] to the east of the SEZ boundary) would be anticipated to be minimal because of considerable separation distances. During the operations phase, potential noise impacts on the nearest residences would be anticipated to be minimal as well. However, if the Dry Lake Valley North SEZ were fully developed, potential noise impacts on residences along

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[12] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than the daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

the roads would likely be due to commuter, visitor, support, and delivery vehicular traffic to and from the SEZ. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed Dry Lake Valley North SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional SEZ-specific design features applied (see Section 11.4.15.3). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

11.4.15.2.1 Construction

The proposed Dry Lake Valley North SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area where key components (e.g., steam turbine/generator) needed to generate electricity are located; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background levels. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment and by temperature lapse conditions typical of daytime hours; thus noise attenuation to a 40-dBA level would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the southeastern SEZ boundary, estimated noise levels at the nearest residences would be about 16 dBA,[13] which is well below the typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn}[14] at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas.

[13] Although high mountain ranges are located between the SEZ and the nearest residences, it is conservatively assumed that these are located on a flat terrain.

[14] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in a day-night average noise level (L_{dn}) of 40 dBA.

It is assumed that a maximum of three projects would be developed at any one time for SEZs greater than 30,000 acres (121.4 km^2), such as the Dry Lake Valley North SEZ. If three projects were to be built in the eastern portion of the SEZ near the closest residences, noise levels would be about 5 dBA higher than the above-mentioned values. These levels would still be well below the typical daytime mean rural background level, and thus their contribution to the existing L_{dn} would be minimal.

There is one specially designated area within a 5-mi (8-km) range from the Dry Lake Valley North, which is the farthest distance that noise, except extremely loud noise, would be discernable. The Chief Mountains SRMA, adjacent to the southern SEZ, is managed primarily for motorized OHV recreation, and thus noise is not likely to be an issue at this SRMA. No noise impact analysis for other specially designated areas farther than 5 mi (8 km) was made.

Depending on soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet, in contrast to the impulsive impact pile drivers frequently sued at large-scale construction sites. Potential impacts on the nearest residences would be anticipated to be negligible, considering the distance (about 10 mi [16 km] from the SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction within the proposed Dry Lake Valley North SEZ would cause minimal unavoidable but localized short-term noise impacts on neighboring communities, even when construction activities would occur near the southeastern SEZ boundary, close to the nearest residences.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are close. Therefore, no adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 69-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a negligible component of construction impacts and would be temporary in nature.

11.4.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area, commuter/visitor/support/delivery traffic within and around the solar facility, and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and firewater pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southeastern SEZ boundary, the predicted noise level would be about 22 dBA at the nearest residences, about 10 mi (16 km) from the SEZ boundary, which is much lower than the typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[15]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. As for construction, if three parabolic trough and/or power tower facilities were operating around the nearest residences, combined noise levels would be about 5 dBA higher than the above-mentioned values. These levels are still well below the typical daytime mean rural background level of 40 dBA, and their contribution to existing L_{dn} level would be minimal. However, day-night average noise levels higher than those estimated above by using simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Dry Lake Valley North SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[16] within 1 or 2 mi (1.6 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions

[15] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

[16] A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

add to the effect of noise being more discernable during nighttime hours, when the background noise levels are lowest. To estimate the day-night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residences (about 10 mi [16 km] from the SEZ boundary) would be 32 dBA, which is a little higher than the typical nighttime mean rural background level of 30 dBA. However, the noise level would be much lower than this value if an air absorption algorithm, among other attenuation mechanisms, were considered. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 41 dBA L_{dn} at the nearest residences, even if TES were used at a solar facility. Consequently, operating parabolic trough or power tower facilities using TES and located near the southeastern SEZ boundary could result in minimal adverse noise impacts on the nearest residences, depending on background noise levels and meteorological conditions.

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the proposed Dry Lake Valley North SEZ, on the basis of the assumption of dish engine facilities of up to 6,833-MW total capacity (covering 80% of the total area, or 61,499 acres [248.9 km^2]), up to 273,330 25-kW dish engines could be employed. For a large dish engine facility, several thousand step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from hundreds of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, for example, about 52 dBA at 1.0 mi (1.6 km) and 50 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field; both values are higher than the typical daytime mean rural background level of 40 dBA. However, these levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed dish engines were placed all over the Dry Lake Valley North SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residences, about 10 mi (16 km) from the SEZ boundary, would be about 39 dBA, which is below the typical daytime mean rural background level of 40 dBA. On the basis of 12-hr daytime operation, the estimated 41 dBA L_{dn} at these residences is well below the EPA guideline of 55 dBA L_{dn} for residential areas. On the basis of other noise attenuation mechanisms, noise levels at the nearest residences would be lower than the values estimated above, and thus potential impacts on nearby residences would be anticipated to be minimal.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the proposed Dry Lake Valley North SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be negligible.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and not be heard at the nearest residences, assuming a 10.5-mi (16.8-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 10 mi [16 km] to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be negligible.

For impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of 230-kV transmission line towers would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. Corona noise includes high-frequency components, considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts unless a residence was close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The proposed Dry Lake Valley North SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residences from corona noise along transmission lines within the SEZ would be negligible.

11.4.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minimal and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus negligible.

11.4.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. Due to the considerable separation distances, activities within the proposed Dry Lake Valley North SEZ during construction and operation would be anticipated to cause only minimal increases in noise levels at the nearest residences and specially designated areas. Accordingly, SEZ-specific design features are not required.

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11.4.16 Paleontological Resources

11.4.16.1 Affected Environment

The surface geology of the proposed Dry Lake Valley North SEZ is predominantly composed of thick alluvial deposits (more than 100 ft [30 m] thick) ranging in age from the Pliocene to Holocene with some playa deposits of similar age in the southern portion of the SEZ. The total acreage of the alluvial deposits within the SEZ is 69,760 acres (282 km^2), or nearly 91% of the SEZ; 9% of the SEZ is composed of 7,114 acres (29 km^2) playa deposits. In the absence of a PFYC map for Nevada, a preliminary classification of PFYC Class 3b is assumed for the playa deposits. Class 3b indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.8 for a discussion of the PFYC system). A preliminary classification of PFYC Class 2 is assumed for the young Quaternary alluvial deposits, similar to that assumed for the Amargosa Valley SEZ (Section 11.1.16). Class 2 indicates that the potential for the occurrence of significant fossil material is low.

11.4.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in 91% of the proposed Dry Lake Valley North SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above and are classified as PFYC Class 2, further assessment of paleontological resources in most of the SEZ is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. The potential for impacts on significant paleontological resources in the remaining 9% of the SEZ is unknown. A more detailed investigation of the playa deposits is needed prior to project approval. A paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007d, 2008b). Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found to be present within the Dry Lake Valley North SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

Approximately 8 mi (13 km) of access road is anticipated to connect to U.S. 93, south of the SEZ resulting in approximately 58 acres (0.23 km^2) of disturbance in areas predominantly composed of alluvial sediments (preliminarily classified as PFYC Class 2). Direct impacts during construction are not anticipated in PFYC Class 2 areas. Although it is assumed elsewhere in this PEIS that 7 mi (11.3 km) of access road is assumed to connect to State Route 318 instead of U.S. 93, this alternative route would result in a greater potential for impacts on paleontological resources. The amount of disturbance is less (51 acres [0.21 km^2]), but the disturbance would occur in both alluvial sediments (PFYC Class 2) and areas of residual deposits in carbonate rocks (preliminarily classified as PFYC Class 3b areas). Direct impacts during construction are not anticipated in PFYC Class 2 areas, but could occur in PFYC Class 3b areas. A more detailed investigation of residual deposits would be needed prior to project approval. No new transmission lines are currently anticipated for the proposed Dry Lake Valley North SEZ, assuming existing lines would be used. Impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop-work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing excavation of the resource, if warranted. Depending on the significance of the find, it could also result in some modification to the project footprint. Since the SEZ is located in an area partially classified as PFYC Class 3b, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources were uncovered during surface-disturbing activities.

11.4.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

If the geological deposits are determined to be as described above and are classified as PFYC Class 2, mitigation of paleontological resources within 91% of the proposed Dry Lake Valley North SEZ would not likely be necessary. The need for and the nature of any SEZ-specific design features for the remaining 9% of the SEZ would depend on the results of future paleontological investigations.

11.4.17 Cultural Resources

11.4.17.1 Affected Environment

11.4.17.1.1 Prehistory

The proposed Dry Lake Valley North SEZ is located in the Great Basin region. The earliest known use of the area was likely during the Paleoindian Period, sometime between 12,000 and 10,000 B.P. Surface finds of Paleoindian fluted projectile points, the hallmark of the Clovis culture, have been found in the area, but no sites with any stratigraphic context have been excavated. The Clovis culture is characterized by the aforementioned fluted projectile point and a hunting and gathering subsistence economy that followed migrating herds of Pleistocene mega fauna. The ambiguity of Paleoindian occupation in the Great Basin has given rise to the assumption that the people of this time period may have been inclined to subsist off of the lake and marsh habitats provided by the ancient Pleistocene pluvial lakes that occupied a large portion of the Great Basin; consequently, these sites are difficult to find because they have been buried by the ebb and flow of the pluvial lakes. The cultural material associated with the pluvial lake habitations is referred to as the Western Pluvial Lakes Tradition. It is likely that these people did not rely entirely on the marshland habitats, but were nomadic hunters and gatherers who relied on both the wetland resources and those resources located away from the pluvial lakes. The archaeological assemblage associated with this cultural tradition is characterized by stemmed projectile points, leaf-shaped bifaces, scrapers, crescents, and in some cases ground stone tools for milling plant material. Often, projectile points and tools were made from locally procured obsidian, sources of which are not far from the proposed Dry Lake Valley North SEZ, and include Kane Springs Wash and Meadow Valley Wash about 30 mi (48 km) to the southeast, South Pahroc about 10 mi (16 km) to the southwest, Modena about 40 mi (64 km) east, and Pierson Summit about 35 mi (56 km) northeast. Exploiting these sources of obsidian and collecting raw materials for tool manufacture were a part of a larger resource exploitation system, in which groups moved in seasonal rounds to take advantage of resources in different localities (Haarklau et al. 2005; Fowler and Madsen 1986; Hockett et al. 2008).

The Archaic Period in the region began with the recession of most of the pluvial lakes in the area, about 8,000 to 6,000 B.P., and extended to about 4,000 B.P. Archaic Period groups likely still congregated around marsh areas, but also used the vast caves that can be found in the mountains of the Great Basin. The settlement system in some areas was likely based around a central base camp, with temporary camps located on the margins of their territory to exploit resources that were not in the immediate vicinity of the base camp. Some of the key Archaic Period sites in the area located near the proposed Dry Lake Valley North SEZ are Stuart Rockshelter in the lower Meadow Valley Wash area, and Etna Cave, Conway Shelter, and O'Malley Shelter in the upper portions of the Meadow Valley Wash area just east of the SEZ. The Lake Lahontan Basin, a large Pleistocene pluvial lake that was located northeast of the SEZ, was also a place where several early Archaic period sites have been documented; the Archaic archaeological assemblage from these sites maintains some cultural continuity with the previous period, consisting of large notched points, leaf-shaped bifaces, scrapers, drills, gravers, and manos and metates (Fowler and Madsen 1986; Neusius and Gross 2007).

During the Middle Archaic Period, 4,000 to 1,500 B.P., there was a climatic shift known as the Little Pluvial, a wetter and cooler climate that caused some of the pluvial lakes to fill back up. The cultural material of this time period is similar to the Early Archaic, with an increased concentration of milling stones, mortars and pestles, and the appearance of normally perishable items that become well preserved in the arid Great Basin climate, such as wicker baskets, split-twig figurines, duck decoys, and woven sandals (Neusius and Gross 2007).

In the vicinity of the proposed Dry Lake Valley North SEZ, the Late Archaic period began around 1,500 B.P., and extended until about 800 B.P. This period saw major technological shifts, evidenced by smaller projectile points that were more useful because groups began using bow-and-arrow technology instead of the atlatl and dart technology, and changes in subsistence techniques, particularly in the use of horticulture. In some areas, the Formative Era began around 1,500 B.P., and the proposed SEZ is situated in an area that borders both the formative Fremont and Virgin Anasazi cultures. In areas where these Formative cultures were not present, the Late Archaic lifeways persisted. A temporary camp, a resource procurement and workshop site (Site LN2698) from the Middle to Late Archaic Period, was documented associated with the dry lake in the southern portion of the SEZ. The Fremont culture was located in most of Utah, north of the Colorado, Escalante, and Virgin Rivers, and in portions of eastern Nevada and western Colorado. The culture is characterized by the use of agricultural and hunting and gathering subsistence practices, distinctive gray ware pottery, rod-and-bundle basketry, anthropomorphic rock art, and leather moccasins. A site with diagnostic Fremont-style pottery of the Sevier Fremont branch was documented at a site in the southern portion of the proposed Dry Lake Valley North SEZ related to dry lake resource procurement and processing (Site LN2691). The Virgin Anasazi culture was an extension of the Puebloan groups from the American Southwest into the Great Basin region. These groups brought with them the knowledge of horticulture, which they used on the floodplains of the river valleys which they inhabited. Pueblo Grande de Nevada, located south of the SEZ near Overton, Nevada, is a prime example of the extensive settlements of the Virgin Anasazi culture in the vicinity. Characteristic of this period are gray ware ceramics (sometimes decorated), rock art and intaglios, bedrock milling features, and turquoise mining. Both the Fremont and Virgin Anasazi groups had left the region by about 800 to 1000 B.P., at which time the Numic-speaking groups migrated into the region; however, the exact timing of these events is unclear and is a subject for further research in the region. These Numic-speaking people were the descendents of the Southern Pauite, and the archaeological assemblage associated with this time period consists of Desert Series projectile points, brown ware ceramics, unshaped manos and millingstones, incised stones, mortars, pestles, and shell beads. The following section describes the cultural history of the time period in greater detail.

11.4.17.1.2 Ethnohistory

The proposed Dry Lake Valley North SEZ is located within the traditional use area of the Southern Paiute. Southern Paiute groups tended to be wide ranging and often shared resources. The SEZ lies at the western edge of the core area of the Panaca Band, which stretched from the

Indian Peaks Range, northwest of Cedar City, Utah, to the Pahroc Range in Nevada (Kelly 1934; Kelly and Fowler 1986). Near the northern limits of Southern Paiute territory, the SEZ may have been known to Western Shoshone, who reportedly camped in the Pioche Hills (Stoffle and Dobyns 1983).

Southern Paiute

The Southern Paiute appear to have moved into southern Nevada and southwestern Utah about A.D. 1150 (Euler 1964). Most of the territory occupied by the Southern Paiute lies within the Mojave Desert, stretching from the high Colorado Plateaus westward through canyon country and southwestward following the bend in the Colorado River through the Basin and Range geologic province into southeastern California. The territory includes several different vegetation zones reflected in corresponding differences in Southern Paiute subsistence practices. There is some evidence that before the arrival of Euro-American colonists, the Southern Paiute may have been organized on a tribal level under the ritual leadership of High Chiefs, and that their territory was bound together by a network of trails used by specialist runners (Stoffle and Dobyns 1983). The proposed Dry Lake Valley North SEZ falls within *Paranayi*, the western subdivision of the Southern Paiute Nation (Stoffle et al. 1997).

When first described by ethnographers, Southern Paiute groups had survived a 75% reduction in population resulting from the spread of European diseases, Ute slave raids, and displacement from high-quality resource areas by Euro-American settlers. They did not maintain any overall tribal organization; territories were self-sufficient economically; and the only known organizations were kin-based bands, often no larger than that of a nuclear family (Kelly and Fowler 1986). The Southern Paiute practiced a mixed subsistence economy. They maintained floodplain and irrigated agricultural fields and husbanded wild plants through transplanting, pruning, burning, and irrigation. They supplemented their food supply by hunting and fishing (Stoffle and Dobyns 1983). The Panaca Band is reported to have maintained gardens on the margins of seasonal lakes (Kelly and Fowler 1986) and along Meadow Valley Wash (Stoffle and Dobyns 1983). The diet of the Southern Paiute was varied, but the harsh climate of the area at times made subsistence precarious. They made use of a wide variety of indigenous plants. Botanical knowledge was maintained primarily by the women, and this knowledge of seasonal plant exploitation meant that at times the agricultural fields would have been little maintained while groups were away from their base camp gathering resources (Stoffle et al. 1999). The Southern Paiute maintained dwellings to match the seasons. In the summer, they constructed sun shades and windbreaks. After the fall harvest, they resided in conical or subconical houses or in caves. It was not until the late 19th century that teepees and sweathouses were adopted from the Utes. Basketry was one of the most important crafts practiced by the Southern Paiute. Conical burden baskets, fan-shaped trays for winnowing and parching, seed beaters, and water jugs were made from local plants. The annual cycle of seasonal plant exploitation required great mobility on the part of the Southern Paiute, and consequently gatherers often used lightweight burden baskets. The Panaca also made conical, sun-dried pottery vessels (Kelly and Fowler 1986).

The Southern Paiute were not a warlike group, and consequently they were often the target of raids by their more aggressive neighbors. Despite the Ute aggression, the Southern

Paiute were on friendly terms with most of the other groups north of the Colorado River; they would visit, trade, hunt, or gather in each other's territory and occasionally intermarry.

The arrival of Europeans in the New World had serious consequences for the Southern Paiute. Even before direct contact occurred, the spread of European diseases and the slave trade implemented by Utes and Navajo for the Spanish colonial markets in New Mexico, Sonora, and California resulted in significant depopulation. The Southern Paiutes retreated from areas where there was an increased presence of Euro-American travelers, such as along the Old Spanish Trail. They were further displaced by Euro-American settlers in Utah and Nevada, who sought the same limited water supplies that the Southern Paiute relied on. Dependence on wild plant resources increased during this time, as the Southern Paiute withdrew into more remote areas away from the intruding Euro-Americans. The Southern Paiute traditionally farmed along Meadow Valley Wash just over the mountains east of the SEZ. In the 1860s, there was an influx of miners. Communities such as Panaca were established to supply the mines, most notably at Pioche. They deprived the Paiutes of their traditional water sources and reduced the game and other wild foods they depended on. As Euro-American settlements grew, the Southern Paiute were drawn into the new economy, often serving as transient wage labor. Tribal settlements or colonies of laborers grew up around Euro-American settlements, farms, and mines, often including individuals from across the Southern Paiute homeland (Kelly and Fowler 1986). A community of Paiute wage laborers referred to as the Panaca Band formed around the town of Panaca (Stoffle and Dobyns 1983).

In 1865, an initial attempt by the U.S. Government to settle the Southern Paiutes in northeastern Utah with their traditional enemies, the Utes, failed. The Moapa River Reservation was established in 1875. Initially, it was intended for all Southern Paiutes from across their range, but the original reservation as authorized by President Ulysses S. Grant was severely reduced by Congress to 1,000 acres (4 km^2) of mostly un-irrigable land, and many Southern Paiutes preferred to remain in their home ranges or to seek wage labor employment elsewhere. Some of the Panaca Band eventually settled on the Indian Peaks Reservation, established in Utah in 1915, while others migrated to Cedar City or the Moapa River Reservation. On the Indian Peaks Reservation they subsisted on gardens and a few cattle, becoming part of the Indian Peaks Band. By 1935 the reservation had been largely abandoned and it, along with the other Southern Paiute Reservations in Utah, was terminated from federal control in 1954. The Indian Peaks Band sold their lands to establish themselves at Cedar City and other locations. In 1965, the Southern Paiutes were awarded a judgment by the Indian Claims Commission of over $8,000,000 in compensation for the loss of their aboriginal lands. In 1980, the Paiute Indian Tribe of Utah, including the Indian Peaks Band, was restored to a federal trust relationship. By 1984, the Indian Peaks Band had begun to reacquire a land base (Kelly and Fowler 1986; Stoffle and Dobyns 1983).

Western Shoshone

The Western Shoshone are ethnically similar Central Numic speakers who traditionally occupied the northwestern flank of Southern Paiute territory—stretching from eastern California through central Nevada into northwestern Utah and southern Idaho (Thomas et al. 1986).

Moving primarily in small groups, depending on the abundance of resources available, they pursued a mobile subsistence strategy following a seasonal round, gathering a wide variety of plant resources (Stoffle et al. 1990) supplemented by hunting. Pinenuts, available in the mountains of eastern Nevada and western Utah, were a storable staple, which may have attracted them to Meadow Valley. Pronghorn antelope and bighorn sheep were among the large game animals they hunted, but smaller game, including rodents, birds, and, where available, fish, provided more protein. Groups, often identified by their home territory, varied in size and composition with the seasons. The largest groups gathered for the pine nut harvest, which may have included a rabbit or antelope drive as well. Winter villages, consisting of conical structures overlaid with juniper bark, were usually close to stores of pine nuts. They interacted peacefully with the Southern Paiutes, with whom they were on good terms (Thomas et al. 1986) and camped with them in Meadow Valley just across the Highland Range from the SEZ (Stoffle and Dobyns 1983). Any of the Western Shoshone bands in the southeastern part of their range could have and probably did interact with the Southern Paiutes in Meadow Valley.

Their first recorded contact with Euro-Americans was with the trapper Jedediah Smith in 1827. The Western Shoshone were heavily affected by the Mormon migration to the Valley of the Great Salt Lake beginning in 1847 and the onslaught of prospectors seeking gold and other mineral wealth in California and Nevada beginning in 1849. The Shoshone were occasionally hostile to miners and those traveling trails to the west, and attempts were made to negotiate treaties and set up reservations beginning in 1860 (Rusco 1992). Never actually surrendering their lands (the Western Shoshone were not willing to give up their mobile lifestyle), the Treaty of Ruby Valley, in eastern Nevada, and the Treaty of Tooele Valley, in western Utah, were signed in 1863. Reserves or "farms" were set aside for the Western Shoshone beginning in the late 1850s; however, it was not until after 1900 that federal lands were set aside for Western Shoshone "colonies." The Ely Colony and Duckwater Reservation are the closest to the proposed Dry Lake Valley North SEZ (Thomas et al. 1986).

11.4.17.1.3 History

The Great Basin was one of the last areas of the continental United States to be fully explored. The harsh and rugged landscape deterred most European and American explorers until the late 18th century. The earliest documented European presence in the Great Basin region was the Dominguez-Escalante Expedition that began in July of 1776. Two Catholic priests, Fathers Francisco Atanasio Dominguez and Silvestre Velez de Escalante, were looking for a route from the Spanish capital city of Santa Fe to the Spanish settlement of Monterey on the California coast. The group did not end up completing their intended journey due to poor weather, but their maps and journals describing their travels and encounters would prove valuable to later explorers who traversed the area, such as Spanish/New Mexican traders and Anglo-American fur trappers traveling the Old Spanish Trail in the 1820s and 1830s (BLM 1976).

Further exploration of the Great Basin occurred in 1826 with fur-trapping expeditions, one conducted by Peter Ogden of the Hudson Bay Company, the other by Jedediah Smith of the Rocky Mountain Fur Company. Both men were seeking new beaver fields; Ogden took a more northerly route through Elko, Pershing, and Humbolt Counties, and Smith entered near the proposed Dry Lake Valley North SEZ at Mesquite and traveled into California. When Smith entered California he was detained by Mexican authorities and ordered to go back the way he came; however, he decided instead to travel farther north in California and cut across central Nevada, further exploring the Nevada region. Fur trapping never became a lucrative enterprise in Nevada; however, these trailblazers paved the way for later explorers and mappers, such as John C. Frémont. Frémont was a member of the Topographical Engineers, and was commissioned to map and report on the Great Basin area in 1843 and 1844. The results of his work gained wide circulation and were of great importance in understanding the topography of the Great Basin, both for official use and by those moving westward to seek new homes and fortunes (Elliott 1973).

Nevada and the larger Great Basin region have provided a corridor of travel for those seeking to emigrate west. Several heavily traveled trails crossed the region, although none were particularly close to the proposed Dry Lake Valley North SEZ. The Old Spanish Trail was an evolving trail system generally established in the early 19th century, but it tended to follow earlier established paths used by earlier explorers and Native Americans. The 2,700-mi (4,345-km) network of trails passes through six states, beginning in Santa Fe, New Mexico, and ending in Los Angeles, California. The closest portion of the congressionally designated Old Spanish National Historic Trail to the proposed SEZ is where it follows the Virgin River, about 70 mi (113 km) to the southeast. Mormons also frequently used the Old Spanish Trail in emigrating farther west to Nevada, Arizona, and California, and often the trail is referred to as the Old Spanish Trail/Mormon Road. Other notable trails that crossed Nevada were the California Trail, a trail that followed portions of the notable Oregon Trail farther east of Nevada, and then broke off from that trail and continued through the northern portion of Nevada along the Humbolt River until it reached California. The Pony Express Trail, a mail route that connected Saint Joseph, Missouri, to Sacramento, California, entered Nevada northeast of Ely and exited just south of Lake Tahoe (von Till Warren 1980).

With the ratification of the Treaty of Guadalupe Hidalgo in 1848 closing out the Mexican-American War, the area came under American control. In 1847, the first American settlers arrived in the Great Basin, among them Mormon immigrants under the leadership of Brigham Young, who settled in the Valley of the Great Salt Lake in Utah. They sought to bring the entire Great Basin under their control, establishing an independent State of Deseret. From its center in Salt Lake City, the church sent out colonizers to establish agricultural communities in surrounding valleys and missions to acquire natural resources such as minerals and timber. Relying on irrigation to support their farms, the Mormons often settled in the same places as the Fremont and Virgin Anasazi centuries before. The result was a scattering of planned agricultural communities from northern Arizona to southern Idaho and parts of Wyoming, Nevada, and southern California. Mormon settlements near the proposed Dry Lake Valley North SEZ were located at Crystal Springs, about 20 mi (32 km) to the west, and Clover Valley, about 40 mi (64 km) to the southeast (Paher 1970; Fehner and Gosling 2000).

Nevada’s nickname is the “Silver State,” so named for the Comstock Lode strike in 1859 in Virginia City about 400 mi (640 km) to the west of the proposed Dry Lake Valley North SEZ. This was the first major silver discovery in the United States, and with the news of the strike hopeful prospectors flocked to the area in an effort to capitalize on the possible wealth under the surface of the earth. The discovery of the Comstock Lode led to the creation of Virginia City and other nearby towns that served the burgeoning population influx. The population increase due to mining was so dramatic that in the 1850 census there were less than a dozen non-native persons in the territory of Nevada; by 1860 there were 6,857, and by 1875 an estimated 75,000 people had settled within the boundaries of the Nevada territory. The Comstock Lode strike is important to the history of Nevada, not just because of the population growth and significant amount of money that was consequently brought into the area, but also because of the technological innovations that were created and employed in the mines, such as the use of square-set timbering. This technique kept loose soil from collapsing on miners, a concept that was eventually employed in other mines around the world (Paher 1970).

Mining for valuable deposits occurred in all regions of the state of Nevada, including in the vicinity of the proposed Dry Lake Valley North SEZ. The most notorious mining district in Lincoln County was Pioche, located on the east side of the Highland Range, 15 mi (24 km) from the SEZ. Pioche was a violent, Wild West town that was one of the most prosperous districts in the county. The closest mining district to the proposed SEZ was the Highland Mine, a short-lived silver mine that operated from 1868 to 1870. The still-producing mine of Bristol is located just north of the proposed Dry Lake Valley North SEZ. Originally opened in 1870, this mine produced silver that was smelted in large charcoal kilns at a location just west of Bristol, named Bristol Wells. The charcoal kilns are still standing and are located about 5 mi (8 km) to the northeast of the SEZ. Other mines close to the proposed SEZ are Jackrabbit Mine, just northeast of the SEZ; Silverhorn Mine, a short-lived silver mine north of the SEZ; Delamar Mine, a prosperous gold mine 25 mi (40 km) south of the SEZ; and Bullionville, a site with 5 mills that crushed the ore from Pioche that arrived via a railroad. Native Americans in the area were often aware of the location of mineral deposits and informed the prospective miners as to the location of the deposits. The Native Americans themselves did some mining, mainly for turquoise and garnet, minerals used for decorative, pottery-tempering, or healing purposes, although occasionally their services were enlisted in the mines or in processing the material for the white miners too (Pogue 1912; Paher 1970). A cinder cone, said to be a source of garnets, was observed to the west of the SEZ during a preliminary site visit.

The construction of railroads in Nevada was often directly related to the mining activities. It was necessary to construct intrastate rail lines to move ore from mines to mills; the Pioche to Bullionville Railroad is the closest line to the proposed SEZ, but interstate railroads were also critical to the development of the economy. The San Pedro–Los Angeles–Salt Lake Railroad was constructed in 1905, connecting two of the most populous cities in the American West. This still-used rail line is located to the east of the proposed Dry Lake Valley North SEZ, a spur of which passes within 2 mi (3 km) north of Pioche, and continues on to Caliente, on its way south towards Las Vegas. The infamous Transcontinental Railroad was constructed between 1863 and 1869, connecting Sacramento, California, and Omaha, Nebraska, passing through the Nevada towns of Reno, Wadsworth, Winnemucca, Battle Mountain, Elko, and Wells on its way to changing the manner in which people traversed the United States.

Nevada's desert-mountain landscape has made it a prime region for use by the U.S. military for several decades. Beginning in October of 1940, President Franklin D. Roosevelt established the Las Vegas Bombing and Gunnery Range, a 3.5-million-acre (14,164-km^2) parcel of land northwest of Las Vegas, near Indian Springs, Nevada. The main purpose of the range was to serve as air-to-air gunnery practice, but at the end of WWII the gunnery range was closed. It was reopened at the start of the Cold War in 1948 and was re-commissioned as the Las Vegas Air Force Base, and renamed Nellis Air Force Base in 1950 (Fehner and Gosling 2000).

Prior to the dropping of the atomic bomb on the Japanese cities of Nagasaki and Hiroshima, the only testing of nuclear weapons on U.S. soil was at the Trinity site, at the White Sands Missile Range, near Los Alamos Laboratory in Alamogordo, New Mexico. Tests of nuclear weapons had been conducted at the newly acquired Marshall Islands in the Pacific, but due to logistical constraints, financial expenditures, and security reasons, a test site for nuclear weapons was needed in a more convenient region. Project Nutmeg was commenced in 1948 as a study to determine the feasibility and necessity of a test site in the continental United States. It was determined that due to the public relations issues and radiological safety and security issues, a continental test site should only be pursued in the event of a national emergency. In 1949, that emergency occurred when the Soviet Union conducted their first test of a nuclear weapon, and the Korean War started in the summer of 1950. Five initial test sites were proposed, Alamogordo/White Sands Missile Range in New Mexico, Camp LeJeune in North Carolina, the Las Vegas–Tonopah Bombing and Gunnery Range in Nevada, a site in central Nevada near Eureka, and Utah's Dugway Proving Ground/Wendover Bombing Range. Several factors were considered when making the final decision, such as fallout patterns, prevailing winds and predictability of weather, terrain, downwind populations, security, and public awareness and relations. The Las Vegas–Tonopah Bombing and Gunnery Range was chosen as the NTS by President Truman in December of 1950.

Covering 1,375 mi^2 (3,561 km^2), the NTS is a part of the Las Vegas–Tonopah Bombing and Gunnery Range, and it stretches from Mercury, Nevada, in the southeast to Pahute Mesa in the northwest. The first set of nuclear tests was conducted in January of 1951. Originally named FAUST (First American Drop United States Test) and later renamed Ranger, these bombs were detonated over Frenchman Flat, an area about 90 mi (145 km) southwest of the proposed Dry Lake Valley North SEZ. Tests were also later conducted at Yucca Flat, an area located northwest of Frenchman Flat, in an effort to minimize the effect of the blasts on the population in Las Vegas, which reported some disturbances (non-radiological in nature) from the series of tests conducted at Frenchman Flat. Tests were also conducted at Jackass Flats, to the west of the proposed Dry Lake Valley North SEZ, and Pahute Mesa, located to the north and west of the SEZ. Nuclear tests were conducted in an effort to test new weapons concepts, proof test existing weapons, and test the impact of nuclear weapons on manmade structures and the physical environment. Experimental testing in search of possible peaceful uses, specifically the Pluto ramjet, Plowshare, and Rover rocket programs, was also conducted. The Pluto ramjet project was funded by the Air Force to design a system that could propel a vehicle at supersonic speeds and low altitudes, while the Rover rocket was a design for a nuclear-powered rocket for space travel. The Plowshare project was an attempt to show that nuclear weapons could be effective in moving large amounts of earth for canal and harbor construction. None of these three projects resulted in any sustained results in terms of the goals that they were seeking, yet they were important in their contribution to the overall work done at the NTS. In the fall of 1958, President Dwight Eisenhower declared a moratorium on nuclear testing, with the Soviet Union following suit, until 1961 when testing resumed on both sides. However, this testing was performed mostly underground at the NTS, with most atmospheric tests being conducted in the Pacific. The last atmospheric test at the NTS was on July 17, 1962, with the Limited Test Ban Treaty being signed by the U.S. and Soviet Union on August 5, 1963, ending nuclear testing in the atmosphere, ocean, and space. The last underground nuclear detonation at the NTS was on September 23, 1992, after which Congress declared a moratorium on nuclear testing. In 1996, a Comprehensive Test Ban Treaty was proposed by an international organization, but it has yet to be ratified by the U.S. Senate; however, nuclear tests have not been conducted since. In total, 1,021 of the 1,149 nuclear detonations that were detonated by the U.S. during the Cold War were conducted at the NTS (Fehner and Gosling 2000).

11.4.17.1.4 Traditional Cultural Properties—Landscape

The Southern Paiutes have traditionally taken a holistic view of the world, in which the sacred and profane are inextricably intertwined. According to their traditions, they were created in their traditional use territory and have a divine right to the land, along with a responsibility to manage and protect it. Within their traditional use area, landscapes as a whole are often culturally important. Adverse effects to one part damages the whole (Stoffle and Zedeño 2001a). From their perspective, landscapes include places of power. Among the most important of such places are sources of water; peaks, mountains, and elevated features; caves; distinctive rock formations; and panels of rock art. Places of power are important to the religious beliefs of the Southern Paiute. They may be sought out for individual vision quests or healing and may likewise be associated with culturally important plant and animal species. The view from such a point of power or the ability to see from one important place to another can be an important element of its integrity (Stoffle and Zedeño 2001b). Landscapes as a whole are tied together by a network of culturally important trails (Stoffle and Dobyns 1983; Stoffle and Zedeño 2001a).

The proposed Dry Lake Valley North SEZ is situated just over the mountains (about 12 mi, or 20 km) from Meadow Valley. Traditionally, the Southern Paiute farmed the banks of Meadow Valley Wash and gathered high-quality pine nuts from Panaca Summit. Paiutes and Shoshones camped in the canyons east of Pioche and in the Pioche Hills, where they harvested pine nuts, berries, and wild grasses, and hunted deer and rabbits. Members of the Indian Peak and Cedar Bands interviewed for a proposed power line to be built in Dry Lake Valley and Meadow Valley expressed their greatest concern over burial sites, springs, and religious sites. The important food-gathering sites they identified were largely in Meadow Valley and surrounding mountains. However, the Black Canyon Range and the Burnt Springs Range adjacent to the southern end of the SEZ were considered culturally important, as were the Delamar Mountains 9 mi (15 km) to the south. Dry Lake Valley itself was considered to have a somewhat lesser importance (Stoffle and Dobyns 1983). However, a scattering of isolated stone flakes indicates that over the years Dry Lake Valley has been the site of Native American activities. Isolates and temporary campsites are more common in the southern part of the SEZ, closer to Black Canyon and the Burnt Springs Range. A repeatedly used campsite is located along the western side of the dry lake outside the SEZ.

11.4.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources

In the proposed Dry Lake Valley North SEZ, 19 surveys have been conducted within the boundaries of the SEZ, covering approximately 2.8% of the SEZ, and 23 additional surveys have been conducted within 5 mi (8 km) of the SEZ. Of the 19 surveys conducted within the boundaries of the SEZ, 18 have been block surveys, 12 of which also had linear segments. Only one survey was strictly linear, and one was strictly a block survey. A total of 53 sites (including isolated artifacts) have been documented in the Dry Lake Valley North SEZ, 50 prehistoric sites and 3 historic sites. Another 153 sites have been documented within 5 mi (8 km) of the proposed SEZ; of these, 140 are prehistoric, and 13 are historic (de DuFour 2009).

The SEZ has potential to yield significant cultural resources, especially prehistoric sites in the areas around the dry lake, at the south end of the SEZ, as well as in alluvial fans, fan piedmonts, ridge tops, passes, and stream terraces, located on the outer portions of the SEZ (Drews and Ingbar 2004). Around the dry lake in the SEZ are four sites that have significant potential as to their eligibility for inclusion in the NRHP. These four sites are temporary camps associated with the resource procurement and processing potential of the dry lake. Most of the sites that have been documented in the SEZ are isolated lithic fragments, but some chipping circles and lithic scatters have been documented as well, along with a few temporary camp sites. A few of the isolates have had diagnostic material, a Pinto projectile point from the early Archaic, an Elko series projectile point from the Middle to Late Archaic, and a Rose Spring projectile point, a bow-and-arrow point used from the Late Archaic through the Formative Period. Historic mining sites are likely to be located outside the boundaries of the SEZ, but within the 5-mi (8-km) buffer of the SEZ a significant number of historic mining claims and camps are in the mountains to the east and north of the SEZ.

The BLM has designated several locations within relatively close proximity to the SEZ as ACECs because of their significant cultural value. The Pahroc Rock Art ACEC is located about 12 mi (19 km) to the southwest of the proposed Dry Lake Valley North SEZ at the southern end of the North Pahroc Range. The Shooting Gallery ACEC is a culturally sensitive rock art area located 30 mi (48 km) southwest of the SEZ, just west of Alamo. The name “Shooting Gallery” was applied to the district as there is evidence that prehistoric people created hunting blinds and a system of channels made of rocks to corral and hunt large game. The Mount Irish ACEC is located 25 mi (40 km) to the west of the SEZ, near Hiko, and is noted for its rock art and prehistoric camp sites. There are several other areas that contain culturally sensitive material and meet the criteria for ACEC designation, but in the interest of protecting the resources the BLM has not designated other ACECs, as it is presumed that the ACEC designation could bring unwanted attention to the site, including an increased potential for vandalism.

National Register of Historic Places

There are four sites within the boundaries of the proposed Dry Lake Valley North SEZ that have potential to be eligible for inclusion in the NRHP, as mentioned above, and all four are associated with the dry lake area at the southern portion of the SEZ. Within 5 mi (8 km) of the SEZ are 10 sites that exhibit potential significance for inclusion in the NRHP. Seven of these sites are prehistoric cultural resources associated with the dry lake, consisting of heavy lithic scatters, workshop sites, and resource processing areas. Three of the other potentially significant sites are historic section markers from surveys conducted in the 1880s, reflecting the initial mapping and exploration of the region. The Bristol Wells site is located about 5 mi (8 km) to the north of the SEZ and was listed in the NRHP in 1972. Bristol Wells, a mining town associated with the prosperous Bristol Mine, was the location where the ore was stamped and smelted; the charcoal kilns used for the process are still standing today. In addition, nine other properties within Lincoln County are listed in the NRHP. Three of these properties are prehistoric sites, the White River Narrows Archaeological District, located about 10 mi (16 km) west of the proposed SEZ; the Black Canyon Petroglyph Site in the Pahranagat National Wildlife Refuge, south of Alamo about 35 mi (56 km) south of the SEZ; and the Panaca Summit Archaeological District, about 30 mi (48 km) east of the SEZ. The other properties listed in the NRHP in Lincoln County are historic sites in the towns of Caliente and Pioche to the southeast and east of the SEZ.

11.4.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Dry Lake Valley North SEZ; however, further investigation is needed at the project-specific level. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. The Dry Lake Valley North SEZ has a high potential for containing prehistoric sites, especially in the dry lake and dune areas at the southern end of the SEZ; a potential for historic sites also exists in the area, but to a lesser degree. The largest potential for direct impacts on significant cultural values is in the playa area to the south and alluvial fans, located on the outer portions of the SEZ. At least 4 of the 53 sites recorded in this portion of the proposed Dry Lake Valley North SEZ have been determined to be eligible for listing in the NRHP. Section 5.15 discusses the types of impacts that could occur on any significant cultural resources found to be present in the Dry Lake Valley North SEZ. Impacts will be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

Indirect impacts on cultural resources resulting from erosion outside of the SEZ boundary (including ROWs) are unlikely, assuming programmatic design features to reduce water runoff and sedimentation are implemented (as described in Appendix A, Section A.2.2).

Approximately 8 mi (13 km) of access road is anticipated to connect to U.S. 93, south of the SEZ, resulting in approximately 58 acres (0.23 km^2) of disturbance. Impacts on cultural resources are possible in areas related to the access ROW, as new areas of potential cultural significance could be directly impacted by construction or opened to increased access from road use. Indirect impacts, such as vandalism or theft, could occur if significant resources are located in close proximity to the ROW. Programmatic design features assume that the necessary surveys, evaluations, and consultation will occur for the ROW, as with the project footprint within the SEZ. In this particular area, several surveys have been previously conducted, resulting in the recordation of five isolated artifacts (four prehistoric and two historic) according to the NVCRIS GIS, and no sites (de DuFour 2009). Although it is assumed elsewhere in this document that 7 mi (11.3 km) of access road is assumed to connect to State Route 318 instead of U.S. 93, this alternative route could result in a greater potential for impacts on cultural resources. The amount of disturbance is less (51 acres [0.21 km^2]), but the disturbance would occur in an area of higher elevation and potentially higher cultural sensitivity. One small survey (of about 8 acres [0.03 km^2]) has been previously conducted in this vicinity, in the lower elevation, resulting in the recordation of an isolated flake; no other surveys have been conducted in the area (de DuFour 2009). No needs for new transmission have currently been identified, assuming existing lines would be used; therefore, no additional areas of cultural concern would be made accessible as a result of transmission development within the proposed Dry Lake Valley North SEZ. However, impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

11.4.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features and cultural awareness training for the workforce, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

11.4.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns that are specific to Native Americans or to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Dry Lake Valley North SEZ, Section 11.4.17 discusses archaeological sites, structures, landscapes, and traditional cultural properties; Section 11.4.8 discusses mineral resources; Section 11.4.9.1.3 discusses water rights and water use; Section 11.4.10 discusses plant species; Section 11.4.11 discusses wildlife species, including wildlife migration patterns; Section 11.4.13 discusses air quality; Section 11.4.14 discusses visual resources; Sections 11.4.19 and 11.4.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21.

11.4.18.1 Affected Environment

The proposed Dry Lake Valley North SEZ falls within the Tribal traditional use area generally attributed to the Southern Paiute (Kelly and Fowler 1986), although the Paiutes shared resources with the Western Shoshone. All federally recognized Tribes with Southern Paiute or Western Shoshone roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 11.4.18.1-1. Details of government-to-government consultation efforts are presented in Chapter 14; a listing of all federally recognized Tribes contacted for this PEIS is found in Appendix K.

11.4.18.1.1 Territorial Boundaries

Southern Paiutes

The traditional territory of the Southern Paiutes lies mainly in the Mojave Desert, stretching from California to the Colorado Plateau. It generally follows the right bank of the Colorado River (heading downstream), including its tributary streams and canyons in southern Nevada and Utah, including most of Clark and Lincoln Counties in Nevada and extending as far north as Beaver County in Utah (Kelly and Fowler 1986). This area has been judicially recognized as the traditional use area of the Southern Paiute by the Indian Claims Commission (Clemmer and Stewart 1986; Royster 2008).

Western Shoshone

The Western Shoshone traditionally occupied a swath of the central Great Basin stretching from Death Valley in California through central Nevada and northwestern Utah to southeastern Idaho (Thomas et al. 1986). The proposed Dry Lake Valley North SEZ lies within

TABLE 11.4.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed Dry Lake Valley North SEZ

Tribe	Location	State
Chemehuevi Indian Tribe	Havasu Lake	California
Colorado River Indian Tribes	Parker	Arizona
Confederated Tribes of the Goshute Reservation	Ibapah	Utah
Duckwater Shoshone Tribe	Duckwater	Nevada
Ely Shoshone Tribe	Ely	Nevada
Kaibab Paiute Tribe	Fredonia	Arizona
Las Vegas Paiute Tribe	Las Vegas	Nevada
Moapa Band of Paiutes	Moapa	Nevada
Pahrump Paiute Tribe	Pahrump	Nevada
Paiute Indian Tribe of Utah	Cedar City	Utah
Cedar Band	Cedar City	Utah
Indian Peak Band	Cedar City	Utah
Kanosh Band	Kanosh	Utah
Koosharem Band	Cedar City	Utah
Shivwits Band	Ivins	Utah
San Juan Southern Paiute Tribe	Tuba City	Arizona
Skull Valley Band of Goshute Indians	Grantsville	Utah

the northern margins of Southern Paiute territory in an area of shared use (Stoffle and Dobyns 1983).

11.4.18.1.2 Plant Resources

The Southern Paiutes continue to make use of a wide range of indigenous plants for food, medicine, construction materials, and other uses. The vegetation present at the proposed Dry Lake Valley North SEZ is described in Section 11.4.10. The cover types present at the SEZ are all in the Inter-Mountain Basins series. Mixed Salt Desert Scrub predominates. There is a smaller, but substantial, area of Playa, and yet smaller areas of Greasewood Flat, Semi-Desert Shrub Steppe, and Big Sagebrush Shrubland (USGS 2005ab). The SEZ is sparsely vegetated with a pattern of braided drainage running generally north to south. As shown in Table 11.4.18.1-2, there are likely to be some plants used by Native Americans for food and/or medicinal purposes in the SEZ (Stoffle et al. 1999; Stoffle and Dobyns 1983). Project-specific analyses will be needed to determine their presence at any proposed building site.

11.4.18.1.3 Other Resources

Southern Paiutes with ties to the area of the proposed SEZ indicate that springs are some of the most important cultural resources in their cultural landscape. Water is an essential prerequisite for life in the arid areas of the Great Basin. As a result, water holds a key place in

TABLE 11.4.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Dry Lake Valley North SEZ

Common Name	Scientific Name	Status
Food		
Beavertail prickly pear	*Opuntia basilaris*	Observed
Desert trumpet (buckwheat)	*Eriogonum inflatum*	Observed
Cholla cactus	*Cylindropuntia* spp.	Observed
Dropseed	*Sporobolus* spp.	Observed
Greasewood	*Sarcobatus vermiculatus*	Likely
Indian rice grass	*Oryzopsis hymenoides*	Observed
Iodine bush	*Allenrolfea occidentalis*	Possible
Juniper	*Juniperus* spp.	Possible
Wolfberry	*Lycium andersonii*	Possible
Medicine		
Greasewood	*Sacarbatus vermiculatus*	Likely
Mormon tea	*Ephedra* spp.	Observed
Sagebrush	*Artemesia tridentate*	Likely
Saltbush	*Atriplex* spp.	Observed

Sources: Field visit; USGS (2005a); Stoffle and Dobyns (1983); Stoffle et al. (1999).

the religion of desert cultures. Great Basin cultures consider all water sacred and purifying. Springs are often associated with powerful beings, and hot springs in particular figure in Southern Paiute creation stories. Water sources are often associated with rock art. Water sources are seen as connected, so damage to one damages all (Fowler 1991; Stoffle and Zedeño 2001a). There are springs located on the west of the SEZ. Tribes are also sensitive to the use of scarce local water supplies for the benefit of far distant communities and recommend that the determination of adequate water supplies should be a primary consideration in determining whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

Wildlife likely to be found in the proposed Dry Lake Valley North SEZ is described in Section 11.4.11. Deer and rabbit are the animals of most concern, as mentioned by Native Americans with local ties (Stoffle and Dobyns 1983). The SEZ provides suitable habitat for mule deer (*Odocoileus hemionus*), black-tailed jackrabbit (*Lepus californicus*), and desert cottontail (*Sylvilagus audubonii*). Other animals traditionally important to the Southern Paiute include lizards, which are likely to occur in the SEZ, and the golden eagle (*Aquila chrysaetosi*). The SEZ falls within the range of the wide-ranging eagle (USGS 2005b). Common tribally important animals that can be expected to be found in the proposed SEZ are listed in Table 11.4.18.1-3.

TABLE 11.4.18.1-3 Animal Species Used by Native Americans as Food Whose Range Includes the Proposed Dry Lake Valley North SEZ

Common Name	Scientific Name	Status
Mammals		
Badger	*Taxidea taxus*	All year
Black-tailed jackrabbit	*Lepus californicus*.	All year
Bobcat	*Lynx rufus*	All year
Chipmunk	*Tamias* spp.	All year
Coyote	*Canis latrans*	All year
Cottontail	*Silvilagus* spp.	All year
Gray fox	*Urocyon cinereoargenteus*	All year
Kangaroo rat	*Dipodomys* spp.	All year
Kit fox	*Vulpes macotis*	All year
Mule deer	*Odocoileus hemionus*	All year
Pocket gopher	*Thomomys bottae*	All year
Pocket mouse	*Perognathus* spp.	All year
Porcupine	*Erethizon dorsatum*	All year
White-tailed antelope squirrel	*Ammospermophilus leucurus*	All year
Woodrat	*Neotoma* spp.	All year
Birds		
Burrowing owl	*Athene cunicular*	Summer
Common raven	*Corvus corax*	All year
Gambel's quail	*Callipepla gambelii*	All year
Golden eagle	*Aquila chrysaetos*	All year
Great horned owl	*Bubo virginianus*	All year
Great blue heron	*Ardea herodias*	All year
Mourning dove	*Callipepla gambelii*	All year
Northern mockingbird	*Mimus polyglottos*	All year
Sage-grouse	*Centrocercus urophasianus*	All year
Sandhill crane	*Grus Canadensis*	Spring/fall
Reptiles		
Desert horned-lizard	*Phrynosoma platyrhinos*	All year
Western rattlesnake	*Crotalus viridis*	All year
Large lizards	Various species	All year

Sources: Field visit; USGS (2005b); Fowler (1986).

Other natural resources traditionally important to Native Americans include salt, clay for pottery, and naturally occurring mineral pigments for the decoration and protection of the skin (Stoffle and Dobyns 1983). Of these, clay beds are possible in the dry lake within the SEZ (see Section 11.4.7).

11.4.18.2 Impacts

In the past when energy projects have been proposed, Great Basin Native Americans have expressed concern over project impacts on a variety of resources. They tend to take a holistic view of their traditional homeland. For them, cultural and natural features are inextricably bound together. Effects on one part have ripple effects on the whole. Western distinctions between the sacred and the secular have no meaning in their traditional worldview (Stoffle and Dobyns 1983). While no comments specific to the proposed Dry Lake Valley North SEZ have been received from Native American Tribes to date, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. In the area, the Southern Paiute have expressed concern over adverse effects on a wide range of resources. Geophysical features and physical cultural remains are discussed in Section 11.4.17.1.4. Such features are often seen as important because they are the location of or have ready access to a range of plant, animal, and mineral resources (Stoffle et al. 1997). Resources considered important include food plants, medicinal plants, plants used in basketry, plants used in construction, large game animals, small game animals, birds, and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those likely to be found within the Dry Lake Valley North SEZ are discussed in Section 11.4.18.1.2.

Meadow Valley was an important farming and harvesting location for the northern bands of Southern Paiutes. Dry Lake Valley is adjacent to Meadow Valley and was almost certainly known by the bands that regularly camped in Meadow Valley. Although the SEZ is sparsely vegetated, its proximity to a traditionally settled area that was a gathering place for the pine nut harvest suggests that the area may be well known to modern Southern Paiutes, and that the resources that do exist there may be exploited by the Southern Paiute, although Meadow Valley and its surrounding mountains appear to hold more abundant resources. This should be confirmed during consultation with the Tribes.

Development of the SEZ would result in the removal of plant species from the footprint of the facility during construction. This would include some plants of cultural importance. However, the primary species that would be affected are abundant in the region; thus the cumulative effect would likely be small. Likewise, habitat for important species, such as the black-tailed jackrabbit, would be reduced (See Sections 11.4.10 and 11.4.11). As consultation with the Tribes continues and project-specific analyses are undertaken, it is also possible that Native American concerns will be expressed over potential visual and other effects on specific resources and any culturally important landscapes within or adjacent to the SEZ.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

11.4.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to address impacts of potential concern to Native Americans, such as avoidance of sacred sites, water resources, and tribally important plant and animal species, are provided in Appendix A, Section A.2.2. Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 11.4.17.3, in addition to the design features for historic properties presented in Appendix A, Section A.2.2.

The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with the affected Tribes listed in Table 11.4.18.1-1.

11.4.19 Socioeconomics

11.4.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Dry Lake Valley North SEZ. The ROI is a three-county area comprising Clark and Nye Counties in Nevada and Iron County in Utah. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

11.4.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 944,909 (Table 11.4.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was higher in Lincoln County (5.1%) than in Iron County (3.4%) or Clark County (3.2%). At 3.2%, growth rates in the ROI as a whole was higher than the average rate for the state of Nevada (2.7%).

In the ROI in 2006, the services sector provided the highest percentage of employment at 59.3%, followed by wholesale and retail trade at 14.9% and construction (11.7%) (Table 11.4.19.1-2). Within the three counties in the ROI, the distribution of employment across sectors is different than that of the ROI as a whole; employment in services (59.6%) higher in Clark County than in the ROI as a whole, while employment in wholesale and retail trade (14.8%), and agriculture (0.0%) were lower than in other counties in the ROI.

TABLE 11.4.19.1-1 ROI Employment in the Proposed Dry Lake Valley North SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Clark County, Nevada	675,693	922,878	3.2
Lincoln County, Nevada	1,114	1,731	5.1
Iron County, Utah	14,571	20,300	3.4
ROI	691,582	944,909	3.2
Nevada	978,969	1,282,012	2.7
Utah	1,080,441	1,336,556	2.1

Sources: U.S. Department of Labor (2009a,b).

TABLE 11.4.19.1-2 ROI Employment in the Proposed Dry Lake Valley North SEZ by Sector, 2006

Industry	Clark County, Nevada		Lincoln County, Nevada		Iron County, Utah		ROI	
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	213	0.0	130	16.1	934	7.0	1,277	0.1
Mining	522	0.1	38	4.7	10	0.1	570	0.1
Construction	100,817	11.6	60	7.4	*1,829*	13.8	102,706	11.7
Manufacturing	25,268	2.9	0	0.0	1,732	13.1	27,000	3.1
Transportation and public utilities	38,529	4.4	70	8.7	363	2.7	38,962	4.4
Wholesale and retail trade	128,498	14.8	309	38.3	2,650	20.0	131,407	14.9
Finance, insurance, and real estate	56,347	6.5	24	3.0	646	4.9	57,044	6.5
Services	516,056	59.6	343	42.6	5,068	38.2	521,500	59.3
Other	105	0.0	0	0.0	10	0.1	115	0.0
Total	866,093		806		13,250		880,149	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009a,b).

11.4.19.1.2 ROI Unemployment

The average unemployment rate in Lincoln County over the period 1999 to 2008 was 5.2%, slightly higher than the rate in Clark County (5.0%) and higher than the rate in Iron County (45.1%) (Table 11.4.19.1-3). The average rate in the ROI over this period was 5.0%, the same as the average rate for Nevada. Unemployment rates for the first 11 months of 2009 contrast with rates for 2008 as a whole; in Clark County, the unemployment rate increased to 11.1%, while the rate reached 8.0% in Lincoln County and 6.1% in Iron County. The average rates for the ROI (11.0%) and for Nevada as a whole (11.0%) were also higher for the first 11 months of 2009 than the corresponding average rates for 2008.

11.4.19.1.3 ROI Urban Population

The population of the ROI in 2008 was 57% urban. The largest city, Las Vegas, had an estimated 2008 population of 562,849; other large cities in Clark County include Henderson (253,693) and North Las Vegas (217,975) (Table 11.4.19.1-4). In addition, there are two smaller cities in the county, Mesquite (16,528) and Boulder City (14,954). A number of unincorporated urban areas in Clark County are not included in the urban population; that is, the percentage of the county population not living in urban areas is overstated. The largest urban area in Iron County, Cedar City, had an estimated 2008 population of 28,439; other urban areas in the county include Enoch (5,076) and Parowan (2,606) (Table 11.4.19.1-4). In addition, there are three other urban areas in the county, Paragonah (477), Kanaraville (314) and Brian Head (126). Most of these cities are less than 100 miles (161 km) from the site of the proposed SEZ.

TABLE 11.4.19.1-3 ROI Unemployment Rates for the Proposed Dry Lake Valley North SEZ (%)

Location	1999–2008	2008	2009[a]
Clark County, Nevada	5.0	6.6	11.1
Lincoln County, Nevada	5.2	5.4	8.0
Iron County, Utah	4.1	4.2	6.4
ROI	5.0	6.5	11.0
Nevada	5.0	6.7	11.0
Utah	4.1	3.4	5.2

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

TABLE 11.4.19.1-4 ROI Urban Population and Income for the Proposed Dry Lake Valley North SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000-2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Boulder City	14,966	14,954	0.0	65,049	NA[b]	NA
Brian Head	118	126	0.8	56,732	NA	NA
Caliente	1,123	1,191	0.7	33,260	NA	NA
Cedar City	20,527	28,439	4.2	41,719	41,318	−0.1
Enoch	3,467	5,076	4.9	48,112	NA	NA
Henderson	175,381	253,693	4.7	72,035	67,886	−0.7
Kanaraville	311	314	0.1	44,258	NA	NA
Las Vegas	478,434	562,849	2.1	56,739	55,113	−0.3
Mesquite	9,389	16,528	7.3	52,005	NA	NA
North Las Vegas	115,488	217,975	8.3	56,299	60,506	0.2
Paragonah	470	477	0.2	43,721	NA	NA
Parowan	2,565	2,606	0.2	41,749	NA	NA

[a] Data are averages for the period 2006 to 2008.

[b] NA = data not available.

Source: U.S. Bureau of the Census (2009b–d).

Population growth rates in the ROI have varied over the period 2000 to 2008 (Table 11.4.19.1-4). North Las Vegas grew at an annual rate of 8.3% during this period, with higher than average growth also experienced in Mesquite (7.3%), Enoch (4.9%), and Henderson (4.7%). The cities of Las Vegas (2.1%), Brian Head (0.8%), Caliente (0.7%), and others experienced a lower growth rate between 2000 and 2008, while Boulder City (0.0%) experienced a static growth rate during this period.

11.4.19.1.4 ROI Urban Income

Median household incomes vary across urban areas in the ROI. Data for the period 2006 to 2008 were available for only four cities. Henderson ($67,886) and North Las Vegas ($60,506) had median incomes that were higher than the average for Nevada ($56,348) and Utah ($56,484), while Las Vegas ($55,113) and Cedar City ($41,318) had median incomes slightly lower than both state averages (Table 11.4.19.1-4).

Growth rates between 1999 and 2006 to 2008 were small in North Las Vegas (0.2%) and negative in Henderson (−0.7%), Las Vegas (−0.3%), and Cedar City (−0.1%). The average median household income growth rate over this period was −0.2% in Nevada and −0.5% in Utah.

11.4.19.1.5 ROI Population

Table 11.4.19.1-5 presents recent and projected populations in the three counties, the ROI, and the two states as a whole. Population in the ROI stood at 1,927,930 in 2008, having grown at an average annual rate of 4.0% since 2000. The growth rate for the ROI was higher than that for the state of Nevada (3.4%).

All three counties in the ROI experienced growth in population between 2000 and 2008; population in Clark County grew at an annual rate of 4.0%; in Iron County, 3.4%; and in Lincoln County, 1.4%. The ROI population is expected to increase to 2,782,449 by 2021 and to 2,865,746 by 2023.

11.4.19.1.6 ROI Income

Total personal income in the ROI stood at $75.2 billion in 2007 and grew at an annual average rate of 4.9% over the period 1998 to 2007 (Table 11.4.19.1-6). Per-capita income also rose over the same period at a rate of 1.0%, increasing from $36,099 to $39,847. Per-capita incomes were higher in Clark County ($40,307) than in Lincoln County ($26,858) and Iron County ($21,922) in 2007. Growth rates in total personal income have been higher in Clark County than in Iron County and Lincoln County. Personal income growth rates in the ROI

TABLE 11.4.19.1-5 ROI Population for the Proposed Dry Lake Valley North SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Clark County, Nevada	1,375,765	1,879,093	4.0	2,710,303	2,791,161
Lincoln County, Nevada	4,165	4,643	1.4	5,350	5,412
Iron County, Utah	33,779	44,194	3.4	66,796	69,173
ROI	1,413,709	1,927,930	4.0	2,782,449	2,865,746
Nevada	1,998,257	2,615,772	3.4	3,675,890	3,779,745
Utah	2,233,169	2,727,343	2.5	3,546,228	3,666,248

Sources: U.S. Bureau of the Census (2009e,f); Nevada State Demographers Office (2008).

TABLE 11.4.19.1-6 ROI Personal Income for the Proposed Dry Lake Valley North SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Clark County, Nevada			
Total income[a]	45.7	74.1	5.0
Per-capita income	36,509	40,307	1.0
Lincoln County, Nevada			
Total income[a]	0.1	0.1	0.7
Per-capita income	24,711	24,121	-0.2
Iron County, Utah			
Total income[a]	0.7	0.9	3.5
Per-capita income	21,352	21,922	0.3
ROI			
Total income[a]	46.5	75.2	4.9
Per-capita income	36,099	39,847	1.0
Nevada			
Total income[a]	68.9	105.3	4.3
Per-capita income	37,188	41,022	1.0
Utah			
Total income[a]	61.9	82.4	2.9
Per-capita income	28,567	31,003	0.8

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of Census (2009e,f).

were higher than the rates for Nevada (4.3%) and Utah (2.9%), but per-capita income growth rates in Clark County were the same, while rates in Lincoln County and Iron County were lower than in Nevada as a whole (1.0%) and Utah (0.8%) as a whole.

Median household income in 2006 to 2008 varied from $41,173 in Lincoln County, to $42,687 in Iron County, to $56,954 in Clark County (U.S. Bureau of the Census 2009d).

11.4.19.1.7 ROI Housing

In 2007, more than 774,400 housing units were located in the three ROI counties; about 97% of these were in Clark County (Table 11.4.19.1-7). Owner-occupied units composed

TABLE 11.4.19.1-7 ROI Housing Characteristics for the Proposed Dry Lake Valley North SEZ

Parameter	2000	2007
Clark County, Nevada		
Owner-occupied	302,834	393,453
Rental	209,419	268,572
Vacant units	47,546	92,144
Seasonal and recreational use	8,416	NA[a]
Total units	559,799	754,169
Lincoln County, Nevada		
Owner-occupied	1,156	1,204
Rental	384	400
Vacant units	638	664
Seasonal and recreational use	305	NA
Total units	2,178	2,268
Iron County, Utah		
Owner-occupied	7,040	8,387
Rental	3,587	5,387
Vacant units	2,991	4,202
Seasonal and recreational use	1,986	NA
Total units	13,618	17,976
ROI		
Owner-occupied	311,030	403,044
Rental	213,390	274,359
Vacant units	51,175	97,010
Seasonal and recreational use	10,707	NA
Total units	575,595	774,413

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h-j).

approximately 60% of the occupied units in the two counties; rental housing made up 40% of the total. Vacancy rates in 2007 were 29.3% in Lincoln County, 23.4% in Iron County, and 12.2% in Clark County. With an overall vacancy rate of 12.5% in the ROI, there were 97,010 vacant housing units in the ROI in 2007, of which 39,291 are estimated to be rental units that would be available to construction workers. At the time of the 2000 Census, there were 10,707 units in seasonal, recreational, or occasional use in the ROI; 1.5% of housing units in Clark County, 14.6% in Iron County, and 14.0% in Lincoln County were used for seasonal or recreational purposes.

Housing stock in the ROI as a whole grew at an annual rate of 4.3% over the period 2000 to 2007, with 198,818 new units added to the existing housing stock (Table 11.4.19.1-7).

The median value of owner-occupied housing in 2006 to 2008 varied from $80,300 in Lincoln County, to $112,000 in Iron County, to $139,500 in Clark County (U.S. Bureau of the Census 2009g).

11.4.19.1.8 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 11.4.19.1-8. In addition, three Tribal governments are located in the ROI, with members of other Tribal groups located in the county but whose Tribal governments are located in adjacent counties or states.

11.4.19.1.9 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

Schools

In 2007, the three-county ROI had a total of 347 public and private elementary, middle, and high schools (NCES 2009). Table 11.4.19.1-9 provides summary statistics for enrollment

TABLE 11.4.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed Dry Lake Valley North SEZ

Governments	
City	
Boulder City	Kanaraville
Brian Head	Las Vegas
Caliente	Mesquite
Cedar City	North Las Vegas
Enoch	Paragonah
Henderson	Parowan
County	
Clark County	Lincoln County
Lincoln County	
Tribal	
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada	
Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada	
Paiute Indian Tribe of Utah	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

TABLE 11.4.19.1-9 ROI School District Data for the Proposed Dry Lake Valley North SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Clark County, Nevada	303,448	15,930	19.0	8.7
Lincoln County, Nevada	1,074	81	13.3	18.2
Iron County, Utah	8,522	402	21.2	9.1
ROI	313,044	16,413	19.1	8.7

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Iron County schools (21.2) is higher than that in Clark County (19.0) and Lincoln County schools (13.3), while the level of service is much higher in Lincoln County (18.2) than elsewhere in the ROI, where there are fewer teachers per 1,000 population (Iron County, 9.1; Clark County, 8.7).

Health Care

The total number of physicians (4,220) and the number of physicians per 1,000 population (2.3) are higher in Clark County than in Iron County (55; 1.2) and in Lincoln County (2; 0.4) (Table 11.4.19.1-10).

TABLE 11.4.19.1-10 Physicians in the ROI for the Proposed Dry Lake Valley North SEZ, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Clark County, Nevada	4,220	2.3
Lincoln County, Nevada	2	0.4
Iron County, Utah	55	1.2
ROI	4,277	2.3

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 11.4.19.1-11). Lincoln County has 26 officers and would provide law enforcement services to the SEZ. There are 3,214 officers in Clark County and 31 officers in Iron County. Levels of service of police protection are 5.8 per 1,000 population in Lincoln County, 1.7 in Clark County, and 0.7 in Iron County. Currently, there are 1,000 professional firefighters in the ROI (Table 11.4.19.1-11).

11.4.19.1.10 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism and illicit drug use, metal health, and divorce, which might be used as indicators of social change, are presented in Tables 11.4.19.1-12 and 11.4.19-1.13, respectively.

TABLE 11.4.19.1-11 Public Safety Employment in the ROI for the Proposed Dry Lake Valley North SEZ

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Clark County, Nevada	3,214	1.7	991	0.5
Lincoln County, Nevada	26	5.8	1	0.2
Iron County, Utah	31	0.7	8	0.2
ROI	3,271	1.7	1,000	0.5

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

TABLE 11.4.19.1-12 County and ROI Crime Rates for the Proposed Dry Lake Valley North SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
Location	Offenses	Rate	Offenses	Rate	Offenses	Rate
Clark County, Nevada	15,505	8.0	66,905	34.5	82,410	42.5
Lincoln County, Nevada	6	1.3	34	7.3	40	8.6
Iron County, Utah	56	1.2	1,085	23.7	1,141	24.9
ROI	15,567	8.1	68,024	35.3	83,591	43.4

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 11.4.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the ROI for the Proposed Dry Lake Valley North SEZ[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Nevada Clark	8.2	2.7	10.5	–[d]
Nevada Rural (includes Lincoln County)	8.0	2.7	9.5	–
Utah Southwest Region (includes Iron County)	5.6	2.5	11.3	–
Nevada				6.5
Utah				3.6

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] A dash indicates data not available.

Sources: SAMHSA (2009); CDC (2009).

There is some variation in the level of crime across the ROI, with higher rates of violent crime in Clark County (8.0 per 1,000 population) than in Lincoln County (1.3) or Iron County (1.2) (Table 11.4.19.1-12). Property-related crime rates are also higher in Clark County (34.5) than in Iron County (23.7) or Lincoln County (7.3); overall crime rates in Clark County (42.5) were higher than in Iron County (24.9) or Lincoln County (8.6).

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located. There is slight variation across the two regions in which the three counties are located; rates for alcoholism and mental health are slightly higher in the region in which Clark County is located (Table 11.4.19.1-13).

11.4.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 11.4.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas based solely on the number of recorded visitors is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands; some activity occurs on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 240,631 people were employed in the ROI in the various sectors identified as recreation, constituting 26.1% of total ROI employment (Table 11.4.19.1-14). Recreation spending also produced almost $9,455 million in income in the ROI in 2007. The primary sources of recreation-related employment were hotels and lodging places and eating and drinking places.

11.4.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of development employing various solar energy technologies are analyzed in detail in subsequent sections.

TABLE 11.4.19.1-14 Recreation Sector Activity in the Proposed Dry Lake Valley North SEZ ROI, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	4,681	147.6
Automotive rental	2,909	118.3
Eating and drinking places	105,589	3,230.5
Hotels and lodging places	116,751	5,620.2
Museums and historic sites	285	17.8
Recreational vehicle parks and campsites	352	10.1
Scenic tours	5,448	221.7
Sporting goods retailers	4,436	88.4
Total ROI	240,631	9,454.7

Source: MIG, Inc. (2009).

11.4.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Dry Lake Valley North SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service and public safety employment. Socioeconomic impacts common to all utility-scale solar energy developments are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic, because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar development in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodation otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy development projects in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 0.1% in regional population during construction of the trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, because of the lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families and an insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar development projects are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

Livestock Grazing Impacts

*C*attle ranching and farming supported 95 jobs, and $1.3 million in income in the ROI in 2007, (MIG, Inc. 2010). The construction and operation of solar facilities in the Dry Lake Valley North SEZ could result in a decline in the amount of land available for livestock grazing, resulting in total (direct plus indirect) impacts of the loss of less than one job and less than

$0.1 million in income in the ROI. There would also be a decline in grazing fees payable to the BLM and to the USFS by individual permitees based on the number of AUMs required to support livestock on public land. Assuming the 2008 fee of $1.35 per AUM, grazing fee losses would amount to $6,614 annually on land dedicated to solar development in the SEZ.

Access Road Impacts

The impacts of construction of an access road connecting the proposed SEZ could include the addition of 148 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 11.4.19.2-2). Construction activities in the peak year would

TABLE 11.4.19.2-2 ROI Socioeconomic Impacts of an Access Road Connecting the Proposed Dry Lake Valley North SEZ[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	85	<1
Total	148	<1
Income[b]		
Total	5.8	<0.1
Direct state taxes[b]		
Sales	0.2	<0.1
Income	<0.1	<0.1
In-migrants (no.)	0	0
Vacant housing[c] (no.)	0	0
Local community service employment		
Teachers (no.)	0	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts assume 7 mi (8 km) of access road is required for the Dry Lake Valley North SEZ. Construction impacts are assessed for the peak year of construction. Although gravel surfacing might be used, the analysis assumes the access road will be paved.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

constitute less than 1% of total ROI employment. Access road construction would also produce $5.8 million in ROI income. Direct sales taxes would be less than $0.2 million; direct income taxes in Utah, less than $0.1 million.

Total operations (maintenance) employment impacts in the ROI (including direct and indirect impacts) of an access road would be less than 1 job during the first year of operation (Table 11.4.19.2-2) and would also produce less than $0.1 million in income. Direct sales taxes would be less than $0.1 million in the first year; direct income taxes, less than $0.1 million.

Construction and operation of an access road would not require the in-migration of workers and their families from outside the ROI; consequently, no impacts on housing markets in the ROI would be expected, and no new community service employment would be required in order to meet existing levels of service in the ROI.

11.4.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are presented in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of three projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 9,000 acres (36 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower, 2022 for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period, because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 9,071 jobs (Table 11.4.1.19.2-3). Construction activities would constitute 0.7% of total ROI employment.

TABLE 11.4.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Dry Lake Valley North SEZ with Solar Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	5,232	2,679
Total	9,071	4,126
Income[b]		
Total	554.2	155.3
Direct state taxes[b]		
Sales	3.5	0.5
Income	1.1	0.2
BLM payments		
Acreage-related fee	NA[c]	4.8
Capacity fee[d]	NA	80.8
In-migrants (no.)	2,229	341
Vacant housing[e] (no.)	1,114	307
Local community service employment		
Teachers (no.)	20	3
Physicians (no.)	5	1
Public safety (no.)	5	1

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,800 MW (corresponding to 9,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 12,300 MW.

b Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

c NA = not applicable.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

e Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

A solar facility would also produce $554.2 million in income. Direct sales taxes would be $3.5 million; direct income taxes in Utah, $1.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 2,229 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 1,114 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.8% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 20 new teachers, 5 physicians, and 5 public safety employee (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 4,126 jobs (Table 11.4.19.2-3). Such a solar facility would also produce $155.3 million in income. Direct sales taxes would be $0.5 million; direct income taxes in Utah, $0.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $4.8 million, and solar generating capacity fees would total at least $80.8 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 341 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 307 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, 3 new teachers, 1 physician, and 1 public safety employee (career firefighters and uniformed police officers) would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 3,613 jobs (Table 11.4.19.2-4). Construction activities would constitute 0.3% of total ROI employment. Such a solar facility would also produce $220.7 million in income. Direct sales taxes would be $1.4 million; direct income taxes in Utah, $0.4 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 888 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 444 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.7% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 8 new teachers, 2 physicians, and 2 public safety employees would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 1,880 jobs (Table 11.4.19.2-4). Such a solar facility would also produce $65.0 million in income. Direct sales taxes would be $0.1 million; direct income taxes in Utah, $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $4.8 million, and solar generating capacity fees would total at least $44.9 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 176 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 159 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such

TABLE 11.4.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Dry Lake Valley North SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	2,084	1,384
Total	3,613	1,880
Income[b]		
Total	220.7	65.0
Direct state taxes[b]		
Sales	1.4	0.1
Income	0.4	0.1
BLM payments		
Acreage-related fee	NA[c]	4.8
Capacity fee[d]	NA	44.9
In-migrants (no.)	888	176
Vacant housing[e] (no.)	444	159
Local community service employment		
Teachers (no.)	8	2
Physicians (no.)	2	0
Public safety (no.)	2	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 6,833 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

employment would be required to meet existing levels of service in the ROI. Accordingly, 2 new teachers would be required in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 1,469 jobs (Table 11.4.19.2-5). Construction activities would constitute 0.1% of total ROI employment. Such a solar facility would also produce $89.7 million in income. Direct sales taxes would be $0.6 million; direct income taxes in Utah, $0.2 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 361 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 180 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 3 new teachers, 1 physician, and 1 public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 1,827 jobs (Table 11.4.19.2-5). Such a solar facility would also produce $63.1 million in income. Direct sales taxes would be $0.1 million; direct income taxes in Utah, $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $4.8 million, and solar generating capacity fees would total at least $44.9 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 171 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-

TABLE 11.4.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Dry Lake Valley North SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	847	1,345
Total	1,469	1,827
Income[b]		
Total	89.7	63.1
Direct state taxes[b]		
Sales	0.6	0.1
Income	0.2	0.1
BLM payments		
Acreage-related fee	NA[c]	4.8
Capacity fee[d]	NA	44.9
In-migrants (no.)	361	171
Vacant housing[e] (no.)	180	154
Local community service employment		
Teachers (no.)	3	2
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 6,833 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

occupied housing units would not be expected to be large, with 154 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 2 new teachers would be required in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 685 jobs (Table 11.4.19.2-6). Construction activities would constitute less than 0.1 % of total ROI employment. Such a solar development would also produce $41.9 million in income. Direct sales taxes would be $0.3 million; direct income taxes in Utah, $0.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 168 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 84 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 2 new teachers would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 182 jobs (Table 11.4.19.2-5). Such a solar facility would also produce $6.3 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $4.8 million, and solar generating capacity fees would total at least $35.9 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 17 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of

TABLE 11.4.19.2-6 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Dry Lake Valley North SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	395	134
Total	685	182
Income[b]		
Total	41.9	6.3
Direct state taxes[b]		
Sales	0.3	<0.1
Income	0.1	<0.1
BLM payments		
Acreage-related fee	NA[c]	4.8
Capacity fee[d]	NA	35.9
In-migrants (no.)	168	17
Vacant housing[e] (no.)	84	15
Local community service employment		
Teachers (no.)	2	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 6,833 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] Not applicable.

[d] The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h) , assuming full build-out of the site.

[e] Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 15 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

11.4.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Dry Lake Valley North SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

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11.4.20 Environmental Justice

11.4.20.1 Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (*Federal Register,* Volume 59, page 7629, Feb. 11, 1994), formally requires federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed Dry Lake Valley North SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons who identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origins. In addition, persons who classify themselves as being of multiple racial origins may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income.** Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 11.4.20.1-1 show the minority and low-income composition of the total population in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

Minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Nevada, 18.5% of the population is classified as minority, while 9.9% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area and does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the Nevada portion of the SEZ.

In the Utah portion of the 50-mi (80-km) radius, 9.2% of the population is classified as minority, while 15.7% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total

TABLE 11.4.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Dry Lake Valley North SEZ

Parameter	Nevada	Utah
Total population	8,878	5,523
White, non-Hispanic	7,239	5,015
Hispanic or Latino	692	264
Non-Hispanic or Latino minorities	947	244
One race	767	185
Black or African American	428	8
American Indian or Alaskan Native	258	151
Asian	42	15
Native Hawaiian or Other Pacific Islander	7	3
Some other race	32	8
Two or more races	180	59
Total minority	1,639	508
Low-income	883	865
Percentage minority	18.5	9.2
State percentage minority	17.2	15.9
Percentage low-income	9.9	15.7
State percentage low-income	10.5	9.4

Source: U.S Bureau of the Census (2009k,l).

population in the area; thus, in aggregate, there are no low-income populations in the Utah portion of the SEZ.

Figure 11.4.20.1-1 shows the locations of the low-income population groups within the 50-mi (80-km) radius around the boundary of the SEZ.

At the individual block group level there are low-income populations in one census block group, in Iron County west of Cedar City (including the towns of Newcastle and Modena), which has a low-income population that is more than 20 percentage points higher than the state average. There are no other block groups exceeding the 20% threshold in the 50-mi (80-km) area, and there are no block groups with low income or minority populations that exceed 50% of the total population in the block group, and the number of minority individuals does not exceed the state average by 20 percentage points or more at the individual block group level.

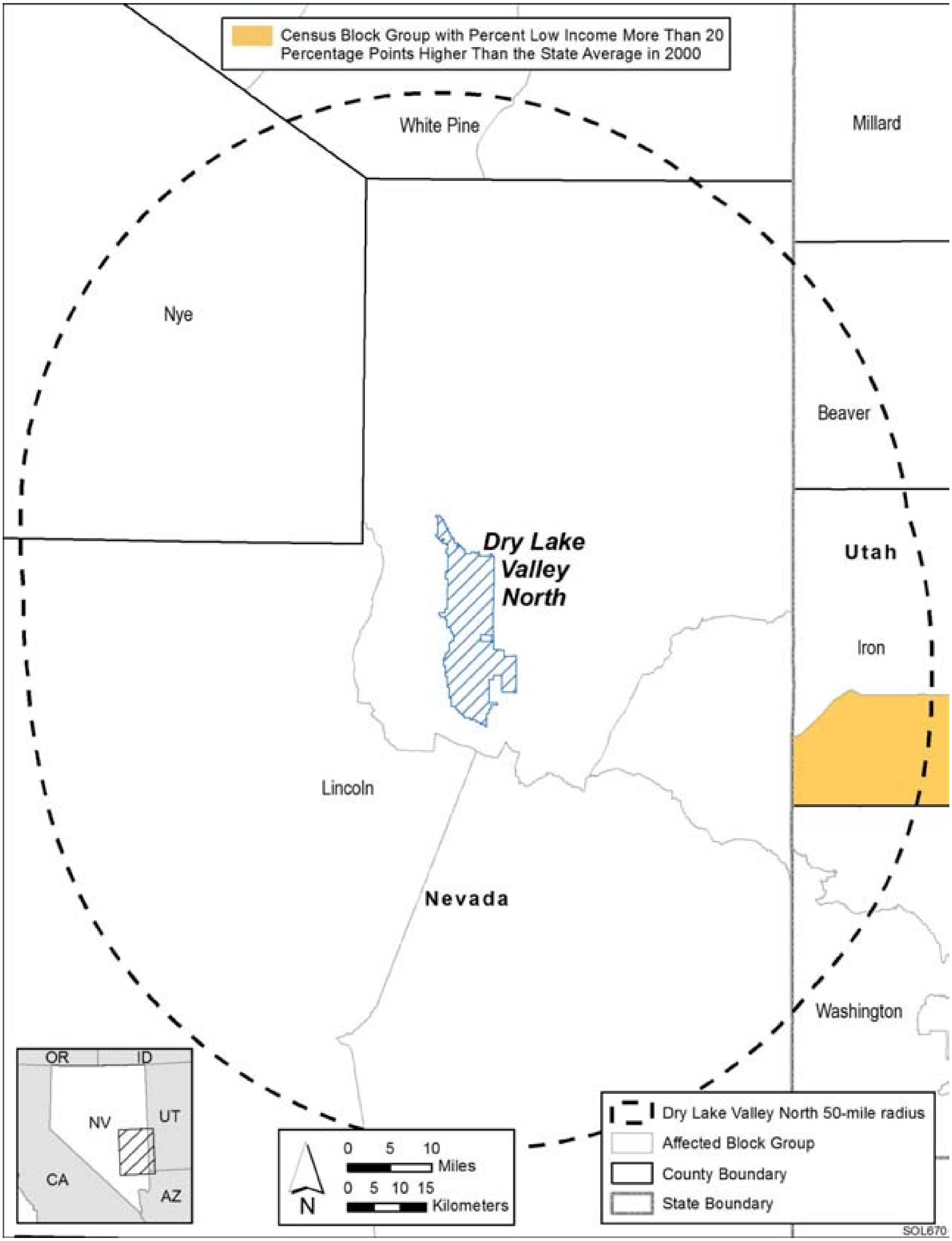

FIGURE 11.4.20.1-1 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Dry Lake Valley North SEZ

11.4.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of the programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed Dry Lake Valley North SEZ include noise and dust during the construction; noise and EMF effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are no minority populations defined by CEQ guidelines (Section 11.4.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects could not disproportionately affect minority populations. Because there are low-income populations within the 50-mi (80-km) radius, there could be impacts on low-income populations.

11.4.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Dry Lake Valley North SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

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11.4.21 Transportation

The proposed Dry Lake Valley North SEZ is accessible by road with rail nearby. One U.S. highway and one state highway serve the area as does a major railroad. Three small airports are in the general area. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

11.4.21.1 Affected Environment

The closest major road, Nevada State Route 318 runs north–south approximately 7 to 8 mi (11 to 13 km) to the west of the Dry Lake Valley North SEZ as shown in Figure 11.4.21.1-1. To the east of the SEZ, U.S. 93 runs north–south with a closest approach just more than 8 mi (13 km) away. The town of Pioche is situated due east of the central portion of the SEZ along U.S. 93. The Las Vegas metropolitan area is approximately 140 mi (24 km) to the south of the SEZ along State Route 318 to U.S. 93. Several local unimproved dirt roads cross the SEZ from both State Route 318 and U.S. 93. As listed in Table 11.4.21.1-1, the SEZ area and surrounding area have been designated as limited to travel on existing roads and trails. State Route 318 and U.S. 93 each carry average traffic volumes of about 1,000 vehicles per day in the vicinity of the Dry Lake Valley North SEZ (NV DOT 2010).

The UP Railroad serves the region. The main line passes through Las Vegas on its way between Los Angeles and Salt Lake City. The railroad has a stop along this route in Caliente, 25 mi (40 km) south of Pioche on U.S. 93.

The nearest public airport is the Lincoln County Airport, a small local airport about a 10-mi (16-km) drive to the south of Pioche in Panaca. The airport has one asphalt runway 4,260-ft (1,408-m) long in fair condition (FAA 2009). Lincoln County Airport does not have scheduled commercial passenger or freight service. The next two closest public airports, Alamo Landing Field Airport (by Alamo on U.S. 93 south of the State Route 375 junction) and Currant Ranch Airport (on U.S. 6 west of the State Route 318 junction), have dirt runways and are owned by the BLM (FAA 2009). McCarran International Airport in Las Vegas, more than a 140-mi (225-km) drive, is the nearest major airport to the SEZ.

11.4.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum) or possibly 6,000 vehicle trips per day if three larger projects were to be developed at the same time. The volume of traffic on either State Route 318 or U.S. 93 would represent an increase in traffic of about a factor of 2, 4, or 6 maximum in the area of the SEZ for one, two, or three projects, respectively. Because higher traffic volumes would be experienced during shift changes, traffic on either State Route 318 or U.S. 93 could experience moderate slowdowns during these time periods in the general area of

TABLE 11.4.21.1-1 AADT on Major Roads near the Proposed Dry Lake Valley North SEZ for 2009

Road	General Direction	Location	AADT (Vehicles)
U.S. 93	North–South	North of I-15 junction (I-15 Exit 64)	2,300
		South of State Route 318	1,600
		North of State Route 375	650
		South of State Route 317 by Caliente	740
		North of Caliente	1,400
		North of State Route 319	1,200
		South of Pioche	1,000
		North of Pioche	580
		North of road to Bristol Silver Mine (due east of northern tip of the SEZ)	500
		South of junction with U.S. 6/U.S. 50	300
State Route 318	North–South	West of junction with U.S. 93	1,100
		1.6 mi (2.6 km) north of junction with State Route 375	1,200
		Nye–White Pine County Line	1,000
		In Lund, Nevada	1,600
State Route 319	East–West	East of junction with U.S. 93 (toward Panaca)	1,800
State Route 322	North–South	East of junction with U.S. 93 in Pioche	250
State Route 375	East–West	West of junction with State Route 318	200

Source: NV DOT (2010).

the SEZ. Local road improvements would be necessary on State Route 318 or U.S. 93 near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any routes designated as open within the proposed SEZ, these routes crossing areas issued ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

11.4.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed Dry Lake Valley North SEZ. The programmatic design features described in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

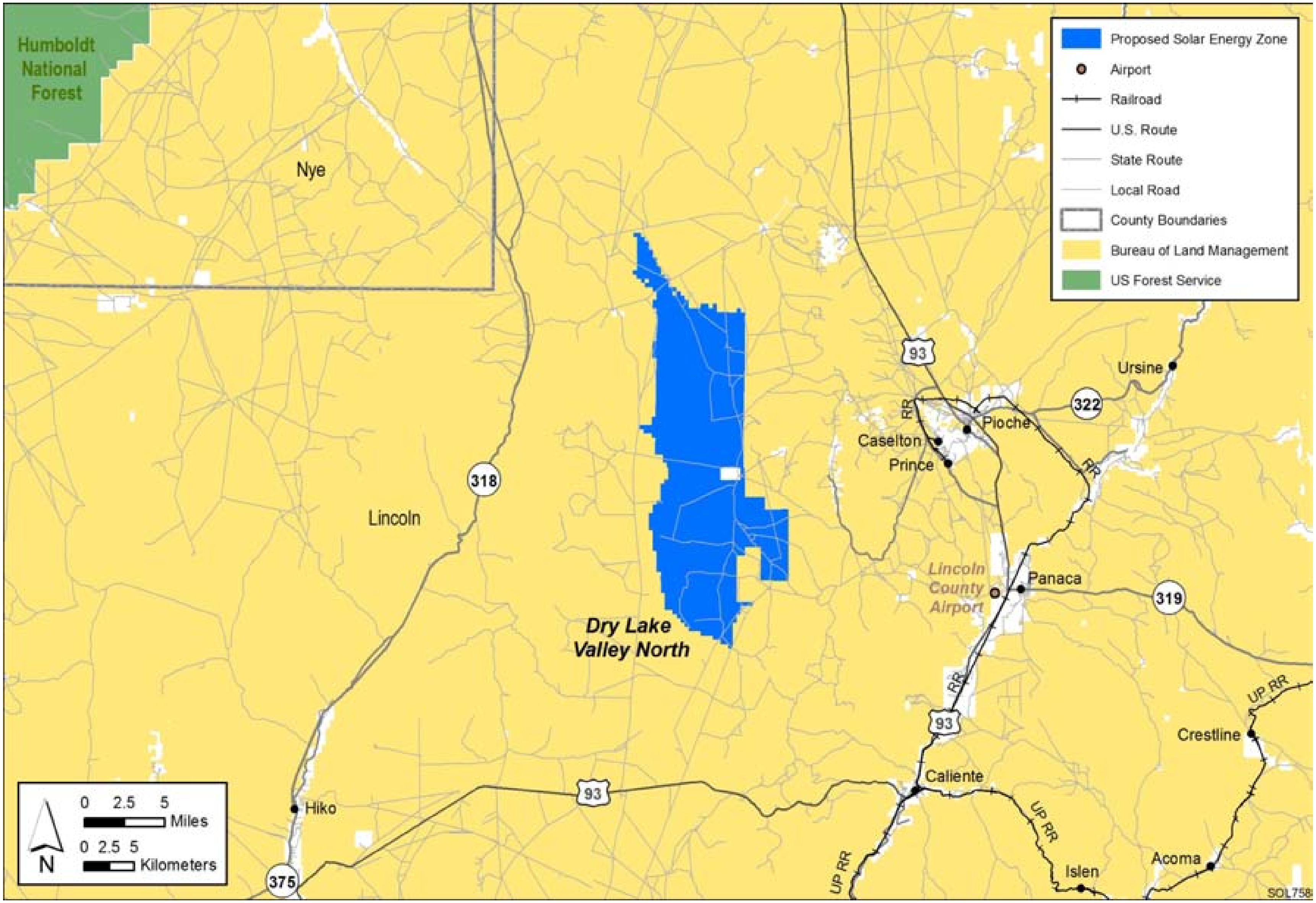

FIGURE 11.4.21.1-1 Local Transportation Network Serving the Proposed Dry Lake Valley North SEZ

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11.4.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Dry Lake Valley North SEZ in Lincoln County, Nevada. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur more than 5 to 10 years in the future.

The land surrounding the proposed Dry Lake Valley North SEZ is undeveloped, with no permanent residents in the area. The nearest population centers are the small communities of Caselton and Pioche (population 2,111), located about 13 mi (21 km) and 15 mi (24 km), respectively, from the eastern boundary of the SEZ. The Pahranagat NWR is about 45 mi (72 km) southwest of the SEZ. The northeast boundary of the Desert National Wildlife Range is located just under 50 mi (80 km) southwest of the SEZ. Two WAs are located near the proposed Dry Lake Valley North SEZ: Big Rocks WA is southwest of the SEZ, and the Weepah Spring WA is west of the SEZ. Portions of seven other WAs are within 50 mi (80 km) of the SEZ. The BLM administers about 82% of the lands in the Ely District that contains the Dry Lake Valley North SEZ. In addition, the proposed Delamar Valley SEZ is located about 20 mi (32 km) to the south of the Dry Lake Valley North SEZ, and for many resources, the geographic extent of impacts of the two SEZs overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the proposed Dry Lake Valley North SEZ is identified in Section 11.4.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 11.4.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 11.4.22.3. Cumulative impacts for each resource area are discussed in Section 11.4.22.4.

11.4.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the proposed Dry Lake Valley North SEZ is provided in Table 11.4.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than visual resources). Most of the lands around the SEZ are administered by the BLM, the USFWS, or the DoD. The BLM administers about 93.8% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 11.4.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Dry Lake Valley North SEZ

Resource Area	Geographic Extent
Land Use	Central Lincoln County–Dry Lake Valley North
Specially Designated Areas and Lands with Wilderness Characteristics	Central Lincoln County
Rangeland Resources	
Grazing	Central Lincoln County
Wild Horses and Burros	A 50 mi (80 km) radius from the center of the Dry Lake Valley North SEZ
Recreation	Central Lincoln County
Military and Civilian Aviation	Central Lincoln County
Soil Resources	Areas within and adjacent to the Dry Lake Valley North SEZ
Minerals	Central Lincoln County
Water Resources	
Surface Water	Dry Lake, Coyote Wash, Fairview Wash, Cherry Creek, and wetlands associated with Dry Lake
Groundwater	Dry Lake Valley and Delamar Valley groundwater basins and the White River flow system
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Dry Lake Valley North SEZ
Vegetation, Wildlife, and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Dry Lake Valley North SEZ, including portions of Lincoln and Nye Counties in Nevada and Washington, Iron, and Beaver Counties in Utah
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Dry Lake Valley North SEZ
Acoustic Environment (noise)	Areas adjacent to the Dry Lake Valley North SEZ
Paleontological Resources	Areas within and adjacent to the Dry Lake Valley North SEZ
Cultural Resources	Areas within and adjacent to the Dry Lake Valley North SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Dry Lake Valley North SEZ for other properties, such as traditional cultural properties.
Native American Concerns	Dry Lake Valley and surrounding mountains; viewshed within a 25-mi (40-km) radius of the Dry Lake Valley North SEZ.
Socioeconomics	Lincoln and Clark Counties in Nevada and Iron County in Utah
Environmental Justice	Lincoln County and Clark Counties in Nevada and Iron County in Utah
Transportation	U.S. Highway 93; State Route 318

11.4.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable;" that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;
- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the Federal Register or state publications;
- Proposals for which enabling legislations has been passed; and
- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 11.4.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 11.4.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

11.4.22.2.1 Energy Production and Distribution

On February 16, 2007, Governor Jim Gibbons of Nevada signed an Executive Order to encourage the development of renewable energy resources in the state (Gibbons 2007a). The Executive Order requires all relevant state agencies to review their permitting processes to ensure the timely and expeditious permitting of renewable energy projects. On May 9, 2007, and June 12, 2008, the Governor signed Executive Orders creating the Nevada Renewable Energy Transmission Access Advisory Committee Phase I and Phase II that will propose recommendations for improved access to the grid system for renewable energy industries (Gibbons 2007b, 2008). On May 28, 2009, the Nevada legislature passed a bill modifying the Renewable Energy Portfolio Standards (Nevada Senate 2009). The bill requires that 25% of the electricity sold be produced by renewable energy sources by 2025.

No existing or foreseeable energy production facilities are located within a 50-mi (80-km) radius from the center of the proposed Dry Lake Valley North SEZ, which includes portions of Lincoln and Nye Counties in Nevada and Washington, Beaver and Iron Counties in Utah. The closest renewable energy facility or project would be the 152-MW Spring Valley Wind project, a fast-track wind project located about 80 mi (130 km) north of the SEZ. Reasonably foreseeable future actions related to energy development and distribution are identified in Table 11.4.22.2-1 and described in the following sections.

Renewable Energy Development

Renewable energy ROW applications are considered in two categories: fast-track and regular-track applications. Fast-track applications, which apply principally to solar energy facilities, are those applications on public lands for which the environmental review and public participation process is underway, and the applications could be approved by December 2010. A fast-track project would be considered foreseeable because the permitting and environmental review processes would be under way. There are no fast-track projects with 50 mi (80 km) of the proposed Dry Lake Valley North SEZ. Regular-track proposals are considered potential future projects but not necessarily foreseeable projects, since not all applications would be expected to be carried to completion. These proposals are considered together as a general level of interest in development of renewable energy in the region and are discussed in the following section.

Pending Solar and Wind ROW Applications on BLM-Administered Lands.

Applications for ROWs that have been submitted to the BLM include one pending solar project, one pending authorization for wind site testing, six authorized for wind testing, and one pending authorization for development of a wind facility that would be located within 50 mi (80 km) of the Dry Lake Valley North SEZ (BLM 2009b). No applications for geothermal projects have been submitted. Table 11.4.22.2-2 lists these applications and Figure 11.4.22.2-1 shows their locations.

The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The number and type of projects, listed in Table 11.4.22.2-2, are an indication of the level of interest in development of renewable energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in general for their potential aggregate effects.

Wind testing would involve some relatively minor activities that could have some environmental effects, mainly the erection of meteorological towers and monitoring of wind conditions. These towers may or may not employ guy wires and may be 200 ft (60 m) high.

Energy Transmission and Distribution Projects

The following proposed transmission line projects, which would run through or near the proposed Dry Lake Valley North SEZ, are considered reasonably foreseeable projects.

TABLE 11.4.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Dry Lake Valley North SEZ

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Development			
None			
Transmission and Distribution Systems			
Southwest Intertie Project	FONSI issued July 30, 2008 In-service in 2010	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes through the SEZ
One Nevada Transmission Line Project	Draft Supplemental EIS Nov. 30, 2009	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes through the SEZ
Zephyr and Chinook Transmission Line Project	Permit Applications in 2011/2012	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes near or through the SEZ

Southwest Intertie Project (SWIP). The SWIP is a 520-mi (830-km) long, single-circuit, overhead 500-kV transmission line project. The first phase, the Southern Portion, is a 264-mi (422-km) long transmission line that begins at the existing Harry Allen Substation located in Dry Lake, Nevada, and extends north to a proposed substation about 18 mi (29 km) northwest of Ely, Nevada. The transmission line will pass through the SEZ. It will consist of self-supporting, steel-lattice and steel-pole H-frame structures placed 1,200 to 1,500 ft (366 to 457 m) apart. The SWIP is expected to be completed in 2010. Construction could have potential impacts on the Mojave desert tortoise (BLM 2007a).

One Nevada Transmission Line Project. NV Energy proposes to construct and operate a 236-mi (382-km) long 500-kV transmission line with fiber optic telecommunication and appurtenant facilities in White Pine, Nye, Lincoln, and Clark Counties. It will consist of self-supporting, steel-lattice and steel-pole H-frame structures placed 900 to 1,600 ft (274 to 488 m) apart. The width of the ROW is 200 ft (61 m). The proposed action includes new substations outside the ROI of the proposed Dry Lake Valley North SEZ. The transmission line would be within the SWIP utility corridor that passes through the SEZ. Construction could have potential impacts on the Mojave Desert Tortoise (BLM 2009a).

Zephyr and Chinook Transmission Line Project. TransCanada is proposing to construct two 500-kV high-voltage direct current transmission lines. The Zephyr project would originate in southeastern Wyoming. The Chinook project would originate in south central Montana. Both would travel along the same corridor from northern Nevada, passing near or through the SEZ,

TABLE 11.4.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Dry Lake Valley North SEZ[a,b]

Serial Number	Applicant	Application Received	Size (acres)[c]	MW	Technology	Status	Field Office
Solar Applications							
NVN 86350	Solar Reserve LLC	Oct. 2, 2008	7,680	180	Power tower	Pending	Caliente
Wind Applications							
NVN 88325	–[d]	–	–	–	Wind	Pending wind site testing	Schell
NVN 86795	Windlab Developments USA, Ltd.	Feb. 25, 2009	–	–	Wind	Authorized wind site testing	Schell
NVN 87298	Windlab Developments USA, Ltd.	March 9, 2009	–	–	Wind	Authorized wind site testing	Schell
NVN 84477	Nevada Wind	Feb. 25, 2008	5,030	–	Wind	Authorized wind site testing	Schell
NVN 83880	Nevada Wind	June 27, 2008	9,020	–	Wind	Authorized wind site testing	Schell
NVN 84476	Nevada Wind	Sept. 24, 2008	2,950	–	Wind	Authorized wind site testing	Schell
UTU 83063	–	–	–	–	Wind	Authorized wind site testing	Cedar City
NVN 87411	–	–	–	–	Wind	Pending wind facilities development	Schell

[a] Source: BLM (2009b).

[b] Information for pending solar energy projects (BLM and USFS 2010c) and pending wind energy projects (BLM and USFS 2010d) was downloaded from GeoCommunicator.

[c] To convert acres to km^2, multiply by 0.004047.

[d] A dash indicates data not available.

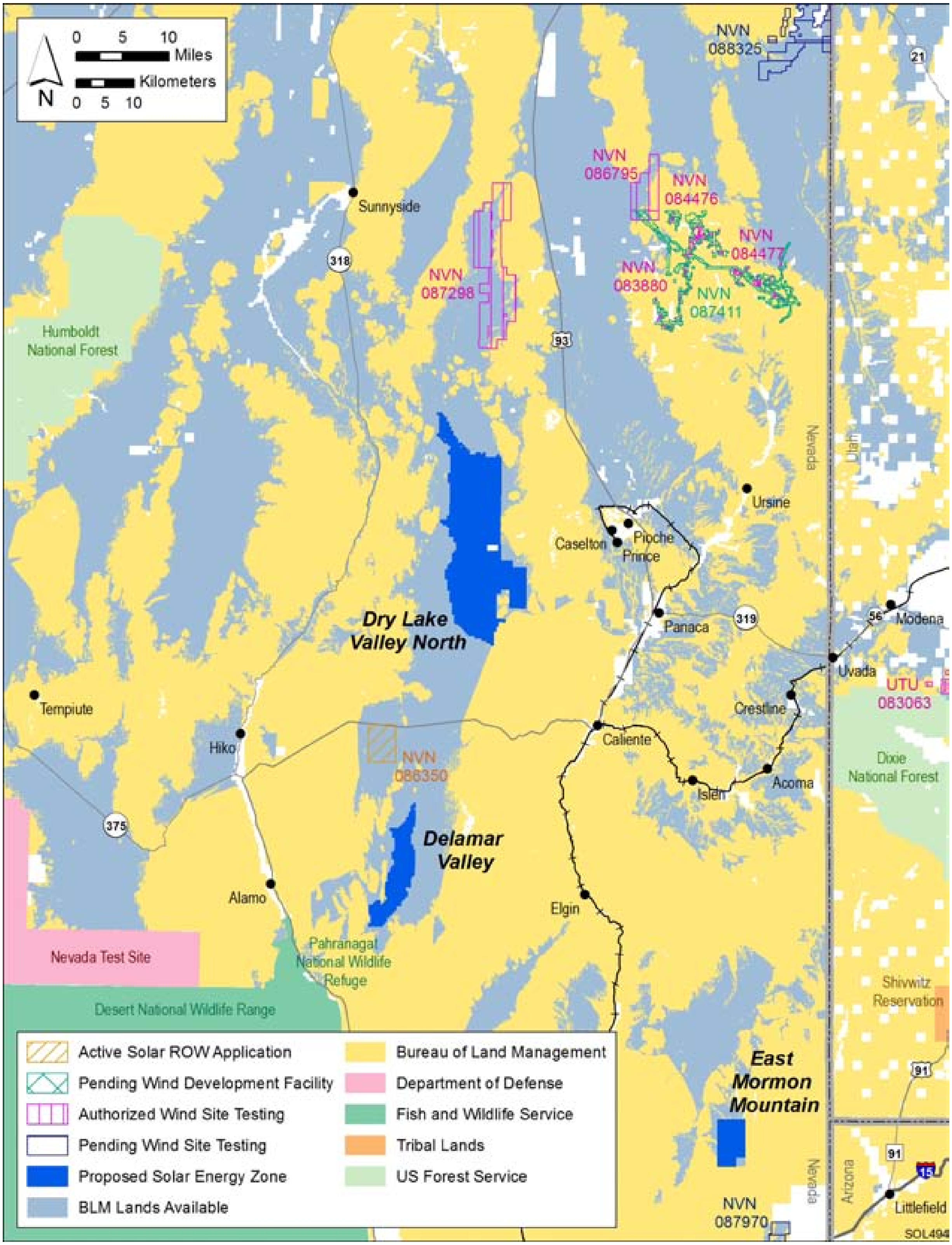

FIGURE 11.4.22.2-1 Locations of Renewable Energy Project ROW Applications on Public Land within a 50-mi (80-km) Radius of the Proposed Dry Lake Valley North SEZ

and terminate in the El Dorado Valley south of Las Vegas. Construction is expected to be complete in 2015 or 2016 (TransCanada 2010).

11.4.22.2.2 Other Actions

Other major ongoing and foreseeable actions identified within 50 mi (80 km) of the proposed Dry Lake Valley North SEZ are listed in Table 11.4.22.2-3 and described in the following subsections.

Other Ongoing Actions

Arizona Nevada Tower Corporation (ANTC). ANTC has constructed seven cellular telephone signal relay towers in Lincoln County along the U.S. 93 corridor between Coyote Springs Valley and the town of Pioche. One site is just east of the SEZ; the others are south and southwest of the site SEZ. Four of the seven sites are 100-ft × 100-ft (30.5-m × 30.5-m) parcels. The remaining three are 50 ft × 100 ft (15.7 m × 30.5 m), 50 ft ×120 ft (15.7 m × 36.6 m) and 100 ft × 200 ft (30.5 m × 61.0 m). Utility corridors were extended to six of the sites to supply electricity. Solar cells are the primary source of power for the Alamo Peak site, with wind generation as the backup. The towers are steel lattice, three-sided, and free standing, and each tower base is a 30-ft (9-m) square concrete slab. The towers at Alamo Peak and Highland Peak are 125 ft (38.1 m) high, and the other five are 195 ft (59.4 m) high (BLM 2007b).

Patriot Communications Exercise in Lincoln Count. The U.S. Air Force at Nellis Air Force Base has acquired a 15-year communications use lease to support ground-based radar/communications exercises at fourteen 5.7-acre (0.023-km^2) sites. A maximum of five exercises would be conducted annually for a period of 15 years. One site is just east of the SEZ. Three of the sites are along U.S. 93 about 15 mi (24 km) south of the SEZ. The remainder are 20 to 40 mi (32 to 64 km) west of the SEZ (BLM 2008c).

Other Foreseeable Actions

Caliente Rail Alignment. The DOE proposes to construct and operate a railroad for the shipment of spent nuclear fuel and high-level radioactive waste to the geologic repository at Yucca Mountain, Nevada. The rail line would begin near Caliente, Nevada and extend north, then turn in a westerly direction, passing through the SEZ, to a location near the northwest corner of the Nevada Test and Training Range, and then continue south-southwest to Yucca Mountain. The rail line would range in length from approximately 328 mi (528 km) to 336 mi (541 km), depending upon the exact location of the alignment. The rail line would be restricted to DOE shipments. Over a 50-year period, 9,500 casks containing spent nuclear fuel and high-level

TABLE 11.4.22.2-3 Other Major Actions near the Proposed Dry Lake Valley North SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Arizona Nevada Tower Corporation Communication Sites	EA issued April 2007	Terrestrial habitats, wildlife, cultural resources	East, west, and southwest of the SEZ
Patriot Communication Exercises in Lincoln County	DEA April 2008	Terrestrial habitats, wildlife, soils	East, south, and west of the SEZ
Caliente Rail Realignment	FEIS June 2008	Terrestrial habitats, wildlife cultural resources	Passes through the SEZ
Clark, Lincoln, and White Pine Counties Groundwater Development Project	DEIS expected in March 2011	Terrestrial habitats, wildlife, groundwater	Within the SEZ
Lincoln County Land Act Groundwater Development and Utility ROW	FEIS issued May 2009 ROD Jan. 2010	Terrestrial habitats, wildlife, groundwater	Southeast of the SEZ
Alamo Industrial Park and Community Expansion	Preliminary Design Report Jan. 2000; FEIS issued Jan. 2010	Terrestrial habitats, wildlife, socioeconomics	35 mi (56 km) southwest of the SEZ
Meadow Valley Industrial Park	FEIS issued Jan. 2010	Terrestrial habitats, wildlife, socioeconomics	14 mi (22 km) southeast of the SEZ
NV Energy Microwave and Mobile Radio Project	Preliminary EA March 2010	Terrestrial habitats, wildlife cultural resources	Two of the sites are 40 mi (64 km) west of SEZ; one site is 50 mi (80 km) northwest of SEZ
U.S. Highway 93 Corridor Wild Horse Gather	EA issued Dec. 28, 2009	Terrestrial habitats, wildlife	East of the SEZ
Silver King Herd Management Area Wild Horse Gather	Preliminary EA issued June 10, 2010	Terrestrial habitats, wildlife	In and around the SEZ
Eagle Herd Management Area Wild Horse Gather	Preliminary EA issued Dec. 17, 2009	Terrestrial habitats, wildlife	East of the SEZ
Ash Canyon Sagebrush Restoration and Fuels Reduction Project	Preliminary EA issued May 2010	Terrestrial habitats, wildlife	25 mi (40 km) southeast of the SEZ
Pioche/Caselton Wildland Urban Interface Project	Preliminary EA issued May 2010	Terrestrial habitats, wildlife	East of the SEZ

radioactive waste, and approximately 29,000 rail cars of other materials, including construction materials, would be shipped to the repository. An average of 17 one-way trains per week would travel along the rail line. Construction of support facilities - interchange yard, staging yard, maintenance-of-way facility, rail equipment maintenance yard, cask maintenance facility, and Nevada Rail Control Center and National Transportation Operation Center would also be required. Construction would take 4 to 10 years and cost $2.57 billion. Construction activities would occur inside a 1000 ft (300 m) wide right-of-way for a total footprint of 40,600 acres (164 km^2) (DOE 2008).

Clark, Lincoln, and White Pine Counties Groundwater Development Project. The Southern Nevada Water Authority (SNWA) proposes to construct a groundwater development project that would transport approximately 122,755 ac-ft/yr (151 million m^3/yr) of groundwater under existing water rights and applications from several hydrographic basins in eastern Nevada and western Utah. The proposed facilities include production wells, 306 mi (490 km) of buried water pipelines, 5 pumping stations, 6 regulating tanks, 3 pressure reducing stations, a buried storage reservoir, a water treatment facility, and about 323 mi (517 km) of 230 kV overhead power lines, and 2 primary and 5 secondary substations. A portion of the project will be located in the Dry Lake Valley North SEZ. The project would develop groundwater in the following amounts in two hydraulically connected valleys that would supply groundwater to the Dry Lake Valley North SEZ: Dry Lake Valley (11,584 ac-ft/yr [14.3 million m^3/yr]) and Delamar Valley (2,493 ac-ft/yr [3.1 million m^3/yr]). In addition, an undetermined amount of water could be developed and transferred from Coyote Spring Valley, which is south of the SEZ and downgradient of the other two basins (SNWA 2010).

Lincoln County Land Act (LCLA) Groundwater Development and Utility ROW. This project involves the construction of the infrastructure required to pump and convey groundwater resources in the Clover Valley and Tule Desert Hydrographic Areas. The construction includes 75 mi (122 km) of collection and transmission pipeline, 30 wells, 5 storage tanks, water pipeline booster stations, transmission lines and substations, and a natural gas pipeline. A total of 240 acres (0.97 km^2) will be permanently disturbed, and 1,878 acres (7.6 km^2) temporarily disturbed. The closest approach to the SEZ is about 30 mi (48 km) southeast (USFWS 2009b).

Alamo Industrial Park and Community Expansion. The BLM is planning to transfer four parcels, consisting of 855 acres (3.46 km^2) to Lincoln County. Parcel A, consisting of approximately 217 acres (0.88 km^2), is intended to be used for light industrial use. It is assumed that the industrial park structures would require 117 acres (0.47 km^2) with parking, roads and support infrastructure on another 100 acres (0.40 km^2). The remaining parcels would be used for community expansion and would be developed primarily for residential purposes. Housing units limited to about 3 units per acre would be built over a 20-year period. The site, about 0.1 mi (0.16 km) southeast of the Town of Alamo along U.S. 93, is about 35 mi (56 km) southwest of the SEZ (Agra Infrastructures, Inc. 2000, BLM 2007f; USFWS 2010b).

Meadow Valley Industrial Park. The BLM is planning to transfer a 103-acre (0.42-km^2) parcel to the City of Caliente, Nevada, for the construction of the Meadow Valley Industrial Park. The site is located on a previously disturbed area used for agriculture and recreation at the intersection of U.S. 93 and State Route 317, about 20 mi (32 km) southeast of the SEZ. Improvements to the site would include construction of a rail spur, access roads, and water and sewer extensions (USFWS 2010b).

NV Energy Microwave and Mobile Radio Project. NV Energy is proposing the installation of a new microwave and radio communications network at 13 sites. Two sites are within about 10 mi (16 km) of the SEZ and another is about 45 mi (72 km) south of the SEZ. The two closest sites are small, occupying about 0.6 acre (0.0024 km^2). The more distant site is 0.6 acre (0.0024 km^2) but requires 57 acres (0.23 km^2) of land disturbance for access and power line ROW. Each site would include a communication shelter, two or three propane tanks, and a generator. Two of the sites would each have an 80-ft (24-m) self-supporting lattice tower, and one would have a 200-ft (60-m) tower (BLM 2010a).

U.S. Highway 93 Corridor Wild Horse Gather. The BLM Schell Field Office plans to gather and remove about 50 excess wild horses residing outside the wild horse herd management areas. The horses are considered to pose a safety hazard on U.S. 93 (BLM 2009c).

Silver King Herd Management Area Wild Horse Gather. The BLM Schell and Caliente Field Offices propose to gather and remove 445 excess wild horses from within and outside the Silver King HMA. The Silver King HMA is 606,000 acres (2,452 km^2) in size and is located 16 mi (26 km) north of Caliente, Nevada (BLM 2010b).

Eagle Herd Management Area Wild Horse Gather. The BLM Schell Field Office proposes to gather and remove 545 excess wild horses from within and outside the Eagle HMA. The Eagle HMA is 670,000 acres (2,710 km^2) in size and is located 20 mi (32 km) northeast of Caliente, Nevada (BLM 2009d).

Ash Canyon Sagebrush Restoration and Fuels Reduction Project. The BLM Caliente Field Office is proposing to conduct a sagebrush improvement and fuels reduction project adjacent to Ash Canyon, about 5 mi (8 km) southeast of Caliente, Nevada, and about 25 mi (40 km) southeast of the SEZ. The size of the project area is 870 acres (3.5 km^2). The goal is to reduce pinyon and juniper in order to achieve a desired state where sagebrush is present along with an understory of perennial species; to reduce risk of wild fires by reducing fuel loading; to restore the historic disturbance regime; and to improve the available habitat for resident wildlife (BLM 2010d).

Pioche/Caselton Wildland Urban Interface Project. The BLM is proposing to conduct a wildland urban interface project near Pioche and Caselton, Nevada, east of the SEZ. About 3,246 to 4,711 acres (13.1 to 19.1 km^2) is planned for treatment. The goal is to reduce the threat of wildfire to Pioche and Caselton through implementation of fuel reduction treatments; to reduce the risk of large, uncontrolled wildfires by reducing fuel loading; and to restore the historic disturbance regime within the project area. The treatment would include reduction of canopy cover and fuel continuity of single-leaf pinyon, Utah juniper, and shrub species to prevent crown fire potential (BLM 2010e).

Grazing

The BLM Ely District in which the proposed SEZ is located has a total of 242 grazing allotments under its administration. There are 139 individual permittees, of which 129 are cattle operators and 10 are sheep operators (BLM 2010f). In Grazing Year 2009 (March 1, 2009 to February 2, 2010) grazing permits were issued for a total of 131,901 AUMs of forage (BLM 2009e).

Mining

The only active mining in the Ely District is at Bald Mountain Mine and Mooney Basin Mine, which are more than 100 mi (162 km) north the SEZ. The Meadow Valley Gypsum Project is proposing to mine gypsum on 21.2 acres (0.086 km^2) of public land more than 50 mi (80 km) south of the SEZ. A total of 46.7 acres (0.19 km^2) would be disturbed during the 10-year lifetime of the project. A 1.5-mi (2.5-km) long access road and a 1.8-acre (0.007-km^2) railroad siding would be constructed (BLM 2007c).

11.4.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change for the proposed Dry Lake Valley SEZ are presented in this section. Table 11.4.22.3-1 lists the relevant impacting factors for the trends.

11.4.22.3.1 Population Growth

Over the period 2000 to 2008, population grew by 1.4% in Lincoln County, 4.0% in Clark County, and 1.4% in Iron County Utah, the ROI for the Dry Valley North SEZ (see Section 11.4.19.1.5). The population of the ROI in 2008 was 1,927,930. The growth rate for the state of Nevada as a whole was 3.4%, and for Utah was 2.5%.

TABLE 11.4.22.3-1 General Trends Relevant to the Proposed SEZs in Nevada

General Trend	Impacting Factors
Population growth	Urbanization Increased use of roads and traffic Land use modification Employment Education and training Increased resource use (e.g., water and energy) Tax revenue
Energy demand	Increased resource use Energy development (including alternative energy sources) Energy transmission and distribution
Water availability	Drought conditions and water loss Conservation practices Changes in water distribution
Climate change	Water cycle changes Increased wildland fires Habitat changes Changes in farming production and costs

11.4.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in seven SEZ areas in Nevada between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5, 0.4, and 0.1% each year, respectively (EIA 2009).

11.4.22.3.3 Water Availability

As described in Section 11.4.9.1, the perennial yield of the Dry Lake Valley basin is equal to 12,700 ac-ft/yr (16 million m^3/yr). Approximately 1,009 ac-ft/yr (1.2 million m^3/yr) (for irrigation) of water rights are permitted in the basin, and an additional 57 ac-ft/year (70,300 m^3/yr) (about 30% for mining, the rest for stock watering) of water rights are certified (i.e., the well was previously permitted, beneficial use was subsequently demonstrated, and a certificate of water right was issued) In July 2008, the State Engineer (NDWR 2008) granted 11,584 ac-ft/yr (14 million m^3/yr) in water rights in the Dry Lake Valley groundwater basin to the SNWA for use in a project that would convey water to Las Vegas (SNWA 2010). However, the allocations are under review by the Nevada Supreme Court and the water rights applications have been opened up by the NDWR to public comment. Concerned parties could present new information about the groundwater basin, and thus the NDWR could alter its previous assessment of water availability in the basin.

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), 11% of which came from surface waters and 89% from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million m^3/yr), with livestock and mining water uses on the order of 230 ac-ft/yr (280,000 m^3/yr) and 450 ac-ft/yr (560,000 m^3/yr), respectively (Kenny et al. 2009).

11.4.22.3.4 Climate Change

Governor Jim Gibbons' Nevada Climate Change Advisory Committee (NCCAC) conducted a study of climate change and its effects on Nevada (NCCAC 2008). The committee's report summarized the present scientific understanding of climate change and its potential impacts on the state. A report on global climate change in the United States prepared by the U.S. Global Change Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from these reports indicate:

- Decreased precipitation with a greater percentage of that precipitation coming from rain, which will result in a greater likelihood of winter and spring flooding and decreased stream flow in the summer.

- The average temperature in the southwest has already increased by about 1.5ºF (0.8ºC) compared to a 1960 to 1979 baseline, and by the end of the century, the average annual temperature is projected to rise 4º to 10ºF (2.2º to 5.5ºC).

- Warming climate and related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires.

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end.

- Much of the Southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region.

- As temperatures rise, landscape will be altered as species shift their ranges northward and upward to cooler climates.

- Temperature increases, when combined with urban heat island effects for major cities such as Las Vegas, present significant stress to health, electricity and water supply.

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

11.4.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Dry Lake Valley North SEZ on the basis of the following assumptions: (1) because of the large size of the proposed SEZ (more than 30,000 acres [121 km^2]), up to three projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 61,499 acres (249 km^2) (80% of the entire proposed SEZ). For purposes of analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. Since an existing 69-kV transmission line intersects the southeastern corner of the SEZ, no analysis of impacts has been conducted for the construction of a new transmission line outside of the SEZ that might be needed to connect solar facilities to the regional grid (see Section 11.4.1.2). Regarding site access, the nearest major road is State Route 318, which extends north-south and lies about 7 mi (11 km) west of the SEZ. It is assumed that an access road would be constructed to this existing route to support solar development in the SEZ.

Cumulative impacts in each resource area that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section are discussed below. At this stage of development, because of the uncertain nature of the future projects in terms of size, number, and location within the proposed SEZ, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

11.4.22.4.1 Lands and Realty

The area covered by the proposed Dry Lake Valley North SEZ is largely isolated and undeveloped. In general, the area surrounding the SEZ is rural in nature. An existing dirt road from State Route 318 provides access to the northern portion of the SEZ, and a dirt road from U.S. 93 provides access to the southern portions of the SEZ. Numerous dirt ranch roads provide access throughout the SEZ (Section 11.4.2.1).

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. Utility-scale solar energy development would be a new and discordant land use in the area.

As shown in Table 11.4.22.2-2 and Figure 11.4.22.2-1, there is one pending solar development ROW application, six authorized and one pending wind site testing applications, and one pending wind development application on BLM administered land within a 50-mi (80-km) radius of the proposed Dry Lake Valley North SEZ. There are currently no solar applications within the SEZ. The lone solar application lies about 13 mi (21 km) southwest of the SEZ, while five of the wind applications lie generally northeast and one lies east in Utah. In addition, the proposed Delamar Valley SEZ is about 20 mi (32 km) south. While not all of these proposed solar and wind projects would likely be built, the number of applications indicates a fairly strong interest in the development of wind energy in particular northeast of the proposed SEZ.

An additional foreseeable project of note is the proposed Groundwater Development Project discussed in Section 11.4.22.2.2. This project would include the construction of a water pipeline and other water conveyance facilities as well as a parallel electrical transmission line extending north-south through the Dry Lake Valley (SNWA 2010).

The development of utility-scale solar projects on public lands in combination with ongoing, foreseeable, and potential actions within the geographic extent of effects, nominally within 50 mi (80 km), could have small cumulative effects on land use in the vicinity of the proposed Dry Lake Valley North SEZ. Most other actions outside of the proposed SEZ are wind energy projects, which would allow many current land uses to continue, including grazing. However, the number and size of such projects could result in cumulative effects, especially if the SEZ is fully developed with solar projects.

11.4.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

Fourteen specially designated areas are within 25 mi (40 km) of the proposed Dry Lake Valley North SEZ (Section 11.4.3.1). Potential exists for cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and the construction of transmission lines outside the SEZ. The exact nature of cumulative visual impacts on the users of these areas would depend on the specific solar technologies employed in the SEZ and the locations selected within the SEZ for solar facilities and outside the SEZ for transmission lines. Currently proposed solar and wind projects lie far enough away from the SEZ that sensitive areas would not likely be cumulatively affected by facilities within the geographic extent of effects. However, facilities and associated roads and transmission lines would add to the visual clutter of the area.

11.4.22.4.3 Rangeland Resources

The proposed Dry Lake Valley North SEZ contains large acreages of three perennial grazing allotments (Section 11.4.4.1.1). If utility-scale solar facilities were constructed on the SEZ, those areas occupied by the solar projects would be excluded from grazing. The effects of other renewable energy projects within the geographic extent of effects, including pending solar and wind applications within 50 mi (80 km) of the SEZ, that are ultimately developed would not likely result in cumulative impacts on grazing because of the small number and distance of the proposed facilities from Dry Lake Valley North and the generally low impact of wind facilities on grazing.

The proposed Dry Lake Valley North SEZ would encompass about 32,440 acres (131.3 km^2) of the 606,000-acre (2,452.4-km^2) Silver King HMA (Section 11.4.4.2.2). Wild horses would be excluded from areas where utility-scale facilities may be constructed on the SEZ. The BLM already had plans to remove 445 of the 505 (88.1%) of the wild horses from the HMA. This would offset the loss of up to 5.4% of the HMA by solar energy development within the SEZ. The effects of other renewable energy projects within the geographic extent of effects, including pending solar and wind applications within 50 mi (80 km) of the SEZ that are ultimately developed, would not likely result in cumulative impacts on wild horses because of the small number and distance of the proposed facilities from Dry Lake Valley North and the generally low impact of wind facilities on wild horses. The wild and horse and burro territories administered by the USFS are located more than 50 mi (80 km) from the Dry Lake Valley North SEZ. Thus, solar energy development within the SEZ would not directly affect wild horses and burros managed by the USFS and would not contribute to cumulative effects on wild horses and burros managed by the USFS.

11.4.22.4.4 Recreation

Limited outdoor recreation (e.g., backcountry driving, OHV use, and some camping and hunting) occurs on or in the immediate vicinity of the SEZ. Construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. Road closures and access restrictions within the proposed SEZ would affect OHV use in particular. Foreseeable and potential actions, primarily potential solar and wind projects, would similarly affect areas of low recreational use, but cumulative impacts on recreation within the geographic extent of effects would be small because of the small number and distance from the SEZ of potential developments.

11.4.22.4.5 Military and Civilian Aviation

Portions of the proposed Dry Valley Lake North SEZ are covered by two aircraft MTRs and a major SUA. The military has expressed serious concern over possible solar energy facilities within the SEZ. Nellis Air Force Base and NTTR have each indicated that facilities of over 50 ft (15 m) tall may be incompatible with their respective missions (Section 11.4.6.2). Additional solar and particularly wind facilities northeast of the SEZ could present additional concerns for military aviation, depending on the eventual location of such facilities with respect to training routes and, thus, could result in cumulative impacts on military aviation. The closest civilian municipal airports located in St. George and Cedar City, Utah, 75 mi (120 km) and 85 mi (137 km) southeast of the SEZ, respectively, are unlikely to be impacted by developments in the SEZ.

11.4.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from construction of other renewable energy facilities, recreational uses, and agriculture. Overall, the cumulative impacts on soil resources would be small, however, because of the small number of currently foreseeable projects within the geographic extent of effects. The number of pending solar and wind applications in this area suggests that future impacts could increase somewhat over that from any development in the SEZ, but would be expected to remain small.

Landscaping of solar energy facility areas in the SEZ could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that from other solar and wind developments and other activities, e.g., OHV use, outside the SEZ. However, with the programmatic design features in place, cumulative impacts would be small.

11.4.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 11.4.8, currently six oil and gas leases, all classified as nonproducing, are within the proposed Dry Lake Valley North SEZ; no mining claims or proposals for geothermal energy development are pending. Because of the generally low level of mineral production in the proposed SEZ and surrounding area and the expected low impact on mineral accessibility of other foreseeable actions within the geographic extent of effects, no cumulative impacts on mineral resources are expected.

11.4.22.4.8 Water Resources

Section 11.4.9.2 describes the water requirements for various technologies if they were to be used to develop utility-scale solar energy facilities on the SEZ. The amount of water needed during the peak construction year for all evaluated solar technologies would be 2,946 to 4,220 ac-ft (3.6 million to 5.2 million m^3). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for all evaluated solar technologies would range from 349 to 184,605 ac-ft/yr (430,000 to 228 million m^3/yr). The amount of water needed during decommissioning would be similar to or less than the amount used during construction.

As discussed in Section 11.4.22.2.3, water withdrawals in 2005 in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Therefore, cumulatively the additional water resources needed for solar facilities in the SEZ during operations would constitute from a relatively small (0.6%) to a very large (320%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Lincoln County), depending on the solar technology used (PV technology at the low end and the wet-cooled parabolic trough technology at the high end). However, as discussed in Section 11.4.9.1.3, the estimated perennial yield for the Dry Lake Valley basin is only an estimated 12,700 ac-ft/yr (15.7 million m^3/yr), of which1,065 ac-ft/yr (1.3 million m^3/yr) has been appropriated and 11,584 ac-ft/yr (14 million m^3/yr) are under review by the NDWR for SNWA for municipal use. If granted the water rights, the SNWA has committed to providing up to 1,500 ac-ft/yr (1.3 million m^3/yr) of water rights to Lincoln County (Section 11.4.9.1.3).Thus, even if water rights were available, water requirements for solar developments on the SEZ would have the potential to far exceed the physically available groundwater in the basin and even within Lincoln County using wet-cooling, while full development with dry-cooled solar trough technologies could exceed the current estimate of the perennial yield (Section 11.4.9.2.2).

While solar development of the proposed SEZ with water-intensive technologies would likely be infeasible due to impacts on groundwater supplies and restrictions on water rights, withdrawals at or above currently appropriated levels could result in impacts on groundwater levels in the Dry Lake Valley basin, which, in turn, could lead to declines in water availability in the adjacent Delamar Valley, which receives outflow from the Dry Lake Valley groundwater basin (Section 11.4.9.2.2). Thus, a significant increase in groundwater withdrawals for development within the proposed SEZ could result in a major impact on groundwater in the Dry Lake Valley. Further cumulative impacts could occur if these withdrawals were combined with other future uses in the valley or on the Delamar Valley basin from solar developments in both the proposed Dry Lake Valley North and in the proposed Delamar Valley SEZ, located 20 mi (32 km) to the south. Another foreseeable action with groundwater demands within in the central portion of the White River groundwater flow system, which is described in Section 11.4.22.2.2, is the Clark, Lincoln, and White Pine Counties Groundwater Development Project, which could withdraw 14,000 ac-ft/yr (17.3 million m^3/yr) from the Dry Lake and Delamar Valley groundwater basins.

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 28 to 212 ac-ft (34,000 to 274,000 m^3) during the peak construction year and would range from less than 7.7 up to 172 ac-ft/yr (up to 212,000 m^3/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to put undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet-cooling systems, there would also be from 1,940 to 3,493 ac-ft/yr (2.4 to 4.3 million m^3/yr) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds were effectively lined in order to prevent contamination of groundwater. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

11.4.22.4.9 Vegetation

The proposed Dry Lake Valley North SEZ is located within the Shadscale-Dominated Saline Basins ecoregion, which primarily supports shadscale low scrub community (Section 11.4.10.1). The southwestern portion of the SEZ is located within the Salt Deserts ecoregion, and the southeastern portion is within the Carbonate Sagebrush Valleys ecoregion. Surrounding lands also include the Carbonate Woodland Zone ecoregion. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the SEZ over 80% of its area would result in large impacts on Inter-Mountain Basins Mixed Salt Desert Scrub, Inter-Mountain Basins Playa, Inter-Mountain Basins Semi-Desert Grassland, Inter-Mountain Basins Big Sagebrush Steppe, and Undifferentiated Barren Land cover types and moderate impacts on Inter-Mountain Basins Semi-Desert Shrub Steppe and Inter-Mountain Basins Greasewood Flat cover types (Section 11.4.10.2.1).

Two mapped wetlands and numerous smaller playa areas that are not mapped, as well as numerous dry washes, are located within the proposed SEZ. Any wetland or riparian habitats within or outside of the SEZ that are supported by groundwater discharge could be affected by hydrologic changes resulting from project activities.

The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other construction, agriculture, recreation, and transportation activities in the area. The cumulative dust loading could result in reduced productivity or changes in plant community composition. Similarly, surface runoff from project areas after heavy rains could increase sedimentation and siltation in areas downstream. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats. The primary plant community types within the proposed SEZ are relatively common in the SEZ region. Ongoing and reasonably foreseeable future actions would have cumulative effects on both abundant and rare community types. Such effects could be moderate with full build-out of the SEZ, but would likely fall to small for foreseeable development due to the abundance of the primary species and the relatively small number of foreseeable actions within the geographic extent of effects. Cumulative effects on wetland species could occur from water use, drainage modifications, and stream sedimentation from development in the region. The magnitude of such effects is difficult to predict at the current time.

11.4.22.4.10 Wildlife and Aquatic Biota

Amphibian, reptile, bird, and mammal wildlife species could potentially be affected by the development of utility-scale solar energy facilities in the proposed SEZ. The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, and wildlife injury or mortality. In general, species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These design features would include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats.

As noted in Section 11.4.22.2, other ongoing, reasonably foreseeable and potential future actions within 50 mi (80 km) of the proposed SEZ include a groundwater transfer project, one pending solar application, and eight pending wind applications in various stages of approval (Figure 11.4.22.2-1). While impacts from full build-out over 80% of the proposed SEZ would result in small to moderate impacts on some wildlife species (Section 11.4.11), impacts from foreseeable development within the 50-mi (80-km) geographic extent of effects would be small. Many of the wildlife species present within the proposed SEZ that could be affected by other actions have extensive available habitat within the region, while no foreseeable solar or wind projects have been firmly identified within the geographic extent of effects. Some number of the pending solar and wind applications in the region could contribute to small cumulative effects, however, as would the foreseeable groundwater transfer project.

No surface water bodies or perennial streams occur within the proposed Dry Lake Valley North SEZ, washes are typically dry and flow only after precipitation, and an unnamed dry lake and associated wetlands rarely contain water. Thus, no standing aquatic communities are likely to be present in the proposed SEZ. However, aquatic communities do exist within the 50-mi (80-km) geographic extent of effects, including in the White River (Section 11.4.11.4). Nonetheless, potential contributions to cumulative impacts on aquatic biota and habitats resulting from groundwater drawdown or soil transport to surface streams from solar facilities within the SEZ and within the geographic extent of effects are low. Potentially affected habitats are generally too far away to be affected by groundwater use in the proposed SEZ, while there is little foreseeable development within the geographic extent of effects. The magnitude of any cumulative impacts on aquatic species that might occur would depend on the extent of eventual solar and other development in the region and on cooling technologies employed by solar facilities.

11.4.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

On the basis of recorded occurrences or suitable habitat, as many as 22 special status species could occur within the Dry Lake Valley North SEZ or could be affected by groundwater use there. Three of these species have been recorded within or near the SEZ: Blaine fishhook cactus, Eastwood milkweed, and Desert Valley kangaroo mouse. The Mojave population of the desert tortoise—listed as threatened under the ESA—is not likely to occur in the area of direct effects based upon the lack of suitable habitat and information provided by the USFWS. Numerous other species that may occur on or in the vicinity of the SEZ are protected by the state of Nevada or listed as a sensitive species by the BLM (Section 11.4.12.1).

Design features to be used to reduce or eliminate the potential for effects on special status species from the construction and operation of utility-scale solar energy projects in the SEZs and related developments (e.g., access roads and transmission line connections) outside the SEZ include avoidance of occupied or unique habitats and minimization of erosion, sedimentation, and dust deposition. Ongoing effects on special status species include those from roads, transmission lines, and recreational activities in the area. However, since the amount of foreseeable development within the geographic extent of effects is low – including only potential solar and wind projects, a groundwater transfer pipeline, and several transmission line projects – the likelihood of cumulative impacts on protected species is relatively low. Actual impacts would depend on the number, location, and cooling technologies of projects that are actually built. Projects would employ mitigation measures to limit effects.

11.4.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with development of solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other nearby projects outside the proposed SEZ or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. Dust generation from construction activities could be controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment.

Because the area proposed for the SEZ is rural and undeveloped land, no significant industrial sources of air emissions occur in the area. The only type of air pollutant of concern is dust generated by winds. Because the number of other foreseeable and potential actions that could produce fugitive dust emissions is small and because such projects are unlikely to overlap in both time and affected area, cumulative air quality effects due to dust emissions during any construction periods would be small.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as use of coal, oil, and natural gas to produce energy. As discussed in Section 11.4.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the Dry Lake Valley North SEZ was fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 57% of all emissions from the current electric power systems in Nevada.

11.4.22.4.13 Visual Resources

The proposed Dry Lake Valley North SEZ is located in the central portion of the broad and flat Dry Lake Valley. The valley is bounded by mountain ranges on the east and west, with more open views to the north and south (Section 11.4.14.1). The area is sparsely inhabited, remote, and rural in character.

The VRI values for the SEZ and immediate surroundings are VRI Class IV, indicating low relative visual values. Currently, there is a low level of cultural disturbance, including from OHV use and from roads, fences, livestock ponds, and a transmission line.

Construction of utility-scale solar facilities on the SEZ and associated transmission lines outside the SEZ would significantly alter the natural scenic quality of the area. Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Other potential solar and wind projects and related roads and transmission lines outside the proposed SEZ would cumulatively affect the visual resources in the area.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area. Currently there are one pending solar application and eight wind applications in various stages of approval on public lands within 50 mi (80 km) of the SEZ, which represent additional potential developments (Figure 11.4.22.2-1). In addition, several new electric transmission projects and a groundwater transfer pipeline project represent foreseeable developments that would pass through or near the proposed SEZ, as discussed in Section 11.4.22.2. While the contribution to cumulative impacts in the area of these potential projects would depend on the number and location of facilities that are actually built, it may be concluded that the general visual character of the landscape within this distance could be altered from what is currently rural desert by the presence of solar facilities, transmission lines, and other new infrastructure. Because of the topography of the region, such developments, located in basin flats, would be visible at great distances from surrounding mountains, which include sensitive viewsheds. Given the cluster of pending wind applications to the northeast, it is possible that two or more facilities might be viewable from a single location. In addition, facilities would be located near major roads and thus would be viewable by motorists, who would also be viewing transmission line corridors, towns, and other infrastructure, as well as the road system itself.

As additional facilities were added, several projects might become visible from one location, or in succession, as viewers moved through the landscape, as by driving on local roads. In general, the new developments would not be expected to be consistent in terms of their appearance and, depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Considering the above in light of the fact that only potential solar and wind developments have been identified, small cumulative visual impacts could occur within the geographic extent of effects from future solar, wind, and other existing and future developments.

11.4.22.4.14 Acoustic Environment

The areas around the proposed Dry Lake Valley North SEZ are relatively quiet. The existing noise sources around the SEZ include road traffic, aircraft flyover, and cattle grazing. Other noise sources are associated with current land use around the SEZ, including outdoor recreation and OHV use. The construction of solar energy facilities could increase the noise levels periodically for up to 3 years per facility, but there would be little or no noise during operation of solar facilities, even from solar dish engine facilities and from parabolic trough or power tower facilities using TES, which could also minimally affect nearby residences due to considerable separation distances.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZs are described in Section 11.4.22.2. Because proposed projects and nearest residents are relatively far from the SEZ with respect to noise impacts and the area is sparsely populated, cumulative noise effects during the construction or operation of solar facilities are unlikely.

11.4.22.4.15 Paleontological Resources

The proposed Dry Lake Valley North SEZ has low potential for the occurrence of significant fossil material in 91% of its area, mainly alluvial deposits, and unknown potential in about 9% of its area, mainly playa deposits (Section 11.4.16.1). While impacts on significant paleontological resources are unlikely to occur in the SEZ, the specific sites selected for future projects would be investigated to determine whether a paleontological survey is needed. Any paleontological resources encountered would be mitigated to the extent possible. No significant cumulative impacts on paleontological resources are expected.

11.4.22.4.16 Cultural Resources

The proposed Dry Lake Valley North SEZ is rich in cultural history, with settlements dating as far back as 12,000 years. The area covered by the proposed Dry Lake Valley North SEZ has the potential to contain significant cultural resources, especially in areas around the dry lake and at the south end of the SEZ, as well as in alluvial fans, fan piedmonts, ridge tops, passes, and stream terraces within and adjacent to the SEZ. It is possible that the development of utility-scale solar energy projects in the SEZ, when added to other potential projects likely to occur in the area, could contribute cumulatively to cultural resource impacts occurring in the region. However, the amount of potential and foreseeable development is low, and includes one pending solar application, two authorized wind testing applications, a proposed groundwater transfer pipeline, and several proposed transmission line projects within the 25-mi (40-km) geographic extent of effects (Section 11.4.22.2). While any future solar projects would disturb large areas, the specific sites selected for future projects would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Nevada SHPO and appropriate Native American governments, it is likely that most adverse effects on significant resources in the region could be mitigated to some degree. It is unlikely that any sites recorded in the SEZ would be of such individual significance that, if properly mitigated, development would cumulatively cause an irretrievable loss of information about a significant resource type, but this would depend on the results of the future surveys and evaluations.

11.4.22.4.17 Native American Concerns

Major Native American concerns in arid portions of the Great Basin include water, culturally important plant and animal resources, and culturally important landscapes. The development of utility-scale solar energy facilities within the SEZ, in combination with the foreseeable development in the surrounding area, could cumulatively contribute to effects on these resources. Development of the SEZ would result in the removal of plant species from the footprint of the facility during construction. This would include some plants of cultural importance. However, the primary species that would be affected are abundant in the region; thus the cumulative effect would likely be small. Likewise, habitat for important species, such as the black-tailed jackrabbit, would be reduced; however, extensive habitat is available in the area, reducing the cumulative effect. The cultural importance of the mountains surrounding the SEZ is as yet undetermined. If culturally important, the view from these features can be an important part of their cultural integrity. The degree of impact on these resources of development at specific locations must be determined in consultation with the Native American Tribes whose traditional use area includes the proposed SEZ. In general, Tribes prefer that development occur on previously disturbed land and this SEZ is largely undeveloped.

Government-to-government consultation is underway with federally recognized Native American Tribes with possible traditional ties to the Dry Lake Valley North area. All federally recognized Tribes with Southern Paiute or Western Shoshone roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. To date, no specific concerns have been raised to the BLM regarding the proposed Dry Lake Valley North SEZ. However, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments, while the Southern Paiute have previously expressed concern over adverse effects of energy projects on a wide range of resources in the area (Section 11.4.18.2). Continued discussions with the area Tribes through government-to-government consultation is necessary to determine the extent to which cumulative effects of solar energy development in the proposed Dry Lake Valley North SEZ can be addressed.

11.4.22.4.18 Socioeconomics

Solar energy development projects in the proposed Dry Lake Valley North SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services in combination with temporary workers involved in other new developments in the area, including other renewable energy development. The number of workers involved in the construction of solar projects in the peak construction year (including the transmission lines) could range from about 200 to 2,700 people, depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 330 (solar PV) to as high as 4,400 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-year or more solar development period.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-year duration, and could combine with those from other new developments in the area, including the proposed groundwater transfer pipeline and several proposed transmission line projects. The number of workers needed at the solar facilities would be in the range of 130 to 2,700, with approximately 180 to 3,900 total jobs created in the region, assuming full build-out of the SEZ (Section 11.4.19.2.2). Population increases would contribute to general upward trends in population in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

11.4.22.4.19 Environmental Justice

No minority or low-income populations as defined by CEQ guidelines are currently located within a 50-mi (80-km) radius of the proposed SEZ (Section 11.4.20.1). If this condition should change in the future, solar development of the proposed SEZ in combination with other development in the area could potentially impact these groups. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual impacts, noise, and exposure to fugitive dust. Actual impacts would depend on where minority or low-income populations were located relative to solar and other proposed facilities and on the geographic range of effects. If needed, mitigation measures could be implemented to reduce the impacts on these populations in the vicinity of the SEZ. Thus, it is not expected that the proposed

Dry Lake Valley North SEZ would contribute to cumulative impacts on minority and low-income populations.

11.4.22.4.20 Transportation

State Route 318 extends north–south about 7 mi (11 km) west of the proposed Dry Lake Valley North SEZ, and U.S. 93 is about 8 mi (13 km) from the eastern boundary. The closest airport is Lincoln County Airport at Panaca, about 17 mi (27 km) east of the SEZ. The UP Railroad serves the region.

During construction of utility-scale solar energy facilities, up to 1,000 workers could be commuting to the construction site at the SEZ for a single project, which could increase the AADT on these roads by 2,000 vehicle trips for each facility under construction. With as many as three facilities assumed under construction at the same time, traffic on either State Route 318 or U.S. 93 could experience moderate slowdowns in the area of the SEZ (Section 11.4.21.2). This increase in highway traffic from construction workers could likewise have moderate cumulative impacts in combination with existing traffic levels and increases from additional future developments in the area, including from construction in the proposed Delamar Valley SEZ located 20 mi (32 km) south, should construction schedules overlap. Local road improvements may be necessary on portions of State Route 318 and on U.S. 93 near the proposed SEZ. Any impacts during construction activities would be temporary. The impacts could also be mitigated to some degree by implementing staggered work schedules and ride-sharing programs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate the solar facilities and would have little contribution to cumulative impacts.

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11.4.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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11.5 EAST MORMON MOUNTAIN

11.5.1 Background and Summary of Impacts

11.5.1.1 General Information

The proposed East Mormon Mountain SEZ is located in Lincoln County in southern Nevada (Figure 11.5.1.1-1). The SEZ has a total area of 8,968 acres (36 km^2). In 2008, the county population was 4,643, while adjacent Clark County to the south had a population of 1,879,093. The towns of Mesquite and Bunkerville are approximately 13 mi (21 km) southeast of the SEZ; the larger, Mesquite, had a population of approximately 9,300 at the 2000 Census. The Las Vegas metropolitan area is approximately 62 mi (100 km) to the southwest of the SEZ.

The nearest major road access to the proposed SEZ is I-15, which runs southwest–northeast approximately 11 mi (18 km) to the southeast of the East Mormon Mountain SEZ. The UP Railroad passes about 20 mi (32 km) west of the SEZ; the closest railroad stop is in Moapa, approximately 25 mi (40 km) to the southwest. The nearest public airport is the Mesquite Airport, a small airport in the vicinity of the SEZ near I-15. The nearest airport with scheduled passenger service is the St. George Municipal Airport, 43 mi (69 km) to the northeast in St. George, Utah.

A 500-kV transmission line is adjacent to the southeast corner of the SEZ; there are two additional transmission lines within designated corridors adjacent to the site. It is assumed that an existing transmission line could potentially provide access from the SEZ to the transmission grid (see Section 11.5.1.2).

Applications for ROWs that have been submitted to the BLM include eight pending solar projects, three pending authorizations for wind site testing, and two authorized projects for wind site testing that would be located within 50 mi (80 km) of the East Mormon Mountain SEZ. These applications are discussed in Section 11.5.22.2.1. There are currently no ROW applications for solar projects within the SEZ.

The proposed East Mormon Mountain SEZ is located in the Lower Virgin River Valley. The Mormon and East Mormon Mountains and Tule Spring Hills are located to the northwest of the SEZ, and the Beaver Dam Mountains (in Utah and Arizona) are to the northeast. The Muddy Mountains and Black Mountains are to the southwest; the Southern Virgin Mountains and Virgin Mountains (Arizona) are to the southeast.

The proposed East Mormon Mountain SEZ and other relevant information are shown in Figure 11.5.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar energy development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions).

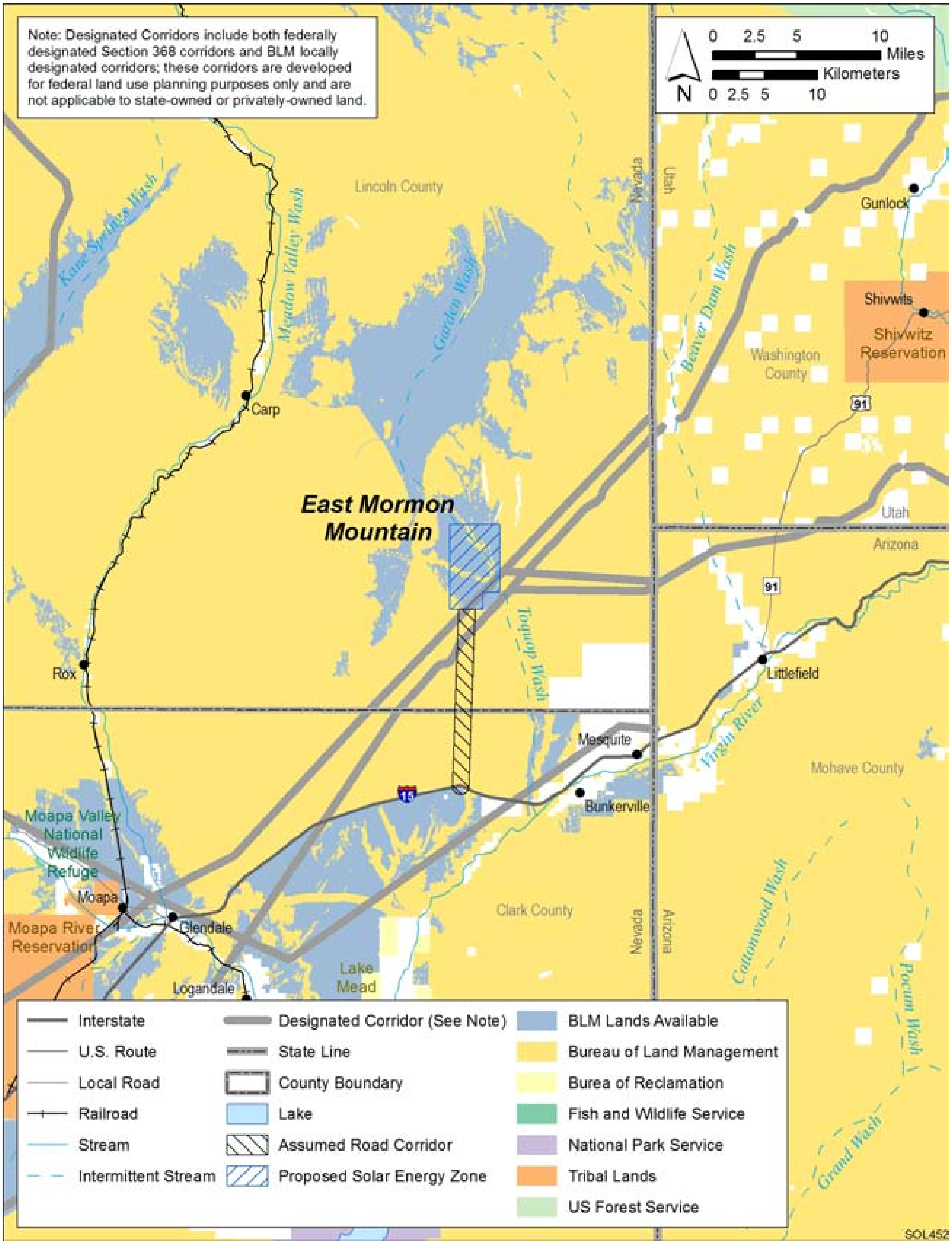

FIGURE 11.5.1.1-1 Proposed East Mormon Mountain SEZ

Although these classes of restricted lands were excluded from the proposed East Mormon Mountain SEZ, other restrictions might be appropriate. The analyses in the following sections evaluate the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed East Mormon Mountain SEZ encompassed 7,418 acres (30 km^2). Subsequent to the study area scoping period, the boundaries of the proposed East Mormon Mountain SEZ were altered somewhat to facilitate the BLM's administration of the SEZ area. Some higher slope areas internal to and at the borders of the site were added to the SEZ; particularly significant was the addition of the Toquop Wash area to acreage. Although included in the SEZ, these higher slope areas would not likely be utilized for solar facilities. Additionally, borders with irregularly shaped boundaries were adjusted to match the section boundaries of the Public Lands Survey System (PLSS) (BLM and USFS 2010c). The revised SEZ is approximately 1,550 acres (6.3 km^2) larger than the original SEZ area as published in June 2009.

11.5.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the East Mormon Mountain SEZ is assumed to be 80% of the SEZ area over a period of 20 years, a maximum of 7,174 acres (29 km^2). These values are shown in Table 11.5.1.2-1, along with other development assumptions. Full development of the East Mormon Mountain SEZ would allow development of facilities with an estimated total of

TABLE 11.5.1.2-1 Proposed East Mormon Mountain SEZ—Assumed Development Acreages, Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Area of Assumed Transmission Line ROW and Road ROW	Distance to Nearest Designated Corridor[d]
8,968 acres and 7,174 acres[a]	797 MW[b] and 1,435 MW[c]	I-15 11 mi[d,e]	Adjacent, 500 kV	0 acres and 80 acres	0 mi

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

[e] To convert mi to km, multiply by 1.609.

797 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 1,435 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 500-kV line that runs adjacent to the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 500-kV capacity of that line would likely be inadequate for 797 to 1,435 MW of new capacity (a 500-kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, it is likely that new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed East Mormon Mountain SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in the PEIS, it was assumed that the existing 500-kV transmission line which runs adjacent to the proposed SEZ, could provide initial access to the transmission grid, and thus no additional acreage for transmission line access was assessed. Access to the existing transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different off-site grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

I-15 lies 11 mi (18 km) to the south of the proposed East Mormon Mountain SEZ. Assuming construction of a new access road to reach I-15 would be needed to support construction and operation of solar facilities, approximately 80 acres (0.3 km^2) of land disturbance would occur (a 60-ft [18.3-m] wide ROW was assumed).

11.5.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 11.5.2 through 11.5.21 for the proposed East Mormon Mountain SEZ are summarized in tabular form. Table 11.5.1.3-1 is a comprehensive list of impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 11.5.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed East Mormon Mountain SEZ are included in Sections 11.5.2 through 11.5.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 11.5.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed East Mormon Mountain SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the proposed East Mormon Mountain SEZ could disturb up to 7,174 acres (29 km^2). Development of the SEZ for utility-scale solar energy production would establish a large, isolated industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity.	None.
	Solar development could sever existing roads and trails (including dry washes) that access the SEZ, making it difficult to access undeveloped public lands within and to the west of the SEZ.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	Wilderness characteristics in about 3,143 acres (13 km^2) or 2% of the Mormon Mountains WA within 5 mi (8 km) from the SEZ would be adversely affected and likely would not be completely mitigated. Depending on the visibility and elevation above the SEZ, wilderness characteristics could be adversely affected at distances up to 11 mi (18 km) in an additional 12,166 acres (49 km^2) or 7.7% of the area.	Design features for visual resources should be applied to minimize adverse visual impacts.
	A new access road would pass through the Mormon Mesa ACEC and designated critical habitat for desert tortoise, causing fragmentation of the ACEC and creating additional hazards for desert tortoises. Road construction would disturb an additional 80 acres (0.3 km^2) that would adversely affect tortoise habitat and would create a barrier to tortoise movement.	The access road to the SEZ should be designed and built to minimize impacts on desert tortoise and tortoise habitat within the Mormon Mesa ACEC.
Rangeland Resources: Livestock Grazing	The Gourd Springs allotment has been previously reduced in size by about 40%, and would lose an additional 9.1% of the allotment. Because the SEZ would occupy the best remaining grazing land in the allotment, it is likely that the grazing operation would become economically infeasible and all 3,458 AUMs currently authorized would be lost.	None.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Rangeland Resources: Wild Horses and Burros	None.	None.
Recreation	Recreational use would be eliminated from portions of the SEZ that would be developed for solar energy production. There may be some loss of wilderness recreation opportunities in up to 9.7% of the Morman Mountains WA.	Design features for visual resources should be applied to minimize adverse impacts on wilderness recreation use.
	Construction of solar energy facilities could sever access to undeveloped public lands in and around the SEZ.	None.
Military and Civilian Aviation	*Military*: The military has indicated that solar technologies with structures higher than 200 ft (61 m) above ground level would intrude into military airspace and would present safety concerns for military aircraft.	None.
	Civilian: There would be no effect on civilian aviation.	None.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase. Impacts would include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation).	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Water Resources	Ground-disturbance activities (affecting 33% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 1,492 ac-ft (1.8 million m^3) of water during the peak construction year. Construction activities would generate as high as 74 ac-ft (91,300 m^3) of sanitary wastewater. Assuming full development of the SEZ, operations would use the following amounts of water: • For parabolic trough facilities (1,435-MW capacity), 1,025 to 2,172 ac-ft/yr (1.3 million to 2.7 million m^3/yr) for dry-cooled systems; 7,195 to 21,543 ac-ft/yr (8.9 million to 27 million m^3/yr) for wet-cooled systems. • For power tower facilities (797-MW capacity), 567 to 1,205 ac-ft/yr (700,000 to 1.5 million m3/yr) for dry-cooled systems; 3,995 to 11,966 ac-ft/yr (5 million to 14.8 million m^3/yr) for wet-cooled systems. For dish engine facilities (797-MW capacity), 408 ac-ft/yr (503,500 m^3/yr). • For PV facilities (797-MW capacity), 41 ac-ft/yr (50,600 m^3/yr). • Assuming full development of the SEZ, operations would generate up to 20 ac-ft/yr (24,700 m^3/yr) of sanitary wastewater and up to 408 ac-ft/yr (503,500 m^3/yr) of blowdown water.	Water resources analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures. Land-disturbance activities should minimize impacts on the ephemeral stream channels found within the SEZ, including but not limited to Toquop Wash and South Fork Toquop Wash, as well as alluvial fan features throughout the SEZ. Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters. Groundwater rights must be purchased and transferred through coordination with the NDWR and current water rights holders. Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection. Groundwater monitoring and production wells should be constructed in accordance with state standards. Water for potable uses would have to meet or be treated to meet water quality standards in accordance with the *Nevada Administrative Code*.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Vegetation[b]	Up to 80% (7,174 acres [29 km^2]) of the SEZ would be cleared of vegetation; re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Vegetation communities associated with playa habitats, riparian habitats, desert dry washes, or other intermittently flooded areas within or downgradient from solar projects could be affected by ground-disturbing activities. The use of groundwater within the proposed East Mormon Mountain SEZ for technologies with high water requirements, such as wet-cooling systems, could disrupt the groundwater flow pattern and adversely affect wetland communities associated with springs in the vicinity of the SEZ.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of desert scrub and other affected habitats, and to minimize the potential for the spread of invasive species such as Mediterranean grass. Invasive species control should focus on biological and mechanical methods, where possible, to reduce the use of herbicides. All desert dry wash, playa, riparian, and Joshua tree communities within the SEZ and access road corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. Any Joshua trees, other yucca species, cacti, or succulent plant species in areas of direct impacts that cannot be avoided should be salvaged. A buffer area should be maintained around dry wash, playa, and riparian habitats to reduce the potential for impacts. Appropriate engineering controls should be used to minimize impacts on dry wash, playa, wetland, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*		Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetlands associated with springs, such as Tule Spring and Abe Spring. Potential impacts on springs should be determined through hydrological studies.
Wildlife: Amphibians and Reptiles[b]	Direct impacts from SEZ development would be small for all representative amphibian and reptile species (i.e., loss of ≤1% of potentially suitable habitats). With implementation of design features, indirect impacts are expected to be negligible.	Development in wash, playa and rock outcrop habitats should be avoided.
Wildlife: Birds[b]	Direct impacts on all representative bird species would be small (i.e., loss of ≤1% of potentially suitable habitats). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act. Playa, wash, and rock outcrop habitats should be avoided.
Wildlife: Mammals[b]	Direct impacts on all representative mammal species would be small (i.e., loss of ≤1% of potentially suitable habitats). Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These impacts are expected to be negligible with the implementation of design features.	The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. Playa, wash, and rock outcrop habitats should be avoided.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Aquatic Biota[b]	There are no perennial streams or lakes present within the East Mormon SEZ or the area of indirect effects. Intermittent and ephemeral washes are present, and these features may be directly affected by ground disturbance (SEZ only), contaminant inputs, and sedimentation from runoff and fugitive dust. However, the washes are typically dry, and impacts on aquatic habitat and communities are not likely to occur. Aquatic habitat and biota potentially found in springs present within the area of indirect effects could be affected by fugitive dust associated with solar energy development within the SEZ. However, more site specific data on these springs are needed. There is the potential for sediments and contaminants deposited in the washes to affect aquatic habitat and communities in the perennial Virgin River. However, the distance of the SEZ to the Virgin River (>12 mi [19 km]) and the infrequency of flooding reduces the chance for sediment to reach the aquatic habitat. Dry and wet cooling is not likely to be possible with local water resources, so water withdrawals and subsequent effects on aquatic habitat and biota would be minimal.	Ground disturbance and contaminant spills near Toquop Wash and the other unnamed washes within the SEZ should be minimized. Appropriate engineering controls should be implemented to minimize the amount of surface water runoff and fugitive dust reaching springs, Toquop Wash and unnamed washes in the SEZ and in the area of indirect effects. The impact of groundwater withdrawals on surface water features near the SEZ (such as Tule Spring, Abe Spring, Gourd Spring and Peach Spring) should be eliminated or minimized.
Special Status Species[b]	Potentially suitable habitat for 32 special status species occurs in the affected area of the East Mormon Mountains SEZ. For all special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects.	Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible for some species, translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Avoiding or minimizing disturbance to desert wash, playa, rocky cliffs, and outcrop habitats could reduce or eliminate impacts on 17 special status species. Consultation with the USFWS and the NDOW should be conducted to address the potential for impacts on the desert tortoise. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Coordination with the USFWS and the NDOW should be conducted for the Las Vegas buckwheat, a candidate species for listing under the ESA. Coordination would identify an appropriate survey protocol and mitigation requirements, which may include avoidance, minimization, translocation, or compensation. Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels would occur at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. These concentrations would decrease quickly with distance. Modeling indicates that emissions from construction activities are not anticipated to exceed the Class I PSD PM_{10} increments at the nearby federal Class I area (Zion NP, Utah). In addition, construction emissions from the engine exhaust of heavy equipment and vehicles could affect AQRVs (e.g., visibility and acid deposition) at nearby federal Class I areas. *Operations*: Positive impact due to avoided emissions of air pollutants from combustion-related power generation: 3.7 to 6.6% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada avoided (up to 3,547 tons/yr SO_2, 3,042 tons/yr NO_x, 0.020 ton/yr Hg, and 1,952,000 tons/yr CO_2).	None.
Visual Resources	The SEZ is in an area of low scenic quality. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. Solar development could produce large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape. The SEZ is located 2.4 mi (3.9 km) from Mormon Mountains WA. Because of the close proximity of the WA to the SEZ, and the elevated viewpoints in the WA, strong visual contrasts could be observed by WA visitors.	The development of power tower facilities should be prohibited within the SEZ.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction:* For construction of a solar facility located near the southern SEZ boundary, estimated noise levels at the nearest residences located about 9 mi (14.5 km) from the SEZ boundary would be about 17 dBA, which is well below the typical daytime mean rural background level of 40 dBA. In addition, an estimated 40 dBA L_{dn} at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas. *Operations:* For operation of a parabolic trough or power tower facility located near the southeastern SEZ boundary, the predicted noise level would be about 22 dBA at the nearest residences, which is well below the typical daytime mean rural background level of 40 dBA. If the operation were limited to daytime, 12 hours only, a noise level of about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated for the nearest residences, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. However, in the case of 6-hour TES, the estimated noise level at the nearest residences would be 32 dBA, which is somewhat higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is still well below the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level at the nearest residences would be about 33 dBA, which is lower than the typical daytime mean rural background level of 40 dBA. On the basis of 12-hour daytime operation, the estimated 40 dBA L_{dn} at these residences (i.e., no contributions from dish engines) would be well below the EPA guideline of 55 dBA L_{dn} for residential areas.	None.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Paleontological Resources	Few, if any, impacts on significant paleontological resources are likely in the proposed East Mormon Mountain SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted.	The need for SEZ-specific design features would depend on the results of future paleontological investigations, especially along a potential new access road corridor; however, based on the current level of information, a need for mitigation of areas potentially classified as PFYC Class 2 or lower is not anticipated.
Cultural Resources	Direct impacts on significant cultural resources could occur in the proposed East Mormon Mountain SEZ; however, further investigation is needed. Areas near Toquop Wash and South Fork have considerable potential for containing significant sites. Visual impacts on the Old Spanish National Historic Trail are possible, as well as visual and auditory effects on nearby rock art sites. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP.	Avoidance of South Fork and Toquop Wash areas is recommended. Coordination with the Trail Administration for the Old Spanish Trail and Old Spanish Trail Association is recommended to identify potential mitigation strategies for avoiding or minimizing potential impacts, if impacts are identified in future studies, on the congressionally designated Old Spanish National Historic Trail. Other SEZ-specific design features would be determined through consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.
Native American Concerns	While no comments specific to the proposed East Mormon Mountain SEZ have been received from Native American Tribes to date, the proposed SEZ does include plants and animals traditionally important to Native Americans. As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concern over water resources and potential visual, acoustic, and other effects of solar energy development within the SEZ on specific resources, including culturally important landscapes.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.

TABLE 11.5.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed East Mormon Mountain SEZ	SEZ-Specific Design Features
Socioeconomics	*Construction:* A total of 444 to 4,438 jobs would be added; ROI income would increase by \$28.1 million to \$268.7 million. *Operations:* A total of 21 to 496 annual jobs would be added; ROI income would increase by \$0.7 million to \$18.9 million. Construction of new access road: 234 jobs; \$9.1 million income in ROI.	None.
Environmental Justice	As defined in CEQ guidelines, no minority or low income populations occur within the 50-mi (80-km) radius around the boundary of the SEZ; thus, there would be no disproportionately high and adverse human health or environmental effects on low-income or minority populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The volume of traffic on I-15 to the southeast of the East Mormon Mountain SEZ would represent an increase in traffic of about 12%.	None.

Abbreviations: AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; AQRV = air quality–related value; BLM = Bureau of Land Management; BMP = best management practice; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; dBA = A-weighted decibel; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; L_{dn} = day-night average sound level; MTR = military training route; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NNHP = Nevada Natural Heritage Program; NO_x = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; PEIS = programmatic environmental impact statement; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 µm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 µm or less; PSD = prevention of significant deterioration; PV= photovoltaic; ROI = region of influence; ROW = right-of-way; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; SRMA = Special Recreation Management Area; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; WA = Wilderness Area.

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed East Mormon Mountain SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 11.5.10 through 11.5.12.

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11.5.2 Lands and Realty

11.5.2.1 Affected Environment

The proposed East Mormon Mountain SEZ is a small but well-blocked area of BLM-administered land that is very isolated and is accessible currently only by travel over 10 to 15 mi (16 to 24 km) of dirt or gravel roads. The character of the land in the SEZ is undeveloped and rural with only a few roads/trails (including dry washes) present within the area. There are two designated 368b (of the Energy Policy Act of 2005) transmission corridors that pass adjacent to the area that contain a total of three major transmission lines and one large natural gas pipeline. There is also a locally designated corridor that heads southeast from the SEZ toward Mesquite, Nevada.

Authorization is being sought for a new natural gas–fueled power generating station, the Toquop Energy Project, located adjacent to the southeastern corner of the SEZ. Water for the proposed energy project would be provided via a pipeline for which the BLM has issued a ROW. The pipeline ROW is located within the proposed SEZ (Linnell 2010).

As of February 2010, there were no ROW applications for solar energy facilities within the SEZ.

11.5.2.2 Impacts

11.5.2.2.1 Construction and Operations

Full development of the proposed East Mormon Mountain SEZ could disturb up to 7,174 acres (29 km^2) (Table 11.5.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and isolated, utility-scale solar energy development would be a new and highly discordant land use to the area. If the Toquop Energy Project (Section 11.5.22.2.2), were built, the area would have a much more industrial nature.

The existing water pipeline ROW on the SEZ would not be affected by solar energy development since it is a prior right. The area of the pipeline would not be available for construction of solar energy facilities. Should the proposed area be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights issued for solar energy development. Because the area is adjacent to three transmission corridors, it is not anticipated that approval of solar energy development in the SEZ would have a significant impact on the availability of land for ROWs in the area.

Existing dirt roads and washes used for travel within the SEZ would be closed wherever solar development facilities were constructed, and access to public lands not developed for solar energy could be affected. This could adversely affect public land users wanting to access any areas isolated by solar development unless provision of alternate access is retained or provided.

11.5.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 500-kV transmission line runs adjacent to the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

To provide adequate road access to the SEZ, about 11 mi (18 km) of new or upgraded road would be required to connect to I-15. This could create an additional 80 acres (0.3 km^2) of surface disturbance. See Section 11.5.1.2 regarding development assumptions for the SEZ.

Power lines and roads would be constructed within the SEZ as part of solar energy development.

11.5.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions may be (1) development of the SEZ would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity, and (2) existing dirt roads and washes within the SEZ would be closed wherever solar development facilities were constructed, and access to public lands not developed for solar energy could be adversely affected.

11.5.3 Specially Designated Areas and Lands with Wilderness Characteristics

11.5.3.1 Affected Environment

There are 20 specially designated areas within 25 mi (40 km) of the proposed East Mormon Mountain SEZ that potentially could be affected by solar energy development within the SEZ, principally from impacts on scenic, recreation, biological, and/or wilderness resources. The potential area of impact for the SEZ includes parts of Nevada, Utah, and Arizona; thus some of the listed areas are located in more than one BLM District. The state(s) in which the area is located is noted after the name of the area. The areas include (see Figure 11.5.3.1-1) the following:

- National Monument
  - Grand Canyon Parashant (Arizona)

- National Recreation Area
  - Lake Mead (Nevada)

- National Natural Landmark
  - Joshua Tree Natural Area (Utah)

- National Designated Historic Trail
  - Old Spanish Trail (Arizona, Nevada, and Utah)

- National Conservation Area
  - Beaver Dam Wash (Utah)

- Wilderness Areas
  - Mormon Mountains (Nevada)
  - Meadow Valley Range (Nevada)
  - Clover Mountains (Nevada)
  - Beaver Dam Mountains (Arizona and Utah)
  - Paiute (Arizona)

- Wilderness Study Area
  - Joshua Tree Instant Study Area (Utah)

- Areas of Critical Environmental Concern
  - Mormon Mesa, both Ely and Las Vegas Districts (Nevada)
  - Virgin River (Nevada)
    Virgin Mountains (also known as Gold Butte Part A) (Nevada)
  - Beaver Dam Slope (Nevada, Utah, and Arizona)
  - Lower Meadow Valley Wash (Nevada)
  - Virgin River Corridor (Arizona)
  - Virgin Slope (Arizona)

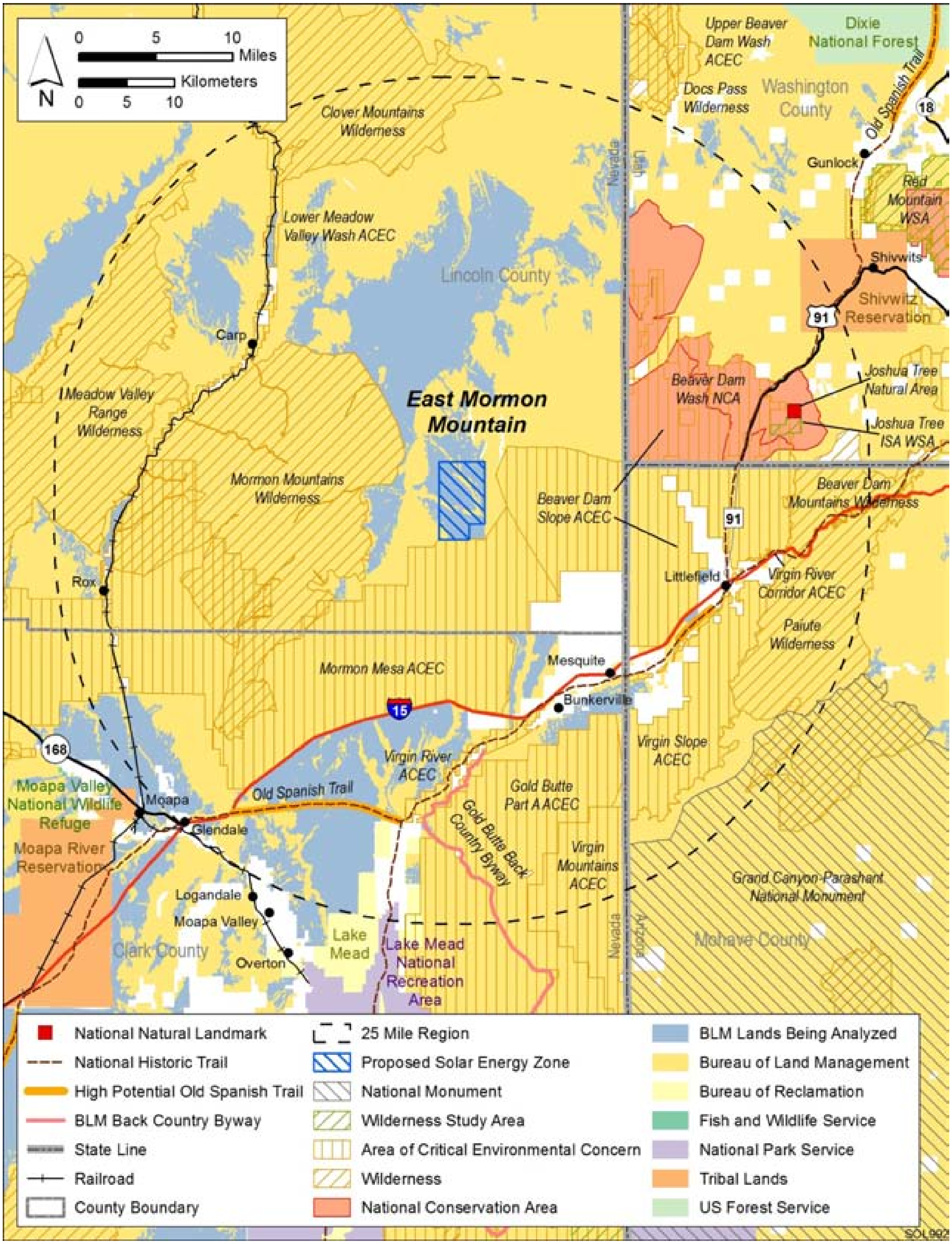

FIGURE 11.5.3.1-1 Specially Designated Areas in the Vicinity of the Proposed East Mormon Mountain SEZ

- Backcountry Byway
  - Gold Butte

Both Lake Mead NRA and Grand Canyon-Parashant National Monument are being dropped from further consideration since both are 23 to 24 mi (37 to 39 km) from the SEZ and less than 1% of their areas would have possible visibility of facilities within the SEZ. No impact on these areas is anticipated.

Less than 5% of the area of the Clover Mountains and Meadow Mountain Range WAs would have any visibility of solar development in the SEZ; the WAs are between 15 and 25 mi (24 and 40 km) from the SEZ. Consequently, no impact on the wilderness characteristics of these areas is anticipated; thus they are not considered further.

Of the listed ACECs, only the Virgin Mountains and the Virgin River Corridor have a scenic component included as part of the rationale for the ACEC designation. Of the remaining ACECs, only portions of the Mormon Mesa in the Ely District and Beaver Dam Slope in Nevada, Utah, and Arizona, which abut the SEZ, may incur impacts from solar development of the proposed SEZ. The remaining four ACECs are not anticipated to be adversely affected by solar development in the SEZ and are not considered further.

There are no lands near the SEZ and outside of designated WAs or WSAs that have been identified by the BLM to be managed to protect wilderness characteristics.

11.5.3.2 Impacts

11.5.3.2.1 Construction and Operations

The primary potential impact on 10 of the 12 remaining specially designated areas near the SEZ would be from visual impacts of solar energy development that could affect scenic, recreational, or wilderness characteristics of the areas. The remaining 2 areas are ACECs designated primarily to protect desert tortoise habitat. The primary potential impact on these areas would come from increased human activity and vehicle traffic, which could increase tortoise mortality.

The visual impact on specially designated areas is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be a factor in the viewshed from portions of these specially designated areas, as summarized in Table 11.5.3.2-1. The data provided in the table assume the use of 650-ft (198.1-m) power tower solar energy technology, which because of the potential height of these facilities, could be visible from the largest amount of land of the technologies being considered in the PEIS. Viewshed analysis for this SEZ has shown that the visual impacts of shorter solar energy facilities would be slightly less than for power tower technology that is used for the analysis (see Section 11.5.14 for more detail on all viewshed analysis discussed in this section). Assessment of the visual impact

TABLE 11.5.3.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi Viewshed of the Proposed East Mormon Mountain SEZ[a]

		Feature Area or Highway Length[c]		
	Feature Name		Visible between	
Feature Type	(Total Acreage/Highway Length)[b]	Visible within 5 mi	5 mi and 15 mi	15 mi and 25 mi
WAs	Beaver Dam Mountains (18,635 acres)	0 acres	0 acres	2,748 acres (15%)
	Mormon Mountains (157,645 acres)	3,143 acres (2%)	15,309 acres (9.7%)	15,304 acres (9.7%)
	Paiute (87,908 acres)	0 acres	0 acres	15,359 acres (17.5%)
	Joshua Tree ISA (1,047 acres)	0 acres	0 acres	744 acres (71%)
ACECs	Virgin River Corridor (Arizona) (2,065 acres)	0 acres	Undetermined	Undetermined
	Virgin Mountains (Nevada) (35,826 acres)	0 acres	0 acres	6,257 acres (17.5%)
	Beaver Dam Slope (Nevada, Utah, Arizona) (137,029 acres)	13,046 acres (9.5%)	42,888 acres (31.3%)	73,249 acres (53.5%)
	Mormon Mesa – Ely (110,275 acres)	19,705 acres (17.9%)	25,118 acres (22.8%)	25,118 acres (22.8%)
National Conservation Area	Beaver Dam Wash (72,040 acres)[d]	0 acres	12,664 acres (17.5%)	33,860 acres (47%)
National Natural Landmark	Joshua Tree Natural Area (1,015 acres)	0 acres	0 acres	1,015 acres (100%)
National Trail	Old Spanish Trail	11 mi	0 mi	1 mi
Scenic Byway	Gold Butte (62 mi)	0 mi	0 mi	7 mi

[a] Assuming power tower solar technology with a height of 650 ft (198.1 m).

[b] To convert acres to km^2, multiply by 0.004047. To convert mi to km, multiply by 1.609.

[c] Percentage of total feature acreage or road length viewable.

[d] This includes public, state, and private lands. Public lands total about 63,488 acres (257 km^2).

of solar energy projects must be conducted on a site-specific and technology-specific basis to accurately identify impacts.

In general, the closer a viewer is to solar development, the greater the impact on an individual's perception. From a visual analysis perspective, the most sensitive viewing distances generally are from 0 to 5 mi (0 to 8 km). The viewing height above a solar energy development area, the size of the solar development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness or scenic experience within these areas could be expected to be more adversely affected than those simply traveling along a highway with another destination in mind. In the case of the East Mormon Mountain SEZ, the low-lying location of the SEZ in relation to the East Mormon Mountains WA, would highlight the industrial-like development in the SEZ.

The occurrence of glint and glare at solar facilities could potentially cause large, but temporary, increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas that were used to assess potential impacts on specially designated areas do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

Wilderness Areas

Beaver Dam Mountains. This WA encompasses lands within both Utah and Arizona, and its nearest boundary to the SEZ is about 19 mi (31 km) east of the SEZ. Almost all of the 2,748 acres (11 km^2) with visibility of the SEZ are on the western slopes of the Beaver Dam Mountains. Although there would be a long-distance view of facilities in the SEZ from the WA, because the viewing angle would be very low, the portion of the horizontal field of view filled by the SEZ would be small, and the distance so great, the contrast caused by solar facilities would be very weak; it is anticipated that solar development would have no impact on wilderness characteristics within the area.

Mormon Mountains. This WA is located about 2 mi (3 km) west of the SEZ at the nearest point, and solar facilities within the SEZ could be visible from the summits and east-facing slopes of some of the mountains in the eastern part of the WA, at distances from about 3 to 11 mi (5 to 18 km) west from the SEZ's western boundary. From many locations within the WA, views of solar facilities within the SEZ would be largely screened by the intervening East Mormon Mountains, or limited to views of taller solar facilities, or both, but there is a substantial portion of the WA with open or nearly open views of the SEZ. These views are generally through two gaps in the East Mormon Mountains, one directly west of the central portion of the SEZ, and another northwest of the northwest corner of the SEZ. These views of the SEZ are the most open, and from some viewpoints (generally closer to the SEZ) expected contrast levels would be moderate to strong. At lower elevations, the East Mormon Mountains screen more of the SEZ from view, and contrast levels are generally much lower. It is anticipated that the wilderness characteristics in 3,143 acres (12.7 km^2) of the WA with a view of the SEZ within 5 mi (8 km) from the SEZ would be adversely affected, and depending on the visibility and height above the SEZ, wilderness characteristics could be adversely affected at somewhat longer distances. Based on viewshed analysis, a total of 15,309 acres (62 km^2), or 9.7%, of the WA within about 11 mi (18 km) would have visibility of solar facilities in the SEZ.

Paiute. The Paiute WA is located in Arizona, with the nearest boundary of the SEZ about 19 mi (31 km) northwest of the area. Like the Beaver Dam Mountains WA, most of the area with visibility of the SEZ is on the western slopes of the mountains. In this case, however, about 15,359 acres (62 km^2), or about 17% of the WA, would have long-distance views of solar development in the SEZ. Because the viewing angle of the SEZ would be very low, the portion of the horizontal field of view filled by the SEZ would be small, and the distance so great, the contrast caused by solar facilities would be very weak; it is anticipated that development within the SEZ would have no impact on wilderness characteristics of the area.

Joshua Tree ISA and the Joshua Tree National Natural Landmark. The NNL is included within the boundaries of the ISA (BLM 2010b), so the areas are discussed together. Both are also included within the congressionally designated Beaver Dam Wash NCA. The Joshua Tree ISA is a small area located about 19 mi (31 km) east of the SEZ, on the upper slopes of the Beaver Dam Mountains. Much of the ISA and NNL would have open views of the distant SEZ. Despite elevations more than 2,800 ft (853 m) higher than the SEZ in some locations, because of the long distance to the SEZ the vertical angle of view is low, and the SEZ would occupy a small portion of the horizontal field of view. Weak contrast levels would be expected from solar facilities within the SEZ as viewed from the ISA and would not affect wilderness characteristics in the area.

Areas of Critical Environmental Concern

Virgin River Corridor. This ACEC is located in Arizona and follows the path of the Virgin River. The ACEC at its nearest approach is about 13.5 mi (22 km) from the southeastern border of the SEZ and actually extends to the northeast past the 25-mi (40-km) analysis area for the SEZ. A review of the viewshed overlay for the area (not a viewshed analysis) indicates that the river appears to be incised and largely topographically screened; thus it is likely solar development would not be visible from within the ACEC. In some areas, dense vegetation would also hinder views outside of the river corridor itself. If solar facilities were visible, the view would only be of the top of sufficiently tall power towers. On the basis of this review, it is anticipated that there would be no impact on the ACEC.

Virgin Mountains. This ACEC is located in Nevada about 19 mi (31 km) southeast of the SEZ. The area was also known as Gold Butte ACEC Part 2 in the BLM's 1998 Las Vegas RMP (BLM 1998b) and was established to protect wildlife, scenic, and botanical resources. About

6,257 acres (25 km^2), or 17.5%, of the area would have potential visibility of solar facilities within the SEZ. The area of potential visibility extends to about 24 mi (39 km) from the boundary of the SEZ and primarily includes higher elevations on the northwest side of the Virgin Mountains. Portions of the ACEC are about 2,500 ft (762 m) above the elevation of the SEZ and would have views of development in the area. The views, however, would be from a long distance, at a low vertical angle, and the SEZ would occupy only a small portion of the horizontal field of view. Weak contrast levels would be expected from solar facilities within the SEZ, as viewed from within the ACEC, and would not affect the values for which the ACEC was established. It is also anticipated that there would be no impact on recreational use of the area.

Beaver Dam Slope and Mormon Mesa. These ACECs are very large and were established for the protection of desert tortoise habitat. The ACECs are also designated as critical habitat for desert tortoise by the USFWS. Relatively small portions of both of these areas are adjacent to the SEZ. The major concern would be for any adverse effects associated with human presence and traffic within these areas associated with development of the SEZ, including increased possibilities for wildfire. Access to the SEZ would need to be dramatically improved to support construction and operation of a solar facility, leading to higher speed driving and much heavier volumes of traffic than at present. Whether mitigation measures would be successful in preventing adverse impacts on tortoise populations and habitat is not known. Section 11.5.12 provides additional information on potential sensitive species impacts.

National Conservation Area

Beaver Dam Wash. This NCA was created by an Act of Congress in 2009 "to conserve, protect and enhance…the ecological, scenic, wildlife, recreational, cultural historical, natural, educational, and scientific resources" (BLM 2010b) of about 63,488 acres (257 km^2) of public lands located in the southwestern corner of Utah. There are diverse recreational opportunities in the area, including casual, dispersed camping; OHV riding; rock climbing; horseback trail riding; and hunting for game birds, mule deer, and desert bighorn sheep. Annual visitation is estimated at 20,000 visitor use days in 2009 (BLM 2010b)

The western boundary of the NCA is about 9 mi (14 km) east of the nearest boundary of the SEZ, and some areas within the NCA would have visibility of solar development out to about 22 mi (35 km). The nearest portions of the SEZ are slightly lower in elevation than the NCA, but views of solar facilities would be at a very low angle, which would result in low contrast between the facilities and the surrounding area. Higher elevations farther east would have long-distance views of development in the SEZ, but the distance would also cause a lack of contrast and detail. While facilities within the SEZ would be visible from about 33,860 acres (137 km^2), or 47%, of the NCA, it is anticipated that there would be no adverse impacts on scenic values of the NCA or on recreational use of the area.

National Trail

Old Spanish National Historic Trail. Almost 18 mi (29 km) of the Old Spanish National Historic Trail are within the SEZ viewshed to the south and to the east of the SEZ. The SEZ would be visible from the trail in a number of places, but the largest segment with visibility is a 12-mi (19-km) stretch closely paralleling U.S. 91 and oriented in a north–south direction between 16 and 19 mi (26 and 31 km) east of the SEZ. Within the southernmost 7 mi (11 km) of this trail segment, visibility would be limited to the upper portions of sufficiently tall power towers within the SEZ, and expected visual contrast levels in this portion of the segment would be minimal. The northern 5 mi (8 km) of the segment would have open views of the SEZ, but at distances exceeding 16 mi (26 m), the SEZ would occupy a very small portion of the horizontal field of view, and the vertical angle of view would be very low. Visual contrast levels would be expected to be very weak. The SEZ would be visible from another 6 mi (10 km) of the Old Spanish National Historic Trail, with four segments of the trail ranging in size from 0.3 mi to 2.8 mi (0.5 to 4.5 km) at a distance of about 18 mi (29 km) from the SEZ. For nearly all of these segments, visibility of solar facilities within the SEZ would be limited to the upper portions of tall power towers, and the expected visual contrast levels would be minimal. Because of the expected low level of visual contrast, it is anticipated that there would be no impact on future management of trail segments or on visitors attempting to re-trace travel on the trail. Section 11.5.17 provides more information on the trail.

Scenic Byway

Gold Butte Backcountry Byway. The northern end of this 62-mi (100-km) BLM-administered backcountry byway is located about 14 mi (22 km) south of the nearest boundary of the SEZ. Viewshed analysis indicates that visitors on most of the byway would have no views of solar development within the SEZ. There is, however, a 7-mi (11-km) portion of the route where the trail runs in a northwest–southeast direction as it leaves the Virgin River and crosses the Virgin Mountains where intermittent views of facilities in the SEZ from distances of about 18 to 23 mi (29 to 37 km) might be possible. From these distances, contrast caused by solar facilities would be weak and are expected to have no impact on visitor use of the trail. About 7 mi (11 km) of the byway before it enters the Muddy Mountains is within the viewshed of the SEZ. Views of solar development within the SEZ from the byway would be generally very low angle. No impact on the use of the byway from the construction of solar facilities within the SEZ is anticipated.

11.5.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of a major transmission line in the SEZ, assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of such activities outside of the SEZ was conducted (see Section 11.5.1.2).

To provide adequate road access to the SEZ, about 11 mi (18 km) of new or upgraded road would be required to connect to I-15. The assumed road alignment would pass through the Mormon Mesa ACEC and designated desert tortoise critical habitat, causing fragmentation of the ACEC and creating additional hazards for desert tortoise. Road construction would disturb an additional 80 acres (0.3 km^2) that would adversely affect tortoise habitat and create a barrier to tortoise movement. Section 11.5.1.2 provides development assumptions for the SEZ, and Section 11.5.12 gives detailed information on potential sensitive species impacts.

11.5.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide some mitigation for identified impacts. The exceptions may be (1) wilderness characteristics in about 3,143 acres (13 km^2), or 2%, of the Mormon Mountains WA within 5 mi (8 km) from the SEZ would be adversely affected and wilderness characteristics could be adversely affected at distances up to 11 mi (18 km) in an additional 12,166 acres (49 km^2), or 7.7%, of the area; and (2) road construction would adversely affect desert tortoise habitat and create a barrier to tortoise movement.

Proposed design features specific to the proposed East Mormon Mountain SEZ include the following:

- Design features for visual resources as described in Section 11.5.14 should be applied to minimize adverse visual impacts.

- The access road to the SEZ should be designed and built to minimize impacts on desert tortoise and tortoise habitat within the Mormon Mesa ACEC.

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11.5.4 Rangeland Resources

Rangeland resources managed by the BLM on BLM-administered lands include livestock grazing and habitat for wild horses and burros. These resources and possible impacts on them from solar development within the proposed East Mormon Mountain SEZ are discussed in Sections 11.5.4.1 and 11.5.4.2.

11.5.4.1 Livestock and Grazing

11.5.4.1.1 Affected Environment

Portions of two grazing allotments—Gourd Springs and Summit Spring—overlap the proposed SEZ. The Gourd Springs allotment contains 57,700 acres (234 km^2) and has an active authorization of 3,458 AUMs. A total of 8,773 acres (36 km^2), or 9.1%, of the allotment is located within the SEZ. This allotment was previously reduced in size by 38,262 acres (155 km^2), or 40%, in September 2000 by the Caliente Management Framework Plan Amendment and Record of Decision for the Management of Desert Tortoise Habitat, which created the Mormon Mesa ACEC. Further restrictions on the grazing season of use were placed on the desert tortoise critical habitat portions of the Gourd Springs and Summit Spring allotments in the Programmatic Biological Opinion for the BLM's Ely District Resource Management Plan in July 2008. Large portions of both allotments were burned by the Southern Nevada Complex Fires in 2005. The location of the SEZ covers most of the Gourd Springs allotment's prime forage as well as some water sources. The primary water sources for this allotment are also approximately 1 mi (1.6 km) west of the SEZ. Development of the SEZ would make these waters unusable because it covers a majority of the land serviced by these waters.

The Summit Spring allotment contains 18,035 acres (73 km^2) and has an active authorization of 715 AUMs. A total of 195 acres (0.8 km^2), or 1.1%, of the allotment is located within the SEZ.

11.5.4.1.2 Impacts

Construction and Operations

Should utility-scale solar development occur in the East Mormon Mountain SEZ, grazing would be excluded from the areas developed, as provided for in the BLM grazing regulations (43 CFR Part 4100). The regulations provide for reimbursement of permittees for their portion of the value for any range improvements in the area removed from the grazing allotment. The impact of this change in the grazing permits would depend on several factors, including (1) how much of an allotment the permittee might lose to development, (2) how important the specific land lost is to the permittee's overall operation, and (3) the amount of actual forage production that would be lost by the permittee.

Since only about 1% of the Summit Spring allotment overlaps the SEZ, the loss of this small amount of area is anticipated to have no impact on this allotment, and any loss of use likely could be absorbed elsewhere in the allotment.

Quantification of the impact on the Gourd Springs allotment would require, at a minimum, consideration of the three factors identified above; however, the allotment has already been reduced in size by about 40%, and the area that would be occupied by the SEZ includes most of the rest of the best grazing land left in the allotment. It is likely that with the loss of the land in SEZ, the allotment would cease to be a feasible economic operation and the total authorized grazing use of 3,458 AUMs would be lost. This would be a large impact on the grazing permittee.

On the basis of an assumed loss of a total of 3,458 AUMs, as described above, the impact on livestock use within the Caliente Field Office from solar development of the SEZ would be small. This conclusion is based on the comparison of the loss of the 3,458 AUMs with the total BLM-authorized AUMs in the field office for grazing year 2009, which totaled 54,199 AUMs (BLM 2009b). This loss is 6.4% of the total authorized use.

Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of a major transmission line adjacent to the SEZ, and assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of electrical transmission facilities outside of the SEZ was conducted (see Section 11.5.1.2).

Although a new road would be required to connect to I-15, the assumed road alignment would pass through the portion of the Gourd Springs allotment that was removed from grazing in 2008. Thus there would be no additional impacts on livestock grazing from this construction.

11.5.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are proposed to mitigate impacts on livestock grazing. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide mitigation for some identified impacts. The exception would be the potential adverse economic impacts on the Gourd Springs permittee.

11.5.4.2 Wild Horses and Burros

11.5.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nearly 100 wild horse and burro herd management areas (HMAs) occur within Nevada (BLM 2009c). Two of the Nevada HMAs and one Utah HMA are partially located within the 50-mi (80-km) SEZ region for the proposed East Mormon Mountain SEZ (Figure 11.5.4.2-1). None of the HMAs occur within the SEZ or indirect impact area of the SEZ. The Gold Butte HMA is the closest HMA. It occurs about 32 mi (51.5 km) south of the SEZ (Figure 11.5.4.2-1).

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). All of the territories are more than 50 mi (80 km) from the East Mormon Mountain SEZ.

11.5.4.2.2 Impacts

Because the proposed East Mormon Mountain SEZ is about 32 mi (51.5 km) or more from any wild horse and burro HMA managed by the BLM and more than about 50 mi (80 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly or indirectly affect wild horses and burros that are managed by these agencies.

11.5.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features for solar development within the proposed East Mormon Mountain SEZ would be necessary to protect or minimize impacts on wild horses and burros.

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11.5.5 Recreation

11.5.5.1 Affected Environment

The site of the proposed East Mormon Mountain SEZ is accessible via a 10- to 15-mi (16- to 24-km) drive on dirt and gravel roads, depending on the chosen access route. The SEZ is generally flat, although it is dissected by several well-developed washes and has a small number of roads and trails (including the dry wash bottoms) that provide access into the area. Although there are no recreation data available, the area appears to offer limited opportunities for recreation with backcountry driving, dispersed camping, and hunting being the most likely uses. OHV use in the SEZ and surrounding area has been designated as “Limited to travel on designated roads and trails” (BLM 2008a).

11.5.5.2 Impacts

11.5.5.2.1 Construction and Operations

Recreational use would be eliminated from portions of the SEZ developed for solar energy production, and existing recreational users would be displaced. The area is not a major recreation destination, and it is not anticipated that the loss of recreational opportunities would be significant. The area contains a few dirt roads and dry washes that may be designated as open to travel that access areas in and around the SEZ, and the potential exists for these roads to be closed because of solar development. If open OHV routes within the SEZ were identified during project-specific analyses, these routes would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated). This could adversely affect access to undeveloped areas within the SEZ and areas outside the SEZ. Whether recreational visitors would continue to use any remaining undeveloped portions of the SEZ, or how the use of areas surrounding the SEZ would change, is unknown.

The boundary of the Mormon Mountains WA is within 2 to 3.5 mi (3 to 6 km) of the SEZ, and solar development within the SEZ would be very visible from about 15,309 acres (62 km^2), or 9.7%, of the WA. Whether the presence of solar development in the SEZ would affect recreational use of these areas is unknown, but about 3,143 acres (12.7 km^2), or about 2%, of the area is located within 0 to 5 mi (0 to 8 km), the most sensitive visual zone surrounding the proposed SEZ. It is anticipated that some wilderness visitors to this area of the WA may be displaced and there is potential for wilderness recreation use to be reduced within the 15,309 acres (62 km^2) with visibility of the SEZ.

11.5.5.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line, no additional construction of transmission facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional recreation impacts. See Section 11.5.1.2 for the development assumptions underlying this analysis.

The 11 mi (18 km) of new or upgraded road connecting the SEZ to I-15 would be visible from portions of the Morman Mountains WA, but because of the small size of the road and the distance from the SEZ, it is not anticipated that there would be any significant additional impact on wilderness characteristics caused by road construction and use.

11.5.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide some mitigation for some identified impacts. The exceptions may be the loss of recreation use within developed portions of the SEZ and in up to 15,309 acres (62 km^2) of the Morman Mountains WA.

A proposed design feature specific to the proposed East Mormon Mountain SEZ includes the following:

- Design features for visual resources as described in Section 11.5.14 should be applied to minimize adverse impacts on wilderness recreation use.

11.5.6 Military and Civilian Aviation

11.5.6.1 Affected Environment

The proposed East Mormon Mountain SEZ is located under two MTRs. One of these is a visual flight route that can be used down to 200 ft (61 m) AGL, and the other is an instrument route that can be used down to 400 ft (122 m) AGL. The area is located 5 mi (8 km) east of the very large Military Operating Area that extends across southern Nevada just north of Las Vegas. The SEZ is also located within a zone identified in BLM land records as a mandatory DoD Consultation Area.

The nearest public airport is in Mesquite, Nevada, about 12 mi (19 km) southeast of the SEZ, which does not have scheduled commercial passenger service.

11.5.6.2 Impacts

The military has indicated that solar technologies with structures higher than 200 ft (61 m) AGL would intrude into military airspace and would present safety concerns for military aircraft use of the airspace.

The Mesquite Airport is located far enough away from the proposed SEZ that there would be no impact on airport operations.

11.5.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features are proposed. The programmatic design features described in Appendix A, Section A.2.2, would require early coordination with the DoD to identify and mitigate, if possible, potential impacts on the use of MTRs.

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11.5.7 Geologic Setting and Soil Resources

11.5.7.1 Affected Environment

11.5.7.1.1 Geologic Setting

Regional Setting

The proposed East Mormon Mountain SEZ is located along the northern edge of the Virgin River depression, a large structural basin within the Basin and Range physiographic province in southeastern Nevada. The depression is predominantly in Nevada but extends into Utah and Arizona to the east. It is bounded on the northwest by the Mormon and East Mormon Mountains and Tule Spring Hills and on the northeast by the Beaver Dam Mountains (in Utah and Arizona). The Muddy Mountains and Black Mountains are to the southwest; the Southern Virgin Mountains and Virgin Mountains (Arizona) are to the southeast. The basin is bisected by the Virgin River, a tributary of the Colorado River, which flows to the southwest toward Lake Mead (Figure 11.5.7.1-1). The Virgin River depression extends across Arizona, Nevada, and Utah and is about 371,000 acres (1,500 km^2) in area. It is divided by a north-northeast trending buried ridge into two deep basins—the Mormon basin, to the east (below Mormon Mesa), and the Mesquite basin, to the west (below the town of Mesquite). The East Mormon Mountain SEZ sits above the northern edge of the Mesquite basin, an east-tilting half graben bounded by normal faults to the east, southeast, and west. The basin contains as much as 3.7 mi (6 km) of sedimentary (basin) fill above a sequence of Mesozoic and Paleozoic sedimentary rocks and Precambrian basement rocks (Bohannon et al. 1993; Forrester 2009).

Basin fill consists of the Muddy Creek Formation, the Red Sandstone unit, and the Horse Spring Formation (all Tertiary). The Muddy Creek Formation is the oldest and thickest unit that crops out in the Mesquite basin; its composition is laterally variable, but typically comprises a basal conglomerate unit overlain by a conglomerate bed of the Toquop Wash, siltstone and claystone, and an upper conglomerate unit (as well as minor evaporites and basalt flows); it constitutes an important producing aquifer in the region. Seismic studies indicate that the Muddy Creek Formation is up to 0.6 to 1.2 mi (1 to 2 km) deep in the Mesquite basin. It unconformably overlies the rocks of the Red Sandstone unit and the Lovell Wash Member of the Horse Spring Formation (Bohannon et al. 1993; Langenheim et al. 2000; Dixon and Katzer 2002).

Exposed sediments near the proposed SEZ consist mainly of modern alluvial and colluvium deposits (Qa) and tuffaceous sedimentary rocks of Tertiary age (Ts) (Muddy Creek Formation [Crafford 2007]) (Figure 11.5.7.1-2). The surrounding mountains are composed predominantly of Paleozoic carbonates (limestone and dolomite) and Mesozoic continental and marine deposits of siltstone, sandstone, and limestone. The oldest rocks in the region are the Precambrian metamorphic rocks (Xm) exposed in the East Mormon Mountains to the south of the proposed SEZ.

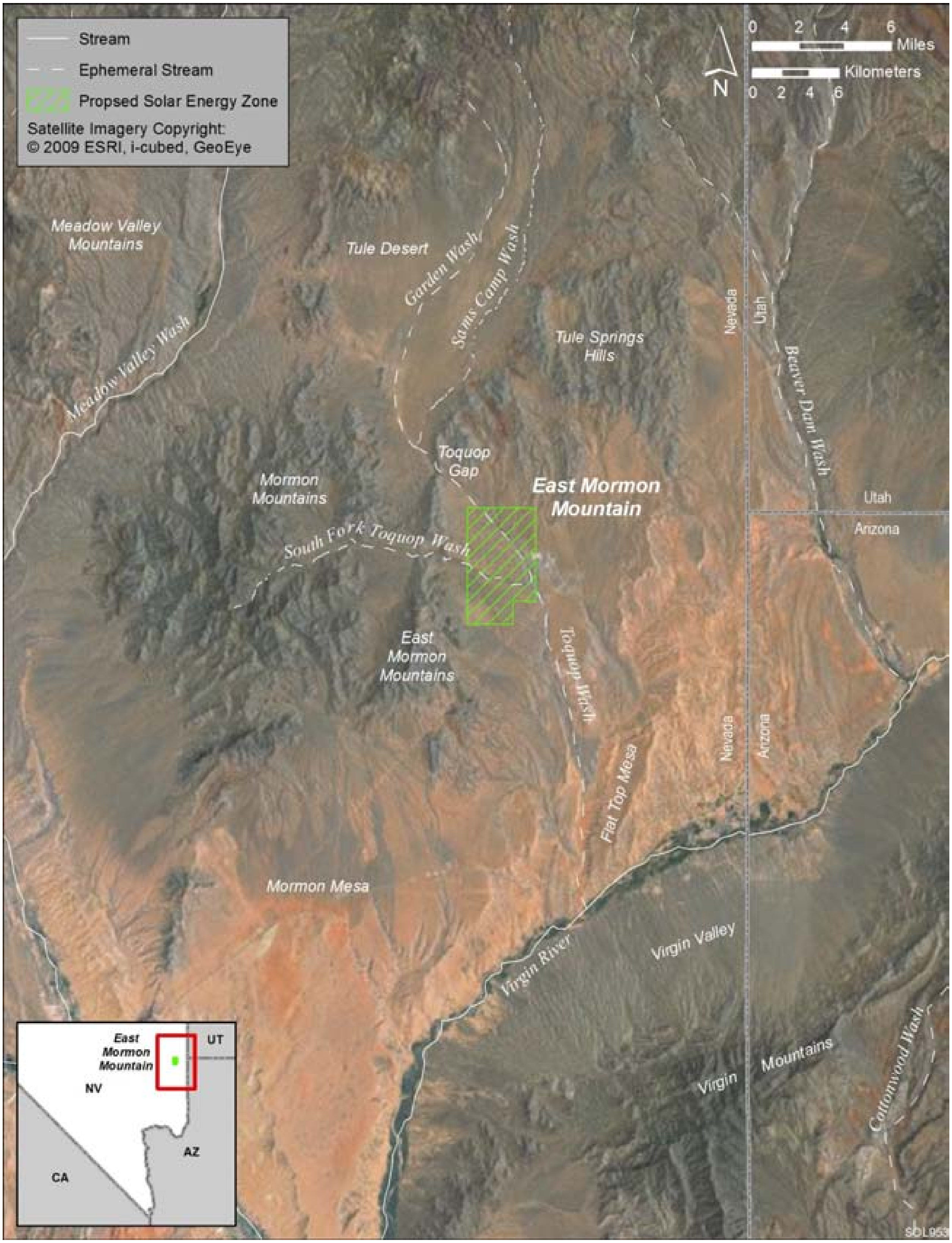

FIGURE 11.5.7.1-1 Physiographic Features of the East Mormon Mountain Region

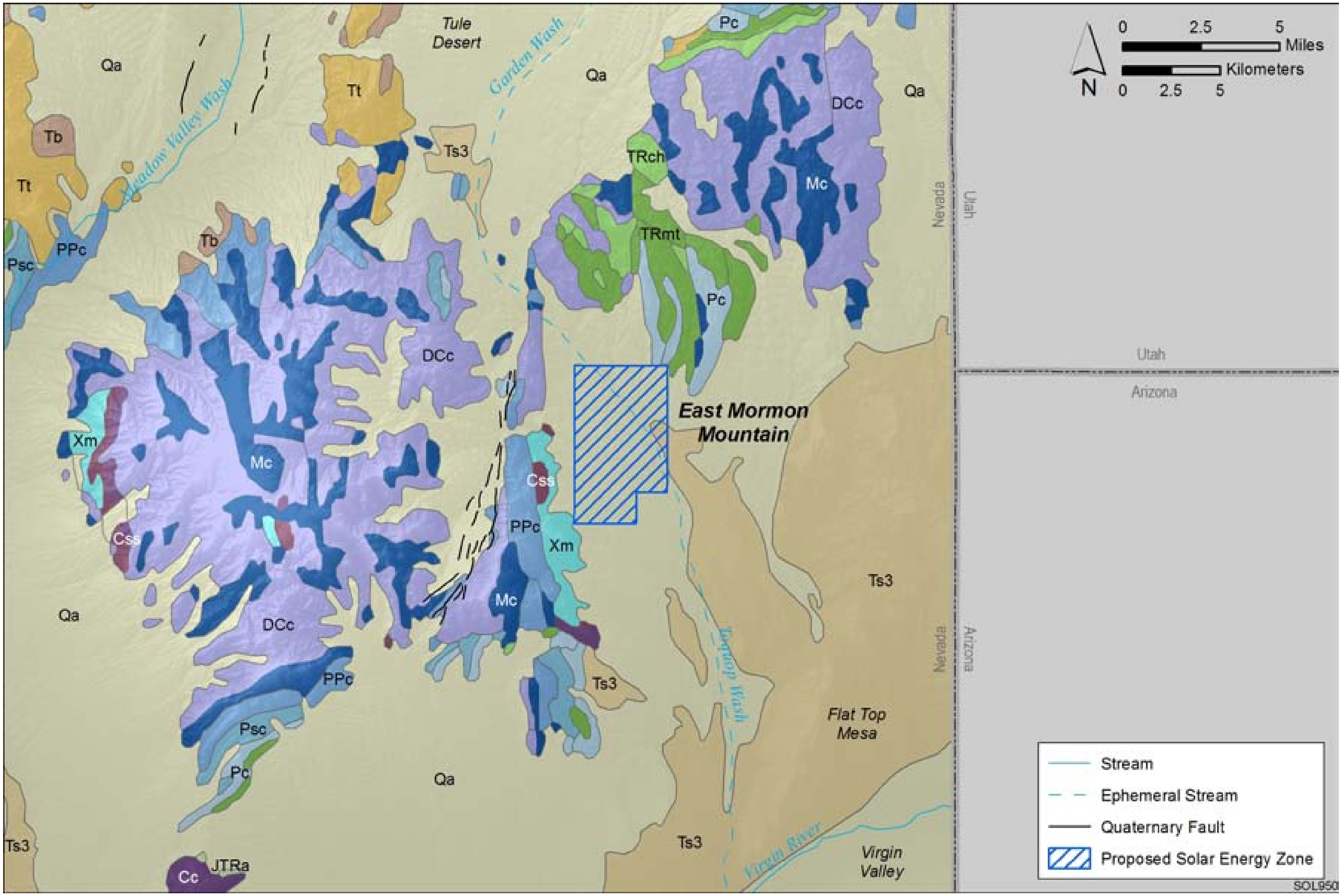

FIGURE 11.5.7.1-2 Geologic Map of the East Mormon Mountain Region (Ludington et al. 2007; Stewart and Carlson 1978)

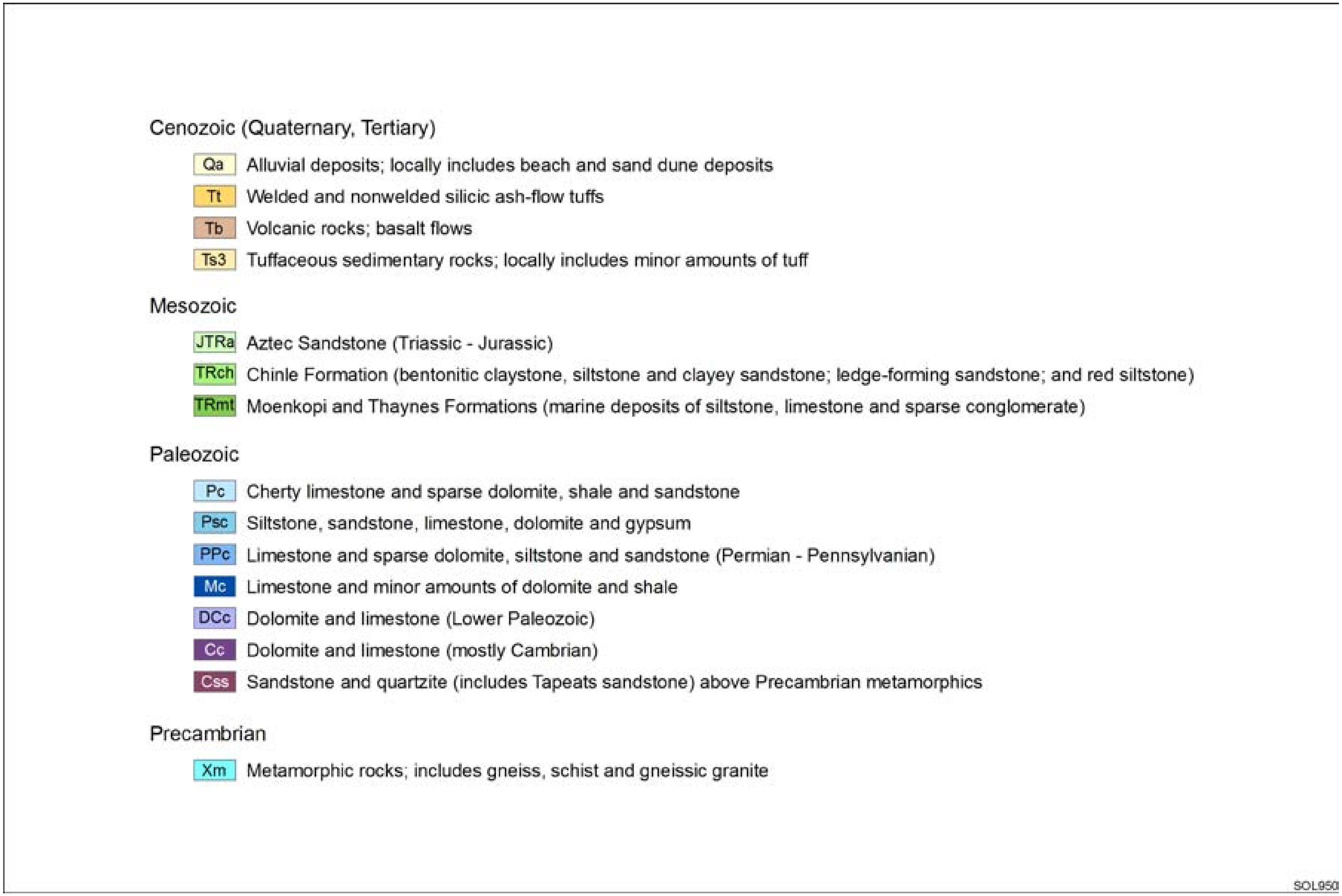

FIGURE 11.5.7.1-2 (Cont.)

Topography

The proposed East Mormon Mountain SEZ is located in the Mesquite basin (within the northern part of the Virgin River depression), just east of the East Mormon Mountains and south of Tule Springs Hills (Figure 11.5.7.1-3). Its terrain slopes gently to the southeast, generally following the course of the Toquop Wash. Elevations range from greater than 2,800 ft (850 m) along the western boundary (toward the base of the East Mormon Mountains) to about 2,405 ft (730 m) at the southeastern end where the South Fork Toquop Wash and Toquop Wash merge and exit the SEZ.

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Section 5.7.3. The following sections provide a preliminary assessment of these hazards at the proposed East Mormon Mountain SEZ. Solar project developers may need to conduct a geotechnical investigation to identify and assess geologic hazards locally to better identify facility design criteria and site-specific mitigation measures to minimize their risk.

Seismicity. The southeastern corner of Lincoln County lies immediately south of the Southern Nevada Seismic Belt (also called the Pahranagat Shear Zone), a south-southwest–trending zone of seismic activity characterized mainly by background earthquakes (i.e., earthquakes not associated with surface expression) (dePolo and dePolo 1999). Although the region is seismically active, there are no Quaternary faults within or immediately adjacent to the proposed East Mormon Mountain SEZ. The nearest Quaternary fault is the Carp Road fault, a north-striking fault that occurs along the western edge of the East Mormon Mountains a few miles west of the SEZ. A series of discontinuous faults making up the Littlefield Mesa fault system is located in Arizona about 15 mi (23 km) to the southeast (Figure 11.5.7.1-4).

The Carp Road fault is a normal fault that forms an abrupt boundary between the down-dropped block to the west and the east-tilting block of the East Mormon Mountains to the east. No detailed field studies of the fault have been made, but maps based on aerial photos show discontinuous fault traces expressed as scarps on surficial deposits and erosional surfaces of Quaternary age along the mountain base. However, these studies do not provide sufficient stratigraphic detail to constrain the date of the most recent movement along the fault more precisely than within the past 1.6 million years. Slip rates along the fault are estimated to be less than 0.2 mm/yr (Anderson 1998).

The Littlefield Mesa faults consist of a group of short, north-striking faults that transect upper Pliocene to middle Pleistocene basin floor sediments and river gravels to the southeast of the East Mormon Mountain SEZ, placing the most recent movement along the faults at less than 750,000 years ago. Scarps are readily seen in the field, showing vertical displacements that range from 30 to 120 ft (10 to 36 m). Slip rates along the faults are estimated to be less than 0.2 mm/yr (Pearthree 1997).

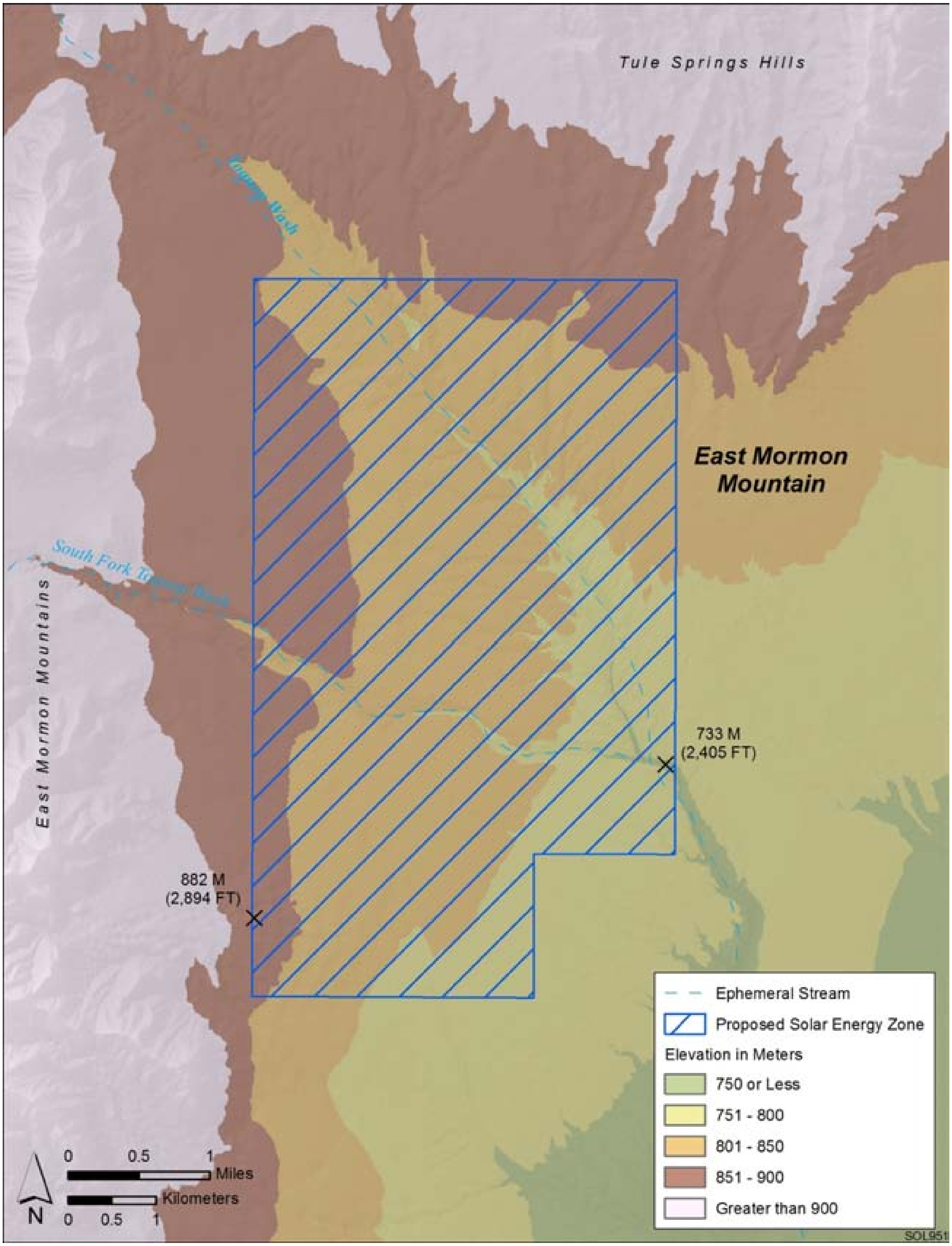

FIGURE 11.5.7.1-3 General Terrain of the Proposed East Mormon Mountain SEZ

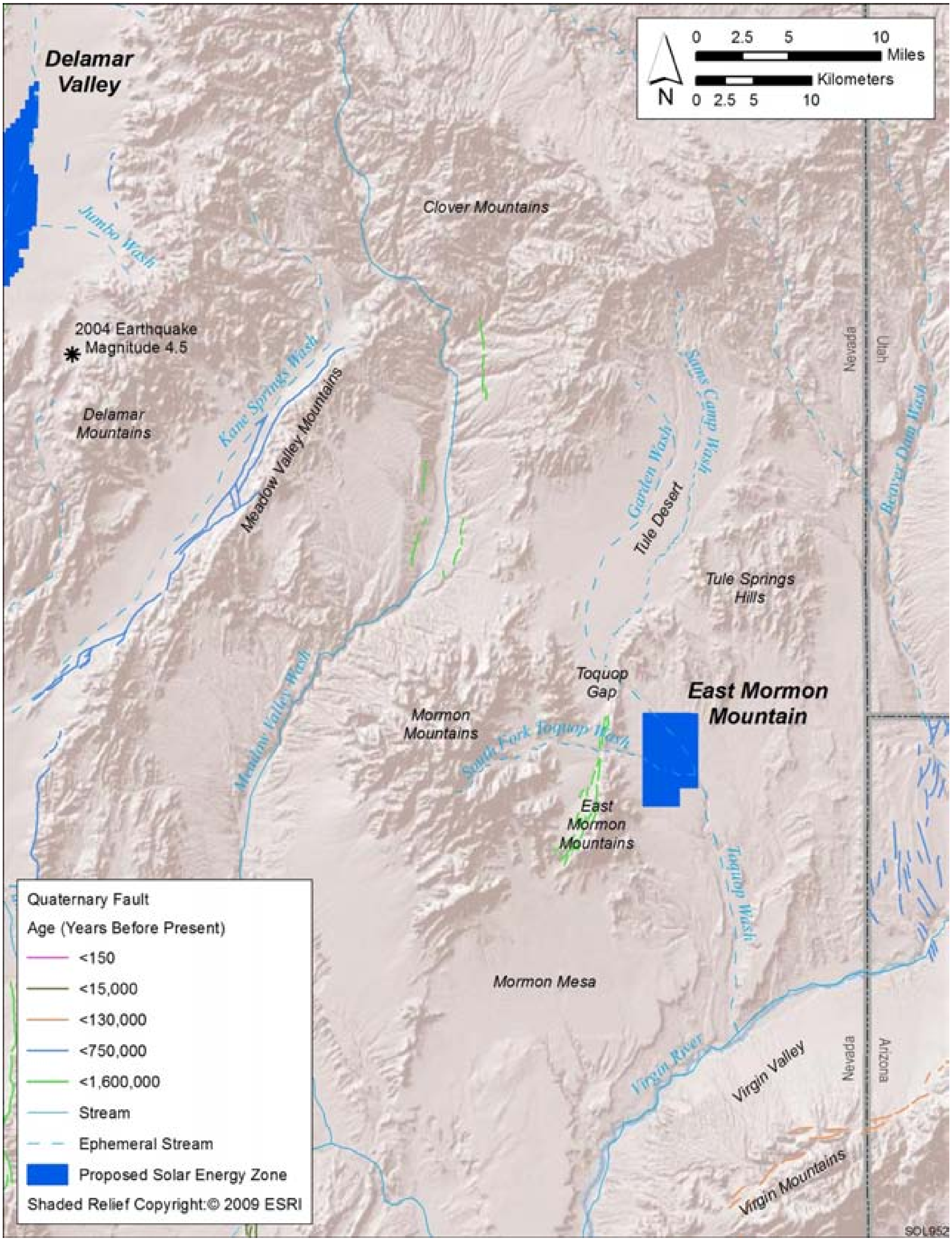

FIGURE 11.5.7.1-4 Quaternary Faults in the East Mormon Mountain Region (USGS and NBMG 2010; USGS 2010a)

Several other inactive faults may occur near or within the proposed East Mormon Mountain SEZ, including the Toquop Wash fault, which parallels the course of the Toquop Wash near the site. This fault is not listed in the USGS Quaternary fault and fold database, but appears as an inferred fault on the Nevada Bureau of Mines and Geology online Quaternary faults interactive map (dePolo et al. 2009).

From June 1, 2000, to May 31, 2010, 64 earthquakes were recorded within a 61-mi (100-km) radius of the proposed East Mormon Mountain SEZ (USGS 2010a). The largest earthquake during that period occurred on May 16, 2004. It was located about 40 mi (60 km) to the northwest of the SEZ in the Gregerson Basin (near the Delamar Mountains) and registered a Richter scale magnitude[1] (ML) of 4.5 (Figure 11.5.7.1-4). During this period, 36 (56%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0; none were greater than 4.5 (USGS 2010a). The most significant earthquake in the region occurred on September 22, 1996, near Caliente, Nevada, about 45 mi (72 km) to the north-northeast of the East Mormon Mountain SEZ; it registered a magnitude of 6.1 (von Seggern and Brune 2000).

Liquefaction. The proposed East Mormon Mountain SEZ lies in an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.07 and 0.08 g. Shaking associated with this level of acceleration is generally perceived as moderate; however, the potential damage to structures is light (USGS 2008). Given the low intensity of ground shaking estimated for the area and the low incidence of historical seismicity in the region, the potential for liquefaction in sediments within and around the SEZ is likely to be low.

Volcanic Hazards. Several calderas in southern Nevada are the sources of voluminous and widespread Tertiary volcanic deposits throughout the region. These include the Indian Peak caldera complex to the northeast of Delamar Valley, between the Highland Range and the Nevada–Utah border; the Caliente caldera complex, to the north, in the northern Delamar and Clover Mountains and extending into western Utah; the smaller Kane Springs Wash caldera in the southern Delamar Mountains; and the Central Nevada caldera complex to the northwest of Delamar Valley (Scott et al. 1992). Tertiary volcanism overlaps periods of extension in southern Nevada and occurred as recently as 2.6 million years ago (late Pliocene) (Noble 1972); however, there is no evidence of more recent volcanic activity associated with these complexes.

The East Mormon Mountain region is located about 80 mi (130 km) due east of the southwestern Nevada volcanic field, which consists of volcanic rocks (tuffs and lavas) of the Timber Mountain-Oasis Valley caldera complex and Silent Canyon and Black Mountain calderas. The area has been studied extensively because of its proximity to the NTS and Yucca Mountain repository. Two types of fields are present in the region: (1) large-volume, long-lived

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[1] Richter scale magnitude (ML) was the original magnitude defined by Richter and Gutenberg for local earthquakes in 1935. It was based on the maximum amplitude recorded on a Wood-Anderson torsion seismograph but is currently calculated for earthquakes with magnitudes ranging from 2 to 6, using modern instruments with adjustments (USGS 2010b).

fields with a range of basalt types associated with more silicic volcanic rocks produced by melting of the lower crust, and (2) small-volume fields formed by scattered basaltic scoria cones during brief cycles of activity, called rift basalts because of their association with extensional structural features. The basalts of the region typically belong to the second group; examples include the basalts of Silent Canyon and Sleeping Butte (Byers et al. 1989; Crowe et al. 1983).

The oldest basalts in the region were erupted during the waning stages of silicic volcanism in the southern Great Basin in the Late Miocene and are associated with silicic volcanic centers like Dome Mountain (the first group). Rates of basaltic volcanic activity in the region have been relatively constant but generally low. Basaltic eruptions occurred from 1.7 million to 700,000 years ago, creating the cinder cones within Crater Flat (Stuckless and O'Leary 2007). The most recent episode of basaltic eruptions occurred at the Lathrop Wells Cone complex about 80,000 years ago, a few miles east of the proposed Amargosa SEZ (Stuckless and O'Leary 2007; see Section 11.1.7). There has been no silicic volcanism in the region in the past 5 million years. Current silicic volcanic activity occurs entirely along the margins of the Great Basin (Crowe et al. 1983).

Crowe et al. (1983) determined that the annual probability of a volcanic event for the region is very low (3.3×10^{-10} to 4.7×10^{-8}), similar to the probability of 1.7×10^{-8} calculated for the proposed Yucca Mountain repository (Cline et al. 2005). The volcanic risk in the region is associated only with basaltic eruptions; the risk of more explosive silicic volcanism is negligible. Perry (2002) cites new hypotheses and geologic data that point to a possible increase in the recurrence rate (and thus the probability of disruption) of volcanism in the region. These include hypotheses of anomalously high strain rate episodes in the region and the presence of a regional mantle hot spot; and new aeromagnetic data that suggest as many as 12 previously unrecognized volcanoes may be buried in the alluvial-filled basins in the region.

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to facilities on the relatively flat terrain of valley floors such as the Virgin River Valley, if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

No land subsidence monitoring has taken place in the East Mormon Mountain region to date; however, earth fissures have been documented in the Las Vegas Valley around Las Vegas, about 70 mi (110 km) southwest of the proposed East Mormon Mountain SEZ. The fissures are likely the result of land subsidence caused by compaction of unconsolidated alluvial sediments due to groundwater withdrawal. Spatial distribution of fissures in the valley suggests that fissures are preferentially located near and along Quaternary faults, with 80% of fissures within 1,150 ft (350 m) of a known fault. The maximum subsidence measured for the period between 1963 and 1987 was about 5 ft (1.5 m). Since then, subsidence rates have declined by as much as 50 to 80%. The reduction in subsidence rates has been attributed to the effects of the artificial recharge program (using water from Lake Mead) started in the 1990s, which has generally increased water levels in the region (Bell et al. 2002; Burbey 2002; Galloway et al. 1999).

Other Hazards. Other potential hazards at the proposed East Mormon Mountain SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Disturbance of soil crusts and desert pavement on soil surfaces may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those found in the valley surrounding the Toquop Wash, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) will depend on the specific morphology of the fan (National Research Council 1996). Section 11.5.9.1.1 provides further discussion of flood risks within the East Mormon Mountain SEZ.

11.5.7.1.2 Soil Resources

Soils within the proposed East Mormon Mountain SEZ are predominantly fine sandy loams of the Mormon Mesa association, which covers about 84% of the site (Figure 11.5.7.1-5). Soil map units within the SEZ are described in Table 11.5.7.1-1. These level to gently sloping soils are derived from alluvium from sedimentary rocks (mainly carbonates). They are predominantly shallow (above a hardpan layer) and well drained. Most of the soils on the site have a high surface runoff potential and moderately rapid permeability. The natural soil surface is suitable for roads, with a slight to moderate erosion hazard when used as roads or trails. The water erosion potential is low for all soils at the site. The susceptibility to wind erosion is moderate for most soils, with as much as 86 tons (78 metric tons) of soil eroded by wind per acre (4,000 m^2) each year (NRCS 2010). Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

None of the soils within the East Mormon Mountain SEZ are rated as hydric.[2] Flooding is not likely for soils at the site (occurring less than once in 500 years). None of the soils are classified as prime or unique farmland (NRCS 2010).

11.5.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy developments in varying degrees and are described in more detail for the four phases of development in Section 5.7 1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger

[2] A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding (NRCS 2010).

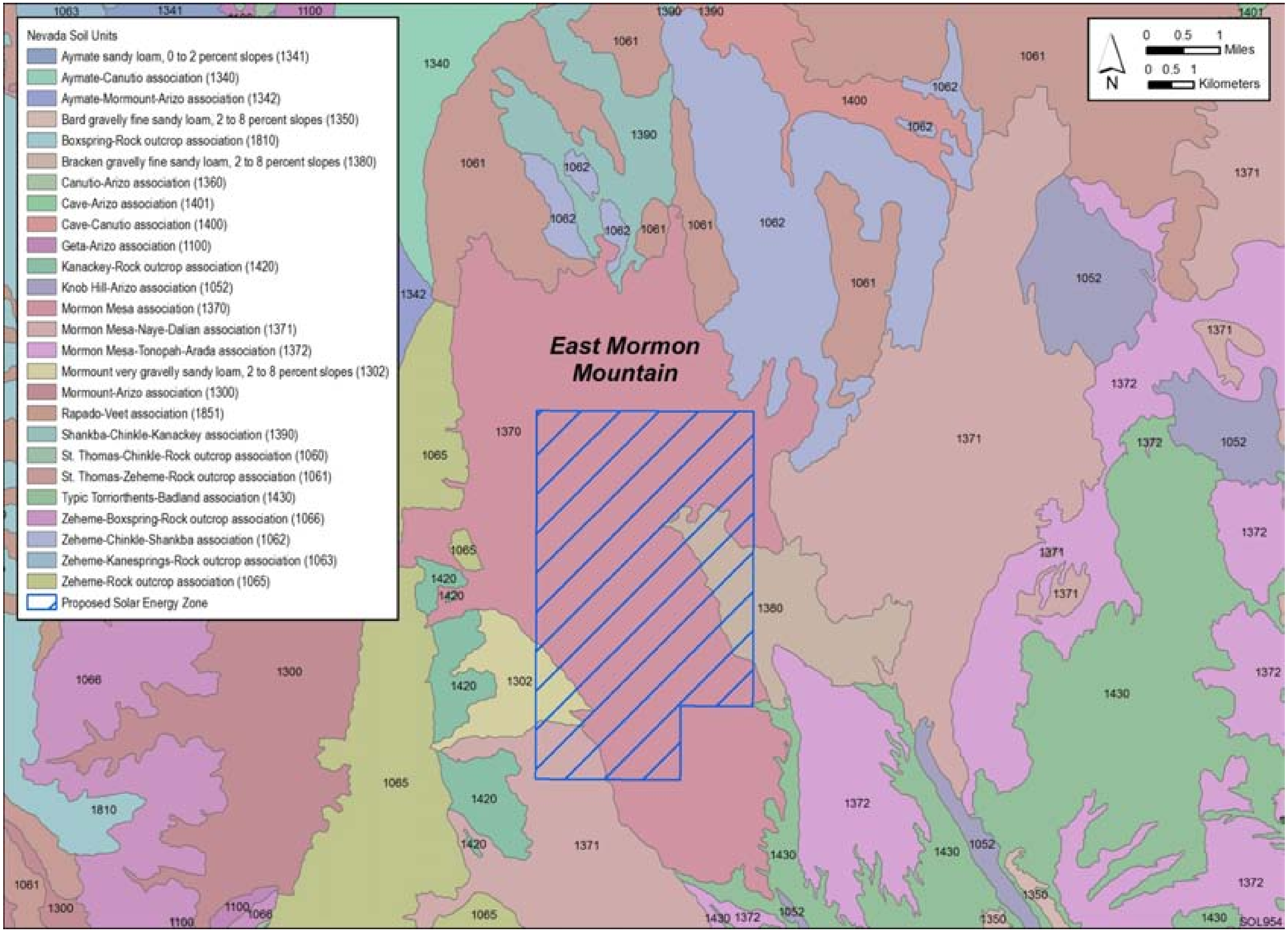

FIGURE 11.5.7.1-5 Soil Map for the Proposed East Mormon Mountain SEZ (NRCS 2008)

TABLE 11.5.7.1-1 Summary of Soil Map Units within the Proposed East Mormon Mountain SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area[c] (% of SEZ)
1370	Mormon Mesa association (0 to 2% slopes)	Low (0.28)	Moderate (WEG 3)[d]	Level to nearly level fine sandy loams on fan remnants and mesas. Parent material consists of alluvium derived from limestone and dolomite. Shallow (to a petrocalcic or hardpan horizon) and well drained, with high surface runoff potential (very slow infiltration rate) and moderately rapid permeability. Available water capacity is very low. Moderate rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	7,506 (84)
1380	Bracken gravelly fine sandy loam (2 to 8% slopes)	Low (0.20)	Moderate (WEG 4)	Gently sloping soils on hills and pediments. Parent material is residuum and colluvium (landslide debris) from gypsiferous sedimentary rocks. Deep and somewhat excessively drained, with moderate surface runoff potential and moderately rapid permeability. Available water capacity is very low. Moderate rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	1,814 (8)
1371	Mormon Mesa-Nay-Dalian association (4 to 8% slopes)	Low (0.15)	Moderate (WEG 4)	Consists of about 45% Mormon Mesa gravelly fine sand, 25% Naye gravelly fine sandy loam, and 15% Dalian very gravelly fine sandy loam. Gently sloping soils on inset fans and fan remnants. Parent material is alluvium derived from limestone and dolomite. Moderately deep and well drained, with high surface runoff potential (very slow infiltration rate) and moderate permeability. Available water capacity is low to very low. Moderate rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	412 (5)

TABLE 11.5.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area (% of SEZ)
1302	Mormount very gravelly sandy loam (2 to 8% slopes)	Low (0.17)	Moderate (WEG 5)	Gently sloping soils on fan piedmont remnants. Parent material consists of alluvium from limestone with minor amounts of volcanic tuffs. Shallow (to a petrocalcic or hardpan horizon) and well drained, with high surface runoff potential (very slow infiltration rate) and moderate permeability. Available water capacity is very low. Slight rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation.	308 (4)

[a] Water erosion potential rates based on soil erosion factor K (whole rock), which indicates the susceptibility of soil to sheet and rill erosion by water. Values range from 0.02 to 0.69 and are provided in parentheses under the general rating; a higher value indicates a higher susceptibility to erosion. Estimates based on the percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8 low (see footnote c for further explanation).

[c] To convert acres to km^2, multiply by 0.004047.

[d] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEGs 3 and 4, 86 tons (78 metric tons) per acre (4,000 m^2) per year; and WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year.

Source: NRCS (2010).

areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility, since some components would involve greater disturbance and would take place over a longer timeframe.

11.5.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed East Mormon Mountain SEZ. Implementing the programmatic design features described under both Soils and Air Quality in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for soil impacts during all project phases.

11.5.8 Minerals (Fluids, Solids, and Geothermal Resources)

11.5.8.1 Affected Environment

As of September 20, 2010, there were no active mining claims located in the proposed East Mormon Mountains SEZ, and there is no history of closed mining claims within the area (BLM and USFS 2010a). The public land within the SEZ was closed to locatable mineral entry in June 2009, pending the outcome of this PEIS. There are no active oil and gas leases within the SEZ, but all of the area has been leased in the past (BLM and USFS 2010b). There are existing non-producing leases adjacent to the eastern border of the SEZ. The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals and for disposal of salable minerals. There is no active or historical geothermal leasing or development in or near the SEZ (BLM and USFS 2010b).

11.5.8.2 Impacts

If the area were identified as a solar energy zone, it would continue to be closed to all incompatible forms of mineral development. For the purpose of this analysis, it was assumed that future development of oil and gas resources, should any be found, would still be possible, since such development could occur with directional drilling from outside the SEZ.

Since the SEZ does not contain existing or closed mining claims, it was also assumed that there would be no future loss of locatable mineral production.

The SEZ has had no history of development of geothermal resources. For that reason, it is not anticipated that solar development would not adversely affect geothermal resources.

The production of common minerals, such as sand and gravel and mineral materials used for road construction or other purposes, might take place in areas not directly developed for solar energy production.

11.5.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required to protect mineral resources. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for protection of mineral resources.

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11.5.9 Water Resources

11.5.9.1 Affected Environment

The proposed East Mormon Mountain SEZ is located within the Lower Colorado–Lake Mead subbasin of the Lower Colorado hydrologic region (USGS 2010c) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed East Mormon Mountain SEZ is located on top of an alluvial fan at the base of the East Mormon Mountains and Tule Springs Mountains within the Lower Virgin River Valley. There are significant surface drainage patterns throughout the proposed SEZ, as evident from aerial photos and topographic maps. Surface elevations within the proposed SEZ range from 2,410 to 2,890 ft (734 to 881 m) and surface elevations in the surrounding East Mormon Mountains reach more than 4,700 ft (1,400 m) (Figure 11.5.9.1-1). The average annual precipitation is approximately 6 in. (15 cm) in the valley (WRCC 2010a). In the mountain regions, the average annual precipitation is higher, ranging up to 15 in. (38 cm) at the highest elevations (Glancy and Van Denburgh 1969). Pan evaporation rates are estimated to be 85 in./yr (216 cm/yr) (Cowherd et al. 1988; WRCC 2010b), and reference crop evapotranspiration has been estimated at 61 in./yr (155 cm/yr) (Huntington and Allen 2010).

11.5.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

There are no perennial surface water features in the proposed East Mormon Mountain SEZ. The Toquop Wash and the South Fork Toquop Wash are significantly incised ephemeral washes that flow through the proposed SEZ (Figure 11.5.9.1-1). The Toquop Wash is a tributary to the Virgin River, approximately 12 mi (19 km) south of the SEZ. The Virgin River is a tributary to the Colorado River and flows into Lake Mead approximately 24 mi (39 km) downstream of the confluence of the river with Toquop Wash. Glancy and Van Denburgh (1969) estimated that the Toquop Wash contributes approximately 3,000 ac-ft/yr (3.7 million m^3/yr) to the Virgin River. The Toquop Wash flows into the Virgin River Valley basin from the Tule Basin, which is adjacent to and to the north of the basin. The Toquop Wash is referred to as the Garden Wash in the Tule basin before it flows through the Toquop Gap and into the Virgin River Valley basin, conveying approximately 1,000 ac-ft/yr (1.2 million m^3/yr) of runoff (Figure 11.5.9.1-1). Total runoff in the Nevada portion of the Virgin River Valley basin is estimated to be 6,300 ac-ft/yr (7.8 million m^3/yr) (Glancy and Van Denburgh 1969). Average surface water inflow in the Virgin River to the Nevada portion of the basin from Arizona is estimated to be 160,000 ac-ft/yr (197 million m^3/yr) (NDWR 1971). Virgin River mean annual flow between 1930 and 2004 at the stream gauge in Littlefield, Arizona, just upstream from the border with Nevada, is 173,000 ac-ft/yr (213 million m^3/yr) (USGS 2010d; gauge 09415000). Outflow of the Virgin River to Lake Mead has been estimated at between 80,000 and 140,000 ac-ft/yr (99 million and 170 million m^3/yr) (Glancy and Van Denburgh 1969; Virgin Valley Water District 2002).

The entire area of the proposed East Mormon Mountain SEZ is located on an alluvial fan at the base of the East Mormon Mountains and Tule Springs Mountains. Several ephemeral

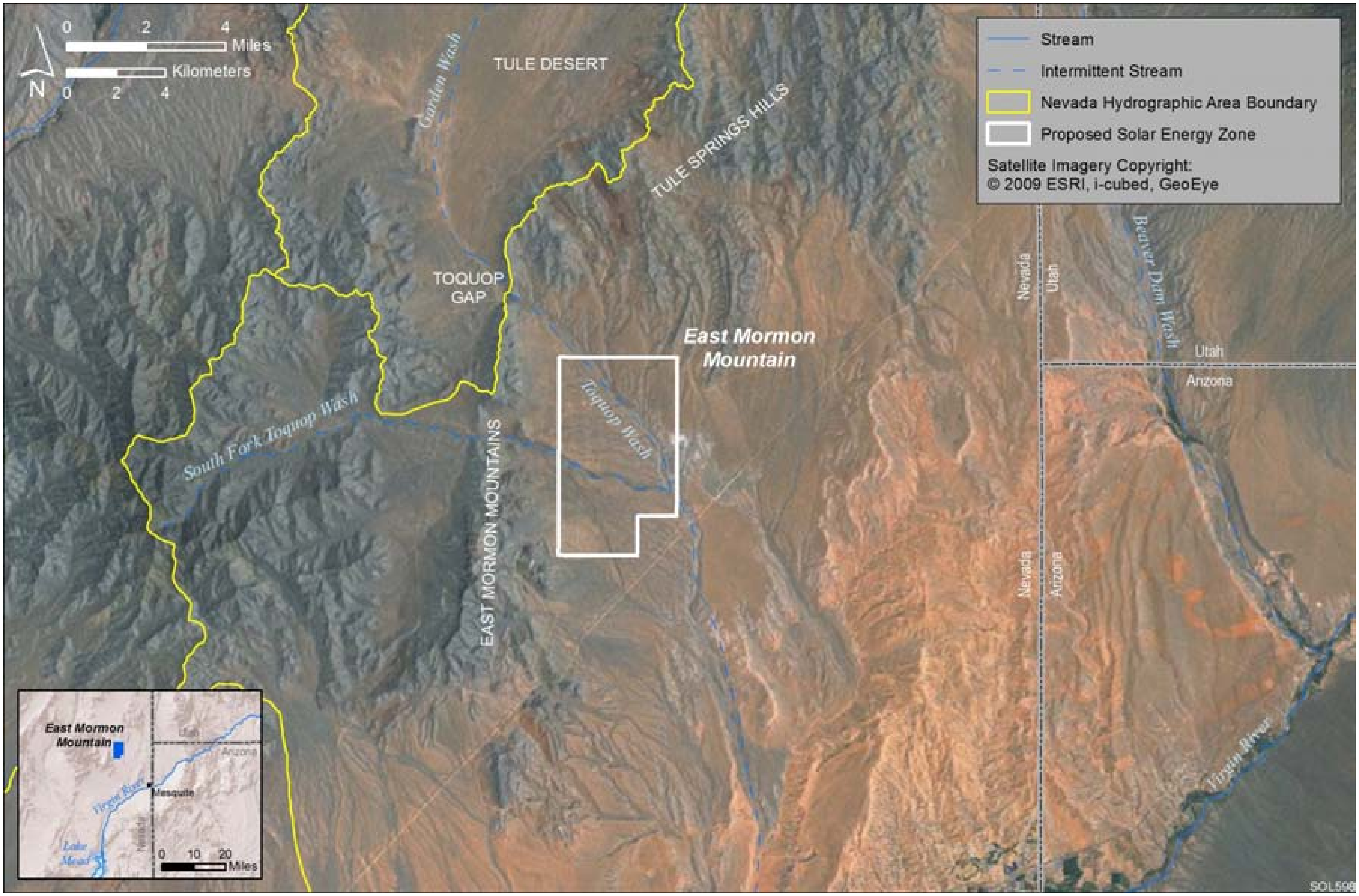

FIGURE 11.5.9.1-1 Surface Water Features near the Proposed East Mormon Mountain SEZ

drainages are present along the fan (Figure 11.5.9.1-1). Four springs are known to exist near the proposed SEZ. Gourd Spring and Peach Spring originate in the East Mormon Mountains approximately 1 mi (1.6 km) west of the SEZ, and Tule Spring and Abe Spring originate in the Tule Springs Mountains about 2.3 mi (3.7 km) north of the SEZ.

The NWI has not identified any wetlands on or in the vicinity of the proposed East Mormon Mountain SEZ (USFWS 2009).

Flood hazards have not been identified in Lincoln County, Nevada (FEMA 2009). During large rainfall events, erosion and sedimentation may occur along Toquop Wash, South Fork Toquop Wash, and the associated alluvial fan within the proposed SEZ. Flooding is very common in all channels in the watershed during large storm events. Flooding was particularly great in 2005 after widespread wildfires in the watershed in the years previous (USACE 2008).

11.5.9.1.2 Groundwater

The proposed East Mormon Mountain SEZ is located within the Virgin River Valley basin (NDWR 2010a). The Virgin River Valley basin, as defined in Nevada, is part of the Lower Virgin River Valley groundwater basin, which covers an area of approximately 1.2 million acres (4,800 km^2) over three states (Arizona, Nevada, and Utah); 770,000 acres (3,100 km^2) of the basin are within Nevada (Glancy and Van Denburgh 1969). The mountain ranges surrounding the SEZ are composed of both carbonate and non-carbonate consolidated rocks. Groundwater in the Lower Virgin River Valley basin is primarily found in the basin-fill aquifer, which is composed of unconsolidated gravel, sand, silt, and clay (Glancy and Van Denburgh 1969). The basin-fill Muddy Creek Formation is the primary source of the potable groundwater supply in the basin (Johnson et al. 2002).

The basin-fill aquifer is underlain by sequences of Paleozoic carbonate rocks (Harrill and Prudic 1998). The basin-fill deposits and carbonate-rock sequences may extend as far as 5 mi (8 km) below the surface near the center of the basin, making it one of the deepest known basins in the region (Glancy and Van Denburgh 1969; Johnson et al. 2002; Virgin Valley Water District, 2002). The Paleozoic carbonate rocks that underlie the basin-fill deposits are thought to be a part of the Virgin River Subregion of the Colorado River Flow System, an interbasin regional-scale carbonate-rock aquifer that flows generally toward the south and terminates at the Virgin River and two regional springs, Rogers and Blue Point Springs, that are in the Lake Mead watershed (Prudic et al. 1995). The Virgin River Subregion of the Colorado River Flow System is a part of a large carbonate-rock province that occurs within approximately one-third of Nevada, a large portion of Utah, and parts of Arizona and California (Harrill and Prudic 1998). In addition, the carbonate-rock aquifer system is thought to be structurally complex in the Virgin River Valley basin, and is discontinuous, highly faulted, and thinned in this area (Dettinger 1992; Virgin Valley Water District 2002). In the vicinity of the SEZ, the thickness of the Paleozoic carbonate-rock sequence is estimated to be approximately 4,000 ft (1,200 m). The Paleozoic carbonate rocks are divided into two parts that are separated by a low-angle thrust fault and a 2,000-ft (610-m) layer of Mesozoic rock that contains sequences of less permeable siltstone and shale (Virgin Valley Water District 2002).

Flow in the basin-fill aquifer is generally toward the Virgin River The basin-fill aquifer Muddy Creek Formation typically has a low transmissivity of about 1,300 ft^2/day (120 m^2/day). However, the aquifer is pumped mostly in zones that have been heavily faulted, which have higher transmissivity values of around 20,000 ft^2/day (1,800 m^2/day) (Johnson et al. 2002). Groundwater recharge from precipitation was estimated by Glancy and Van Denburgh (1969) to be about 9,500 ac-ft/yr (11.7 million m^3/yr) within the Lower Virgin River Valley, with approximately 3,600 ac-ft/yr (4.4 million m^3/yr) of recharge occurring within the Nevada portion of the basin. Glancy and Van Denburgh (1969) estimated subsurface inflow from the Tule basin to the north to be 2,100 ac-ft/yr (2.6 million m^3/yr) and groundwater flow from Arizona to be at least 1,000 ac-ft/yr (1.2 million m^3/yr), for a total inflow estimate of 12,600 ac-ft/yr (16 million m^3/yr) to the groundwater basin. Using a recharge model specifically designed to estimate recharge in the Great Basin Aquifer system, Flint and others (2004) estimated recharge in the basin to be 32,400 ac-ft/yr (40 million m^3/yr). The Virgin Valley Water District (2002) estimated groundwater recharge in basin to be 55,000 ac-ft/yr (440 million m^3/yr), using a revised precipitation map along with a new relationship of groundwater recharge from precipitation.

Evaporation from groundwater in the Nevada portion of basin was estimated by Glancy and Van Denburgh (1969) to be 30,000 ac-ft/yr (37 million m^3/yr) and groundwater outflow from the basin into Lake Mead was estimated to be 40,000 ac-ft/yr (49 million m^3/yr). DeMeo and others (2008) estimated evapotranspiration in the basin to be 52,000 ac-ft/yr (64 million m^3/yr). The Virgin Valley Water District (2002) estimated evapotranspiration in the basin to be 70,000 ac-ft/yr (86 million m^3/yr) and groundwater outflow to Lake Mead to be 29,000 ac-ft/yr (36 million m^3/yr), including 8,000 ac-ft/yr (9.9 million m^3/yr) of estimated discharge to Lake Mead from the regional carbonate aquifer system. Groundwater withdrawals are estimated to be 12,000 ac-ft/yr (15 million m^3/yr) within the basin (Virgin Valley Water District 2002).

Some studies have attempted to determine the sustainable yield of the groundwater basin in the Lower Virgin River Valley basin with estimates ranging between 12,600 and 40,000 ac-ft/yr (16 million and 49 million m^3/yr) (Virgin Valley Water District 2002). However, as discussed in Section 11.5.9.1.3, the NDWR has set the perennial yield at 3,600 ac-ft/yr (4.4 million m^3/yr) in the Nevada portion of the Virgin River basin according to the study by Glancy and Van Denburgh (1969) (NDWR 2010a).

The chemical quality of the water in the Virgin River Valley basin is varied. In the vicinity of the SEZ, the Virgin River Valley basin contains evaporite deposits that lead to poor-quality groundwater in the area (Dettinger 1992; Virgin Valley Water District 2002). TDS concentrations have been measured at between 240 and 10,800 mg/L in the groundwater samples taken within the basin (Virgin Valley Water District 2002). Arsenic concentrations are also high in groundwater, with concentrations ranging from 14 to 53 μg/L. Since the EPA lowered the arsenic drinking water standard to 10 μg/L, the Virgin Valley Water District has constructed five water treatment plants to lower arsenic concentrations to below the MCL (Virgin Valley Water District 2010).

11.5.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million m^3/yr), with livestock and mining water uses on the order of 230 ac-ft/yr (280,000 m^3/yr) and 450 ac-ft/yr (560,000 m^3/yr), respectively (Kenny et al. 2009).

In 2005, water withdrawals from surface waters and groundwater in Clark County were 680,000 ac-ft/yr (839 million m^3/yr), of which 83% came from surface waters and 17% came from groundwater. The largest water use category was public supply, at 526,000 ac-ft/yr (649 million m^3/yr). Thermoelectric water use accounted for 28,000 ac-ft/yr (34 million m^3/yr), with irrigation water use on the order of 17,000 ac-ft/yr (21 million m^3/yr) (Kenny et al. 2009).

The Virgin Valley Water District (2008) reports that groundwater withdrawals for residential use were 2,730 ac-ft (3.4 million m^3/yr) and a total groundwater pumpage of 7,460 ac-ft (9.2 million m^3/yr) in 2007 within the basin. In the Arizona portion of the basin, groundwater withdrawals were reportedly an average of 2,950 ac-ft/yr (3.6 million m^3/yr) between 2001 and 2005 (ADWR 2010). It is estimated that a total of 12,000 ac-ft/yr (15 million m^3/yr) are withdrawn from the basin as a whole (Virgin Valley Water District 2002).

All waters in Nevada are the property of the public in the State of Nevada and subject to the laws described in Nevada Revised Statutes, Chapters 532 through 538 (available at http://leg.state.nv.us/nrs). The NDWR, led by the State Engineer, is the agency responsible for managing both surface water and groundwater resources, which includes overseeing water right applications, appropriations, and interbasin transfers (NDWR 2010b). The two principle ideas behind water rights in Nevada are the prior appropriations doctrine and the concept of beneficial use. A water right establishes an appropriation amount and date such that more senior water rights have priority over newer water rights. In addition, water rights are treated as both real and personal property, such that water rights can be transferred without affecting the land ownership (NDWR 2010b). Water rights applications (new or transfer of existing) are approved if the water is available to be appropriated, if existing water rights will not be affected, and if the proposed use is not deemed to be harmful to the public interest. If these conditions are satisfied according to the State Engineer, proof of beneficial use of the approved water must be provided within a certain time period, and following that a certificate of appropriation is issued (BLM 2001).

The NDWR has the authority to designate preferred uses of groundwater in a basin, overriding the prior appropriation doctrine (BLM 2001). The NDWR generally does not grant water rights in a basin that is over-appropriated. However, in basins that may have alternative sources of water, groundwater rights can be temporarily granted in excess of the estimated recharge of the basin. For example, basins that may have access to Colorado River water in the future may be temporarily granted use of groundwater. Those permits may then be revoked at a later date when water becomes available from the Colorado River (BLM 2001). Interbasin transfers of water are possible within Nevada and are regulated by the NDWR (NDWR 2010b).

In 1980, Virgin River Valley was designated as a groundwater basin by the State Engineer, and no preferred uses were specified (NDWR 1980). In 2007, the State Engineer issued Order 1193 declaring the Virgin River closed to new appropriations of surface water (NDWR 2007). Currently, there are a total of 12,348 ac-ft/yr (15 million m^3/yr) of groundwater rights granted by the NDWR within the Virgin River Valley Hydrographic Area, the vast majority of which are for municipal use (NDWR 2010a). An additional 185,340 ac-ft/yr (228 million m^3/yr) of groundwater rights have been applied for within the basin and are under consideration by the NDWR, most of which have been requested by the Virgin Valley Water district (NDWR 2010c; Virgin Valley Water District 2010). The NDWR estimates the perennial yield for each groundwater basin as the amount of water that can be economically withdrawn for an indefinite period without depleting the source (NDWR 1999). The NDWR has set the perennial yield of the basin at 3,600 ac-ft/yr (4.4 million m^3/yr), based the estimated recharge in the Nevada portion of the basin in the study done by Glancy and VanDenburgh (1969) (NDWR 2010a).

11.5.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, and off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water–wetland–groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by the excessive withdrawal from aquifers).

11.5.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy developments, which are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. Land disturbance activities should be minimized in the vicinity of the incised ephemeral stream channels of the Toquop Wash, the South Fork Toquop Wash, and the incised tributaries to these washes. During large storm events, these channels have the potential to flood and cause sedimentation and erosion issues (note that these streams are suspected to be within the 100-year floodplain, which will have to be determined during the site characterization phase). The entire proposed SEZ is located on top of an alluvial fan containing numerous ephemeral drainages. Disturbances to these ephemeral drainages could cause erosion impacts and disrupt groundwater recharge. In addition, site design and land disturbance activities could potentially alter surface water drainage and sedimentation downstream of the proposed SEZ within the Toquop Wash, which is a tributary to the Virgin River. As such, studies would need to be completed to determine the occurrence of jurisdictional water bodies subject to Clean Water Act Section 404 permitting in areas of proposed development.

11.5.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed East Mormon Mountain SEZ include the following:

- On the basis of a total area of 8,968 acres (36.2 km^2), it is assumed that one solar project would be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;

- The maximum land disturbance for an individual solar facility during the peak construction year is 3,000 acres (12 km^2);

- Assumptions on individual facility size and land requirements (Appendix M) along with the assumed number of projects and maximum allowable land disturbance, results in the potential to disturb up to 33% of the SEZ total area during the peak construction year; and

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry cooling (see Section 5.9.2.1).

Site Characterization

During site characterization, water would be used mainly for controlling fugitive dust and the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible, since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for controlling fugitive dust and the workforce potable water supply. Because there are no significant surface water bodies on the proposed East Mormon Mountain SEZ, the water requirements for construction activities are assumed to be met by either trucking water to the sites or by using on-site groundwater resources.

Water requirements for dust suppression and potable water supply during construction are shown in Table 11.5.9.2-1 and could be as high as 1,492 ac-ft/yr (1.8 million m^3/yr) in the peak construction year. The assumptions underlying these estimates for each solar energy technology are described in Appendix M. Groundwater wells would have to yield an estimated 600 to 920 gpm (2,300 to 3,500 L/min) to meet the estimated construction water requirements. These yields are on the same order of magnitude as large municipal and agricultural production wells (Harter 2003), so multiple wells may be needed in order to obtain the water requirements. In addition, up to 74 ac-ft (91,000 m^3) of sanitary wastewater generated on-site would need to be either treated on-site or sent to an off-site facility. The availability of groundwater and groundwater rights and the impacts of groundwater withdrawal would need to be assessed during the site characterization phase of a solar development project. Obtaining water from an offsite source could be necessary for solar development projects.

Groundwater quality in the vicinity of the SEZ is known to have elevated concentrations of TDS and other constituents. If groundwater were to be used for potable supply during construction, it would need to be tested to verify the quality would comply with drinking water standards.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 11.5.9.2-2).

TABLE 11.5.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed East Mormon Mountain SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	965	1,447	1,447	1,447
Potable supply for workforce (ac-ft)	74	45	19	9
Total water use requirements (ac-ft)	1,039	1,492	1,466	1,457
Wastewater generated				
Sanitary wastewater (ac-ft)	74	45	19	9

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Table M.9-1 (Appendix M).

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 85 in./yr (216 cm/yr) (Cowherd et al. 1988; WRCC 2010b).

[c] To convert ac-ft to m^3, multiply by 1,234.

Water needs for cooling are a function of the type of cooling used (dry, hybrid, wet). Further refinements to water requirements for cooling would result from the percentage of time the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 11.5.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 40 to 717 ac-ft/yr (49,000 to 880,000 m^3/yr), and the workforce potable water supply is estimated to range from 0.9 to 20 ac-ft/yr (1,100 to 25,000 m^3/yr). The maximum total water usage during normal operation at full build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 21,543 ac-ft/yr (26 million m^3/yr). Water usage for dry-cooling systems would be as high as 2,172 ac-ft/yr (2.7 million m^3/yr), approximately a factor of 10 times less than the wet-cooling option. Non-cooled technologies, dish engine and PV systems, require substantially less water at full build-out capacity, at 408 ac-ft/yr (500,000 m^3/yr) for dish engine and 41 ac-ft/yr (95,000 m^3/yr) for PV (Table 11.5.9.2-2). Operations would produce up to 20 ac-ft/yr (50,000 m^3/yr) of sanitary wastewater; in addition, for wet-cooled technologies, 226 to 408 ac-ft/yr (280,000 to 500,000 m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed East Mormon Mountain SEZ. However, obtaining water from an offsite source could be necessary for solar development projects. At full build-out of the SEZ, parabolic trough technologies that use wet cooling would use 2 to 6 times the amount of water of the perennial yield set by the NDWR (2010a). In addition, there are over 185,000 ac-ft/yr (228 million m^3/yr) of water rights that have been applied for within the basin and would be considered by the NDWR first before any applications for new water rights or transfer of existing water rights would be considered. Based on the information presented here, wet cooling would not be feasible for full build-out of the East Mormon Mountain SEZ. To the extent possible, facilities using dry cooling should implement water conservation practices to limit water needs.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its pre-construction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and may also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because quantities of water needed during the decommissioning/reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

TABLE 11.5.9.2-2 Estimated Water Requirements during Operations at the Proposed East Mormon Mountain SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	1,435	797	797	797
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	717	399	399	40
Potable supply for workforce (ac-ft/yr)	20	9	9	0.9
Dry cooling (ac-ft/yr)[e]	287–1,435	159–797	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	6,457–20,806	3,587–11,559	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	408	41
Dry-cooled technologies (ac-ft/yr)	1,025–2,172	567–1,205	NA	NA
Wet-cooled technologies (ac-ft/yr)	7,195–21,543	3,995–11,966	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	408	226	NA	NA
Sanitary wastewater (ac-ft/yr)	20	9	9	0.9

[a] Land area for parabolic trough was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

[b] Water needs are linearly related to power. Water usage for any other size project can be estimated by using multipliers provided in Table M.9-2 (Appendix M).

[c] Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

[d] To convert ac-ft to m^3, multiply by 1,234.

[e] Dry-cooling value assumes 0.2 to 1.0 ac-ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac-ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009).

[f] NA = not applicable.

[g] Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

11.5.9.2.3 Off-Site Impacts: Roads and Transmission Lines

The proposed East Mormon Mountain SEZ is located approximately 11 mi (18 km) from I-15, and is adjacent to existing transmission lines as described in Section 11.5.1.2. Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. The extent of the impacts on water resources is proportional to the amount and location of land disturbance needed to connect the proposed SEZ to major roads and existing transmission lines. Water needed for road modification activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. As a result, water use impacts would be negligible. Impacts on surface water and groundwater quality resulting from spills would be minimized by implementing the mitigation measures described in Section 5.9.3 (e.g., cleaning up spills as soon as they occur). Ground-disturbing activities that have the potential to increase sediment and dissolved solid loads in downstream waters would be conducted following the mitigation measures outlined in Section 5.9.3 to minimize impacts associated with alterations to natural drainage pathways and hydrologic processes.

11.5.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy at the proposed East Mormon Mountain SEZ are related to land disturbance effects on the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation issues, as well as altering groundwater recharge and discharge processes. The ephemeral stream channels of Toquop Wash, South Fork Toquop Wash, and other ephemeral washes found within the SEZ are likely within the 100-year floodplain. Identifying the 100-year floodplain would be done during the site characterization phase, and areas of the proposed SEZ within the 100-year floodplain should be avoided during solar energy development. In addition, alteration of the surface water drainage pattern off the proposed SEZ could impair the Toquop Wash downstream of the SEZ through sedimentation and erosion, as well as changing the quality or quantity of inflows to the Virgin River from Toquop Wash.

Impacts related to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater is the primary water resource available to solar energy facilities in the proposed East Mormon Mountain SEZ. However, obtaining water from an offsite source could be necessary for solar development projects. The estimates of groundwater recharge, discharge, and underflow from adjacent basins suggest that there may not be available groundwater available to support water-intensive technologies, such as those using wet cooling. In addition, there are over 185,000 ac-ft/yr (228 million m^3/yr) of water rights that have been applied for within the basin and would be considered by the NDWR first before any applications for new water rights or transfer of existing water rights would be considered. Obtaining new water rights or transfer of existing water rights within the Virgin River Valley basin could present challenges for solar development. Based on the information presented here, wet cooling would not be feasible for full build-out of the East Mormon Mountain SEZ. To the extent possible, facilities using dry cooling should implement water conservation practices to limit water needs.

Groundwater quality in the vicinity of the SEZ is known to have elevated concentrations of TDS and other constituents. If groundwater were to be used for potable supply during construction, it would need to be tested to verify that the quality would comply with drinking water standards.

11.5.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, will mitigate some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Proposed design features specific to the East Mormon Mountain SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible, and other technologies should incorporate water conservation measures;

- Land-disturbance activities should minimize impacts on the ephemeral stream channels found within the SEZ, including but not limited to Toquop Wash and South Fork Toquop Wash, as well as alluvial fan features throughout the SEZ;

- Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters;

- Groundwater rights must be purchased and transferred through coordination with the NDWR and current water rights holders;

- Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection (NDEP 2010);

- Groundwater monitoring and production wells should be constructed in accordance with state standards (NDWR 2006); and

- Water for potable uses would have to meet or be treated to meet water quality standards in accordance with the *Nevada Administrative Code* (445A.453-445A.455).

11.5.10 Vegetation

This section addresses vegetation that could occur or is known to occur within t*he potentially affected ar*ea of the proposed East Mormon Mountain SEZ. The affected area considered in this assessment includes the areas of direct and indirect effects. The area of direct effects is defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and includes the SEZ and a 60-ft (18-m) wide portion of an assumed access road corridor. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed access road corridor, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects.

Indirect effects considered in the assessment include effects from surface runoff, dust, and accidental spills from the SEZ, but did not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

11.5.10.1 Affected Environment

The proposed East Mormon Mountain SEZ is located within the Creosotebush–Dominated Basins Level IV ecoregion (EPA 2007), which includes stream terraces, floodplains, alluvial fans, and eroded washes, as well as isolated hills, mesas, and buttes (Bryce et al. 2003). Plant communities are characterized by sparse creosotebush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), and big galleta grass (*Pleuraphis rigida*); cacti, yucca (*Yucca* sp.), ephedra (*Ephedra* sp.), and Indian ricegrass (*Achnatherum hymenoides*) are also common, although barren areas occur. Mesquite (*Prosopis* sp.) and acacia (*Acacia* sp.) are present, and blackbrush (*Coleogyne ramosissima*) is common in areas near the Arid Footslopes ecoregion. Riparian habitats include desert willow (*Chilopsis linearis*), coyote willow (*Salix exigua*), and mesquite (*Prosopis* sp.), with salt cedar (*Tamarix* sp.), a non-native shrub/tree invading riparian areas.

Areas surrounding the SEZ include the Creosotebush–Dominated Basins and Arid Footslopes ecoregions. This Level IV ecoregion supports a diverse but sparse mixture of Mojave desert forbs, succulents and shrubs, such as creosotebush, white bursage, *Yucca* species, including Joshua tree (*Yucca brevifolia*), winterfat (*Krascheninnikovia lanata*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedra nevadensis*), big galleta, Indian ricegrass, and annual fescue (*Vulpia myuros*) on alluvial fans, basalt flows, hills, and low mountains (Bryce et al. 2003). Cacti, such as silver cholla (*Cylindropuntia echinocarpa*) and beavertail (*Opuntia basilaris*), occur in rocky areas.

These ecoregions are located within the Mojave Basin and Range Level III ecoregion (see Appendix I). This ecoregion is characterized by broad basins and scattered mountains. Communities of sparse, scattered shrubs and grasses including creosotebush, white bursage, and big galleta grass occur in basins; Joshua tree, other *Yucca* species, and cacti occur on arid footslopes; and woodland and shrubland communities occur on mountain slopes, ridges, and hills (Bryce et al. 2003). Creosotebush, all-scale (*Atriplex polycarpa*), brittlebush (*Encelia farinosa*), desert holly (*Atriplex hymenelytra*), white burrobrush (*Hymenoclea salsola*), shadscale (*Atriplex confertifolia*), blackbrush, and Joshua tree are dominant species within the Mojave desertscrub biome (Turner 1994). Precipitation in the Mojave Desert occurs primarily in winter. Many ephemeral species (winter annuals) germinate in response to winter rains (Turner 1994). Annual plants are abundant with sufficient winter precipitation. Annual precipitation in the vicinity of the SEZ is low, averaging about 6.0 in. (16.3 cm) at Bunkerville, Nevada and 10.4 in. (26.4 cm) at Lytle Ranch, Utah (see Section 11.5.13).

Land cover types described and mapped under the SWReGAP (USGS 2005a) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed East Mormon Mountain SEZ are shown in Figure 11.5.10.1-1. The surface area of each cover type within the potentially affected area is listed in Table 11.5.10.1-1.

Sonora-Mojave Creosote-White Bursage Desert Scrub is the predominant cover type within the proposed East Mormon Mountain SEZ. Additional cover types within the SEZ are given in Table 11.5.10.1-1. During an August 2009 visit to the site, creosotebush and white bursage were the dominant species observed in the desert scrub communities present throughout much of the SEZ, with scattered Joshua tree (*Yucca brevifolia*). Cacti observed on the SEZ included cholla (*Cylindropuntia* sp.). Sensitive habitats on the SEZ include desert dry wash and playa habitats. The area has a history of livestock grazing, and the plant communities on the SEZ have likely been affected by grazing. Much of the SEZ was burned by wildfire in 2005, with very little subsequent shrub regeneration.

The area of indirect effects, including the area within 5 mi (8 km) around the SEZ, includes 11 cover types, which are listed in Table 11.5.10.1-1. The predominant cover type in the area of indirect effects is Sonora-Mojave Creosote-White Bursage Desert Scrub.

There are no wetlands mapped by the NWI within the SEZ or the area of indirect effects (USFWS 2009). NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009). Small areas identified as North American Warm Desert Playa occur in the eastern portion of the SEZ. Toquop Wash and a tributary, South Fork Toquop Wash, are ephemeral streams and major drainages on the SEZ. These drainages include small riparian areas of dense shrubs, primarily desert willow (BLM 2009f). Numerous desert dry washes occur within the SEZ and are tributaries to Toquop Wash and South Fork. The dry washes typically do not support wetland or riparian habitats, but many support shrub communities. The dry washes and playa typically contain water for short periods during or following precipitation events. Springs occur in the vicinity of the SEZ, including Tule Spring and Abe Spring, about 2.3 mi (3.7 km) north of the SEZ, which support wetland communities. Gourd Spring and Peach Spring are about 1 mi (1.6 km) west of the SEZ. The Virgin River, approximately 12 mi (19 km) south of the SEZ, supports extensive wetland and riparian communities.

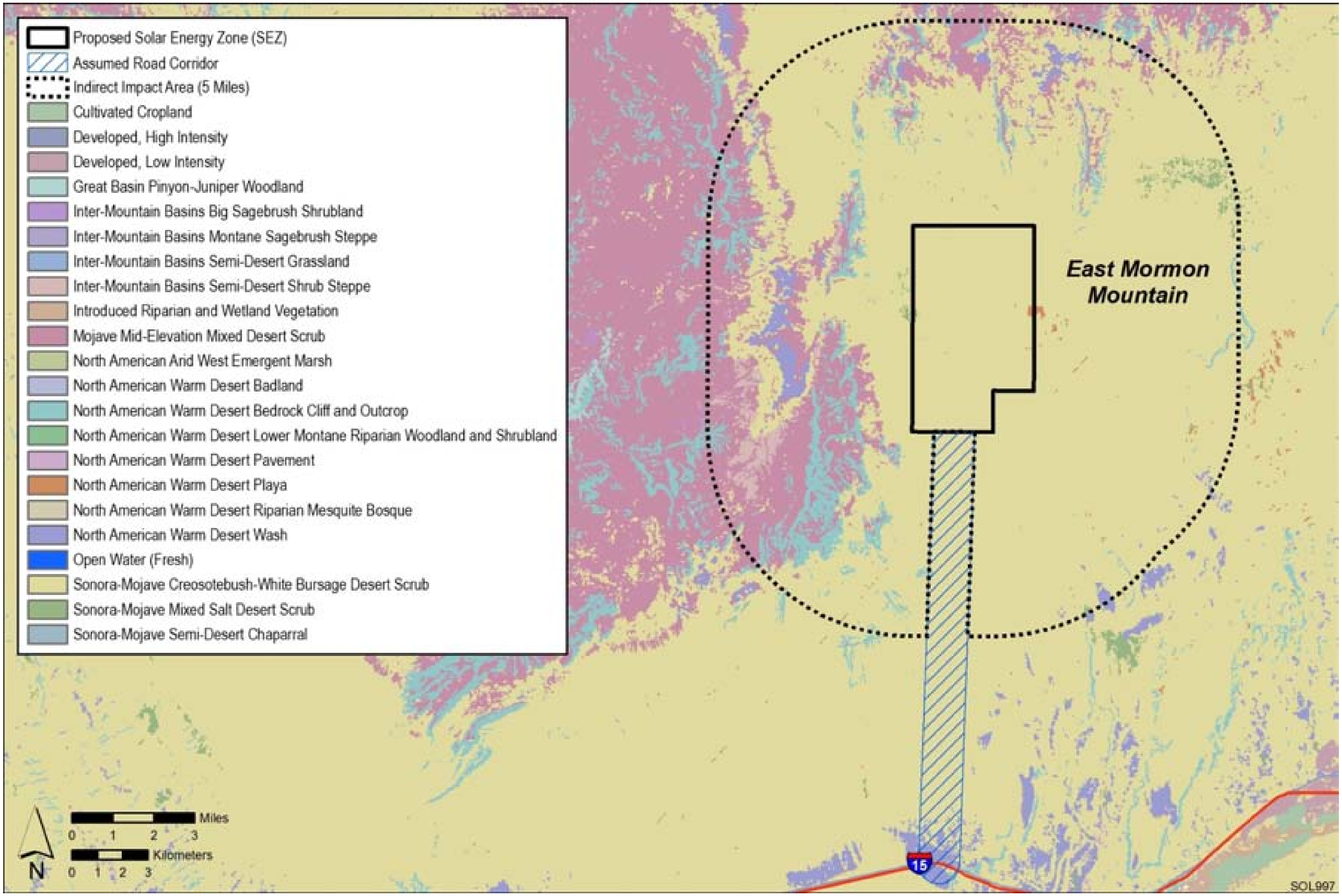

FIGURE 11.5.10.1-1 Land Cover Types within the Proposed East Mormon Mountain SEZ (Source: USGS 2004)

TABLE 11.5.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed East Mormon Mountain SEZ and Potential Impacts

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Sonora-Mojave Creosotebush-White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran Deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	8,913 acres[g] (0.5%, 0.6%)	71 acres (<0.1%)	80,168 acres (4.1%)	Small
North American Warm Desert Playa: Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant.	24 acres (0.6%, 1.1%)	0 acres	110 acres (2.7%)	Small
Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran Deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even co-dominant. Grasses occur at varying densities.	10 acres (0.1%, 0.1%)	0 acres	522 acres (2.7%)	Small
North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, and unstable scree and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	4 acres (<0.1%, <0.1%)	<1 acre (<0.1%)	5,304 acres (2.5%)	Small

TABLE 11.5.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	0 acres	5 acres (<0.1%)	2,121 acres (3.1%)	Small
Developed, Medium-High Intensity: Includes housing and commercial/industrial development. Impervious surfaces compose 50 to 100% of the total land cover.	0 acres	1 acre (<0.1%)	75 acres (1.3%)	Small
Invasive Southwest Riparian Woodland and Shrubland: Dominated by non-native riparian woody plant species.	0 acres	<1 acre (<0.1%)	4 acres (<0.1%)	Small
Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs and grasses and may include *Yucca* spp.	0 acres	0 acres	13,545 acres (1.4%)	Small
Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	0 acres	0 acres	1,672 acres (1.5%)	Small
Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	0 acres	0 acres	15 acres (<0.1%)	Small

TABLE 11.5.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
North American Warm Desert Lower Montane Riparian Woodland and Shrubland: Occurs along perennial and seasonally intermittent streams in mountain canyons and valleys. Consists of a mix of woodlands and shrublands.	0 acres	0 acres	10 acres (0.2%)	Small

[a] Land cover descriptions are from USGS (2005a). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from USGS (2004).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region.

[d] For access road development, direct effects were estimated within an 11-mi (18-km) long, 60-ft (18-m) wide road ROW from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of the cover type within the 1-mi (1.6-km) wide road corridor. Impacts are for the area of the cover type within the assumed ROW, and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed access road corridor, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects include effects from surface runoff, dust, and other factors from project developments. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the area of indirect effects and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[f] Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

[g] To convert acres to km^2, multiply by 0.004047.

The State of Nevada maintains an official list of weed species designated as noxious. Table 11.5.10.1-2 provides a summary of the noxious weed species regulated in Nevada known to occur in Lincoln County (USDA 2010; Creech et al. 2010) which includes the proposed East Mormon Mountain SEZ. Mediterranean grass (*Schismus barbatus*), an invasive species observed to occur within much of the SEZ in August 2009, is not included in this table. The BLM Ely District 2008 weed inventory documented Sahara mustard and salt cedar within the SEZ.

The Nevada Department of Agriculture classifies noxious weeds into one of three categories (NDA 2005):

- "Category A: Weeds not found or limited in distribution throughout the state; actively excluded from the state and actively eradicated wherever found; actively eradicated from nursery stock dealer premises; control required by the state in all infestations."

- "Category B: Weeds established in scattered populations in some counties of the state; actively excluded where possible, actively eradicated from nursery

TABLE 11.5.10.1-2 Designated Noxious Weeds of Nevada Occurring in Lincoln County

Common Name	Scientific Name	Category
Black henbane[a]	*Hyoscyamus niger*	A
Canada thistle[a]	*Cirsium arvense*	C
Dalmatian toadflax[a,b]	*Linaria dalmatica*	A
Diffuse knapweed[a]	*Centaurea diffusa*	B
Hoary cress[b]	*Cardaria draba*	C
Johnsongrass[a]	*Sorghum halepense*	C
Mayweed chamomile[b]	*Anthemis cotula*	A
Malta star thistle	*Centaurea melitensis*	A
Musk thistle[a]	*Carduus nutans*	B
Perennial pepperweed[a]	*Lepidium latifolium*	C
Perennial sowthistle[a]	*Sonchus arvensis*	A
Poison-hemlock[a]	*Conium maculatum*	C
Puncture vine[b]	*Tribulus terrestris*	C
Russian knapweed[a]	*Acroptilon repens*	B
Sahara/African mustard[a]	*Brassica tournefortii*	B
Saltcedar[b]	*Tamarix* spp.	C
Scotch thistle[a]	*Onopordium acanthium*	B
Spotted knapweed[a,b]	*Centaurea biebersteinii/maculosa*	A
Water hemlock[a]	*Cicuta maculata*	C

[a] Creech et al. (2010).

[b] USDA (2010).

Source: NDA (2005).

stock dealer premises; control required by the state in areas where populations are not well established or previously unknown to occur."

- "Category C: Weeds currently established and generally widespread in many counties of the state; actively eradicated from nursery stock dealer premises; abatement at the discretion of the state quarantine officer."

11.5.10.2 Impacts

The construction of solar energy facilities within the proposed East Mormon Mountain SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and -grading operations. Approximately 80% of the SEZ (7,174 acres [29 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (e.g., caused by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation within the SEZ are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and from any additional mitigation applied. Section 11.5.10.2.3, below, identifies design features of particular relevance to the proposed East Mormon Mountain SEZ.

11.5.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion ($\leq$1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ), moderate (>1 but $\leq$10%) if it could affect an intermediate proportion of a cover type, and large if it could affect greater than 10% of a cover type.

Solar facility construction and operation in the proposed East Mormon Mountain SEZ would primarily affect communities of the Sonora-Mojave Creosote-White Bursage Desert Scrub cover type. Additional cover types that would be affected within the SEZ include North American Warm Desert Playa, Sonora-Mojave Mixed Salt Desert Scrub, and North American

Warm Desert Bedrock Cliff and Outcrop. Additional cover types that would be affected only by the assumed access road include North American Warm Desert Wash, Developed, Medium-High Intensity, and Invasive Southwest Riparian Woodland and Shrubland. The Developed, Medium-High Intensity, and Invasive Southwest Riparian Woodland and Shrubland cover types would likely have relatively minor populations of native species. Table 11.5.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed East Mormon Mountain SEZ. While the Sonora-Mojave Creosote-White Bursage Desert Scrub and North American Warm Desert Bedrock Cliff and Outcrop cover types are relatively common in the SEZ region, Sonora-Mojave Mixed Salt Desert Scrub and North American Warm Desert Playa are relatively uncommon, representing 0.4% and 0.08% of the land area within the SEZ region, respectively. Desert dry washes, playas, and riparian habitats are important sensitive habitats. The construction, operation, and decommissioning of solar projects within the proposed East Mormon Mountain SEZ would result in small impacts on all cover types in the affected area. Because much of the SEZ and areas within the SEZ region have been impacted by wildfire, proportional impacts on some cover types may differ somewhat from that shown in Table 11.5.10.1-1, and in some cases may be greater.

Because of the arid conditions, re-establishment of desert scrub communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the vicinity, and likely occur on the SEZ. Damage to these crusts, by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect impact area identified in Table 11.5.10.1-1.

Communities associated with playa habitats, riparian habitats, or other intermittently flooded areas within or downgradient from solar projects or access roads could be affected by ground-disturbing activities. Surface drainage throughout the SEZ is directed toward Toquop Wash. Site-clearing and -grading could disrupt surface water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter riparian shrub communities along Toquop Wash, including occurrences outside of the SEZ, and affect community function. Playa habitats in the eastern portion of the SEZ could also be affected by ground disturbance. Small areas of riparian habitat occur within the access road corridor. Increases in surface runoff from a solar energy project site or access road could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect desert dry wash habitats within the SEZ or access road area of direct effects. Alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation. Wetland and riparian communities along the Virgin River, located downgradient of the SEZ, could be affected by sediment deposition or altered hydrology.

Although the use of groundwater within the East Mormon Mountain SEZ for technologies with high water requirements, such as wet-cooling systems, may be unlikely, groundwater withdrawals for such systems could reduce groundwater elevations. Communities that depend on accessible groundwater, such as wetland communities associated with springs, could become degraded or lost as a result of lowered groundwater levels. The potential for impacts on springs in the vicinity of the SEZ, such as Tule Spring, Abe Spring, Gourd Spring, or Peach Spring, would need to be evaluated by project-specific hydrological studies. Lowered groundwater levels in the basin could potentially affect wetland and riparian communities along the Virgin River.

11.5.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

On February 8, 1999, the President signed E.O. 13112, "Invasive Species," which directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Despite required design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed East Mormon Mountain SEZ, such that weeds could be transported into areas that were previously relatively weed-free, which could result in reduced restoration success and possible widespread habitat degradation. Invasive species, including Mediterranean grass, occur within the SEZ. Additional species designated as noxious weeds in Nevada and known to occur in Lincoln County are given in Table 11.5.10.1-2. Less than 1 acre (<0.004 km^2) of Invasive Southwest Riparian Woodland and Shrubland occurs within the area of direct effects of the assumed access road and approximately 4 acres (0.02 km^2) occurs in the area of indirect effects of the SEZ.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Existing roads, transmission lines, and recreational OHV use within the SEZ area of potential impact would also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species. Disturbed areas may contribute to the establishment of noxious weeds and invasive species. Approximately 1 acre (0.004 km^2) of Developed, Medium-High Intensity occurs within the area of direct effects of the assumed access road and 75 acres (0.3 km^2) occurs in the area of indirect effects.

11.5.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While the specific practices are best established when project details are considered, some SEZ-specific design features can be identified at this time, as follows.

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of desert scrub and other affected habitats, and minimize the potential for the spread of invasive species such as Mediterranean grass. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- All desert dry wash, playa, riparian, and Joshua tree communities within the SEZ and access road corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. Any Joshua trees, other yucca species, cacti, or succulent plant species in areas of direct impacts that cannot be avoided should be salvaged. A buffer area should be maintained around dry wash, playa, and riparian habitats to reduce the potential for impacts.

- Appropriate engineering controls should be used to minimize impacts on dry wash, playa, wetland, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetlands associated with springs, such as Tule Spring and Abe Spring. Potential impacts on springs should be determined through hydrological studies.

If these mitigations measures are implemented in addition to other programmatic design features, it is anticipated that a high potential for impacts from invasive species and potential impacts on Joshua tree communities, dry washes, playas, riparian habitats, wetlands, and springs would be reduced to a minimal potential for impact.

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11.5.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed East Mormon Mountain SEZ. Wildlife species known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from SWReGAP (USGS 2007) and the Nevada Natural Heritage Program (NDCNR 2002). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 60-ft (18-m) wide portion of an assumed 11-mi (18-km) long access road corridor. The maximum developed area within the SEZ would be 7,174 acres (29 km^2).

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within a 1.0-mi (1.6-km) access road corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills in the SEZ or road construction area). Potentially suitable habitat within the SEZ greater than the maximum of 7,174 acres (29.0 km^2) of direct effect was also included as part of the area of indirect effects. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. The area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The areas of direct and indirect effects are more thoroughly defined and the impact assessment approach is described in Appendix M.

The primary habitat type within the affected area is desert scrub, particularly Sonora-Mojave Creosotebush-White Bursage Desert Scrub (over 99.5% of the SEZ) (see Section 11.5.10). Potentially unique habitats in the affected area include cliff and rock outcrop, playa, wash, and riparian woodland and shrubland habitats. Toquop Wash and the South Fork Toquop Wash, temporary aquatic habitats, occur in the SEZ and in the area of indirect effects (see Figure 11.5.9.1-1).

11.5.11.1 Amphibians and Reptiles

11.5.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed East Mormon Mountain SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008), SWReGAP (USGS 2007), and NatureServe (2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). Appendix M provides additional information on the approach used.

Based on the distribution and habitat preferences of the amphibian species, the Great Plains toad (*Bufo cognatus*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). Both toad species would most likely occur in or near the wash habitats within the SEZ.

More than 25 reptile species occur within the area that encompasses the proposed East Mormon Mountain SEZ (USGS 2007; Stebbins 2003). The desert tortoise (*Gopherus agassizii*) is a federal- and state-listed threatened species. This species is discussed in Section 11.5.12. Lizard species expected to occur within the SEZ include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), side-blotched lizard (*Uta stansburiana*), western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*). Snake species expected to occur within the proposed SEZ are the coachwhip (*Masticophis flagellum*), common kingsnake (*Lampropeltis getula*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and nightsnake (*Hypsiglena torquata*). The Mojave rattlesnake (*Crotalus scutulatus*) and sidewinder (*Crotalus cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 11.5.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed East Mormon Mountain SEZ. Special status amphibian and reptile species are addressed in Section 11.5.12.

11.5.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.5.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed East Mormon Mountain SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area as presented in Section 11.5.11.1.1 and following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific

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TABLE 11.5.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur in the Affected Area of the Proposed East Mormon Mountain SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Amphibians					
Great Plains toad (*Bufo cognatus*)	Prairies and deserts. Often breeds in shallow temporary pools or quiet waters of streams, marshes, irrigation ditches, and flooded fields. About 3,064,000 acres[h] of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,656 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. Other than avoidance of playa and wash habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Red-spotted toad (*Bufo punctatus*)	Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos, desert streams and oases, open grassland, scrubland oaks, and dry woodlands. About 3,968,800 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,666 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. Other than avoidance of playa and wash habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards					
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. About 3,713,700 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	105,243 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Great Basin collared lizard (*Crotaphytus bicinctores*)	Usually inhabits alluvia, lava flows, mountain slopes, canyons, buttes, rock outcrops, washes, and rocky plains. Limiting factors are the presence of large boulders and open/sparse vegetation. About 3,490,100 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	105,084 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of rocky outcrop and wash habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 3,256,100 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	95,999 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Side-blotched lizard (*Uta stansburiana*)	Low to moderate elevations in washes, arroyos, boulder-strewn ravines, rocky cliff bases, and flat shrubby areas in canyon bottoms. Often along sandy washes. Usually in areas with a lot of bare ground. About 4,067,400 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	102,880 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of cliff and rock outcrop and wash habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Western fence lizard (*Sceloporus occidentalis*)	Disturbed areas, roadsides, gravel beds, rock quarries, lava flows, outcrops, talus slopes, shrublands, riparian areas, and coniferous woodlands. About 3,835,700 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	89,448 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrop habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Western whiptail (*Cnemidophorus tigris*)	Arid and semiarid habitats with sparse plant cover. About 4,271,400 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,255 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6.612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Zebra-tailed lizard (*Callisaurus draconoides*)	Open, warm-desert habitats, especially dry washes and canyons with fine gravel and sand. About 3,181,900 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	98,239 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Snakes					
Coachwhip (*Masticophis flagellum*)	Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 3,521,300 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	88,902 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Common kingsnake (*Lampropeltis getula*)	Coniferous forests, woodlands, swampland, coastal marshes, river bottoms, farmlands, prairies, chaparral, and deserts. Uses rock outcrops and rodent burrows for cover. About 4,623,400 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	105,228 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrops, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Glossy snake (*Arizona elegans*)	Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 2,475,300 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	85,715 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 4,446,600 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	98,339 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Groundsnake (*Sonora semiannulata*)	River bottoms, desert flats, sand hummocks, rocky hillsides with pockets of loose soil; from prairie and desert lowlands to pinyon-juniper and oak-pine zone; soil may be rocky to sandy, vegetation dense to sparse. About 4,162,900 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,149 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Mojave rattlesnake (*Crotalus scutulatus*)	Mostly upland desert and lower mountain slopes. Barren desert, grassland, open juniper woodland, and scrubland; especially common in areas of scattered scrubby growth such as creosote and mesquite. About 5,017,600 acres of potentially suitable habitat occurs within the SEZ region	7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	105,323 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Nightsnake (*Hypsiglena torquata*)	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, it seeks refuge underground, in crevices, or under rocks. About 3,390,400 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	88,887 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrops, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Sidewinder (*Crotalus cerastes*)	Windblown sand habitats near rodent burrows. Most common in areas of sand hummocks topped with creosote, mesquite, or other desert plants. About 2,884.400 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	95,462 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

a Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

b Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 7,174 acres (29 km^2) of direct effect within the SEZ was assumed.

c Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

d Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 7,174 acres (29 km^2) of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

e For access road development, direct effects were estimated within a 11-mi (18-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

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TABLE 11.5.11.1-1 (Cont.)

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[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: $\leq$1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but $\leq$10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigation measures are suggested here, but final mitigation measures should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 11.5.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on amphibians and reptiles summarized in Table 11.5.11.1-1, direct impacts on representative amphibian and reptile species would be expected to be small, ranging from 0.1 to 0.3%. For all amphibian and reptile species, up to 7,174 acres (29.0 km^2) of potentially suitable habitat would be lost within the SEZ; while, depending on the species, an additional 45 to 77 acres (0.2 to 0.3 km^2) of potentially suitable habitat could be lost by access road construction. Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 3.5% of available habitat for the glossy snake) (Table 11.5.11.1-1). Indirect impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.5.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., washes and playas). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features are best established when considering specific project details, one design feature can be identified at this time:

- Development in wash, playa, and rock outcrop habitats should be avoided.

If this SEZ-specific design feature is implemented in addition to the programmatic design features, impacts on amphibian and reptile species could be reduced. However, as potentially suitable habitats for all of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.5.11.2 Birds

11.5.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on the potentially affected area of the proposed East Mormon Mountain SEZ. The list of bird species potentially present in the SEZ area was determined from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008), SWReGAP (USGS 2007), and NatureServe (2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). Appendix M provides additional information on the approach used.

Fourteen bird species that could occur in the affected area of the SEZ are considered focal species in the *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), crissal thrasher (*Toxostoma crissale*), Gila woodpecker (*Melanerpes uropygialis*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), Lucy's warbler (*Vermivora luciae*), phainopepla (*Phainopepla nitens*), Scott's oriole (*Icterus parisorum*), and verdin (*Auriparus flaviceps*). Because of their special species status, the burrowing owl and phainopepla are discussed in Section 11.5.12.

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state solar study area. However, within the proposed East Mormon Mountain SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Playa and wash habitats within the SEZ may attract shorebird species, but Lake Mead, Muddy River, Virgin River, and larger named washes within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) is the shorebird species most likely to occur within the SEZ.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state solar energy study area. Species expected to occur within the proposed East Mormon Mountain SEZ include the ash-throated flycatcher, Bewick's wren (*Thryomanes bewickii*), black-tailed gnatcatcher, black-throated sparrow, Brewer's sparrow (*Spizella breweri*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker, Le Conte's thrasher, lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), northern mockingbird (*Mimus polyglottos*), rock wren (*Salpinctes obsoletus*), Say's phoebe (*Sayornis saya*), verdin, and western kingbird (*Tyrannus verticalis*) (CDFG 2008; NDCNR 2002; USGS 2007). Potentially suitable habitat for several of the desert focal bird species (crissal thrasher, Gila woodpecker, Lucy's warbler, phainopepla, and Scott's oriole) do not occur in the SEZ; but potentially suitable habitat for all of these species, except Scott's oriole, occurs within the assumed access road corridor.

Birds of Prey

Section 4.10.2.2.4 provided an overview of the birds of prey (raptors, owls, and vultures) within the six-state solar study area. Species that could occur within the proposed East Mormon Mountain SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), and turkey vulture (*Cathartes aura*) (CDFG 2008; NDCNR 2002; USGS 2007). Several special status birds of prey species are discussed in Section 11.5.12.

Upland Game Birds

Section 4.10.2.2.5 provided an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed East Mormon Mountain SEZ include the chukar (*Alectoris chukar*), Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), and white-winged dove (*Zenaida asiatica*). Potentially suitable habitat for the wild turkey (*Meleagris gallopavo*) occurs within the assumed access road corridor (CDFG 2008; NDCNR 2002; USGS 2007).

Table 11.5.11.2-1 provides habitat information for representative bird species that could occur within the proposed East Mormon Mountain SEZ. Special status bird species are discussed in Section 11.5.12.

11.5.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.5.11.2.3, below, identifies design features of particular relevance to the proposed East Mormon Mountain SEZ.

TABLE 11.5.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur in the Affected Area of the Proposed East Mormon Mountain SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Shorebirds					
Killdeer (*Charadrius vociferus*)	Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 73,000 acres[h] of potentially suitable habitat occurs within the SEZ region.	24 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	105 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	1 acre of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 87 acres in area of indirect effect	Small overall impact. Avoid playa and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Neotropical Migrants					
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats, including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 4,437,400 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	98,130 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Bewick's wren (*Thryomanes bewickii*)	Generally associated with dense, brushy habitats. It is a permanent resident of lowland deserts and pinyon-juniper forests. Breeding occurs in brushy areas of open woodlands and other open habitats. It is a cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 3,856,100 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	91,036 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-tailed gnatcatcher (*Polioptila melanura*)	Nests in bushes mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 2,029,200 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	84,032 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.004% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desertscrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 3,936,500 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	95,452 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Brewer's sparrow (*Spizella breweri*)	Prefers to nest in sagebrush, but also nests in other shrubs and cactus. During migration and winter, it occurs in low, arid vegetation, desert scrub, sagebrush, and creosotebush. About 3,390,800 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	95,467 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 3,741,100 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	89,882 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or man-made structures. Forages in sparse, open terrain. About 4,615,600 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,756 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 2,982,700 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	98,115 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,661,400 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	103,561 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 3,442,600 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,671 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Ladder-backed woodpecker (*Picoides scalaris*)	Variety of habitats, including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 4,148,600 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	98,115 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of riparian habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 3,003,300 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,573 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water, including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 3,749,600 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	103,427 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 4,679,600 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,806 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Northern mockingbird (*Mimus polyglottos*)	Parkland, cultivated lands, second-growth habitats, desert scrub, and riparian areas at low elevations. Forages on ground in short, grassy to nearly barren substrates. About 4,887,300 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	105,185 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Rock wren (*Salpinctes obsoletus*)	Arid and semiarid habitats. Breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices, and the nest entrance is paved with small rocks and stones. About 4,903,200 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	104,577 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 3,489,400 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	101,307 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Verdin (*Auriparus flaviceps*)	Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 2,965,800 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,583 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	
Neotropical Migrants (Cont.)					
Western kingbird (*Tyrannus verticalis*)	Occurs in a variety of habitats, including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. It migrates to Central America or the southeastern United States for the winter. About 3,700,000 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,224 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Birds of Prey					
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 2,729,100 acres of potentially suitable habitat occurs in the SEZ region.	14 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) during construction and operations	21,143 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	1 acre of potentially suitable habitat lost (<0.0001% of available potentially suitable habitat) and 87 acres in area of indirect effect	Small overall impact. Avoid bedrock cliff and outcrop habitat.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 2,783,000 acres of potentially suitable habitat occurs in the SEZ region.	38 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) during construction and operations	23,298 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	6 acres of potentially suitable habitat lost (0.0002% of available potentially suitable habitat) and 522 acres in area of indirect effect	Small overall impact. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Great horned owl (*Bubo virginianus*)	Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 4,808,500 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	100,015 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-eared owl (*Asio otus*)	Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush-bursage flats, desert scrub, grasslands, and agricultural fields). About 4,478,400 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,153 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 4,105,300 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	101,306 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Upland Game Birds					
Chukar (*Alectoris chukar*)	Steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds found within 0.25 mi (0.4 km) of water during the brooding period. About 4,549.100 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,681 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 3,895,300 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	105,113 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Upland Game Birds (Cont.)					
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,603,900 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	100,015 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
White-winged dove (*Zenaida asiatica*)	Nests in low to medium height trees with dense foliage and fairly open ground cover. Feeds on wild seeds, grains, and fruit. About 2,985,500 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	98,109 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 7,174 acres of direct effect within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

Footnotes on next page.

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TABLE 11.5.11.2-1 (Cont.)

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 7,174 acres (29 km^2) of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

[e] For access road development, direct effects were estimated within a 11-mi (18-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigation measures are suggested here, but final mitigation measures should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 11.5.11.2.1 and following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 11.5.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), and from disturbance, injury, or mortality to individual birds. Table 11.5.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed East Mormon Mountain SEZ. Direct impacts on representative bird species would be small, ranging from <0.001 to 0.4%. For most of the representative bird species, up to 7,174 acres (29.0 km^2) of potentially suitable habitat would be lost within the SEZ, while, depending on the species, an additional 0.0 to 77 acres (0.0 to 0.3 km^2) of potentially suitable habitat could be lost by access road construction (Table 11.5.11.2-1). No direct impacts would occur to the crissal thrasher, Gila woodpecker, Lucy's warbler, or wild turkey from solar energy development in the SEZ. However, access road construction could result in the loss of up to 1 acre (0.004 km^2) of potential habitat for the Gila woodpecker and up to 5 acres (0.02 km^2) of potential habitat for the other three species.

Larger areas of potentially suitable habitats for the bird species occur within the area of potential indirect effects (e.g., up to 4.1% of available habitat for the black-tailed gnatcatcher) (Table 11.5.11.2-1). Indirect impacts on birds could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.5.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2 would reduce the potential for effects on birds, especially for those species that depend on habitat types that can be avoided (e.g., wash and playa habitats). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important in reducing impacts on birds are best established when project details are considered, some design features can be identified at this time:

- The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed.

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act.

- Playa, wash, and rock outcrop habitats should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on bird species could be reduced. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.5.11.3 Mammals

11.5.11.3.1 Affected Environment

This section addresses representative mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed East Mormon Mountain SEZ. The list of mammal species potentially present in the SEZ area was determined from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008), SWReGAP (USGS 2007), and NatureServe (2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). Appendix M provides additional information on the approach used.

Over 55 species of mammals have ranges that encompass the area of the proposed SEZ (NDCNR 2002; USGS 2007); however, suitable habitats for a number of these species are limited or nonexistent within the SEZ (USGS 2007). Similar to the overview of mammals provided for the six-state solar energy study area (Section 4.10.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share similar habitats.

Big Game

The big game species that occur within Lincoln County include cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), Nelson's bighorn sheep (*Ovis* *canadensis nelsoni*), and pronghorn (*Antilocapra americana*) (CDFG 2008; NDCNR 2002; USGS 2007). Because of its special species status, the Nelson's bighorn sheep is addressed in Section 11.5.12. Based on land cover, potentially suitable habitat for the cougar and mule deer occurs within the proposed East Mormon Mountain SEZ, whereas no potentially suitable habitat for elk or pronghorn occurs within the SEZ. Only 15 acres (0.6 km^2) of potentially suitable habitat for elk and 1,687 acres (6.8 km^2) of potentially suitable habitat for pronghorn occurs within the area of indirect effect. Figure 11.5.11.3-1 shows the location of the SEZ relative to the mapped range of mule deer habitat.

Other Mammals

A number of furbearers and small game mammal species occur within the area of the proposed East Mormon Mountain SEZ. Species that could occur within the area of the SEZ include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and red fox (*Vulpes vulpes*) (CDFG 2008; NDCNR 2002; USGS 2007).

The nongame (small) mammals include bats, rodents, and shrews. Representative species for which potentially suitable habitat occurs within the proposed East Mormon Mountain SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), canyon mouse (*P. crinitis*), deer mouse (*P. maniculatus*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), Merriam's pocket mouse (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), southern grasshopper mouse (*O. torridus*), western harvest mouse (*Reithrodontomys megalotis*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (CDFG 2008; NDCNR 2002; USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), long-legged myotis (*M. volans*), silver-haired bat (*Lasionycteris noctivagans*), and western pipistrelle (*Parastrellus hesperus*) (CDFG 2008; NDCNR 2002; USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ. Several other special status bat species that could occur within the SEZ area are addressed in Section 11.5.12.

Table 11.5.11.3-1 provides habitat information for representative mammal species that could occur within the proposed SEZ. Special status mammal species are discussed in Section 11.5.12.

11.5.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied.

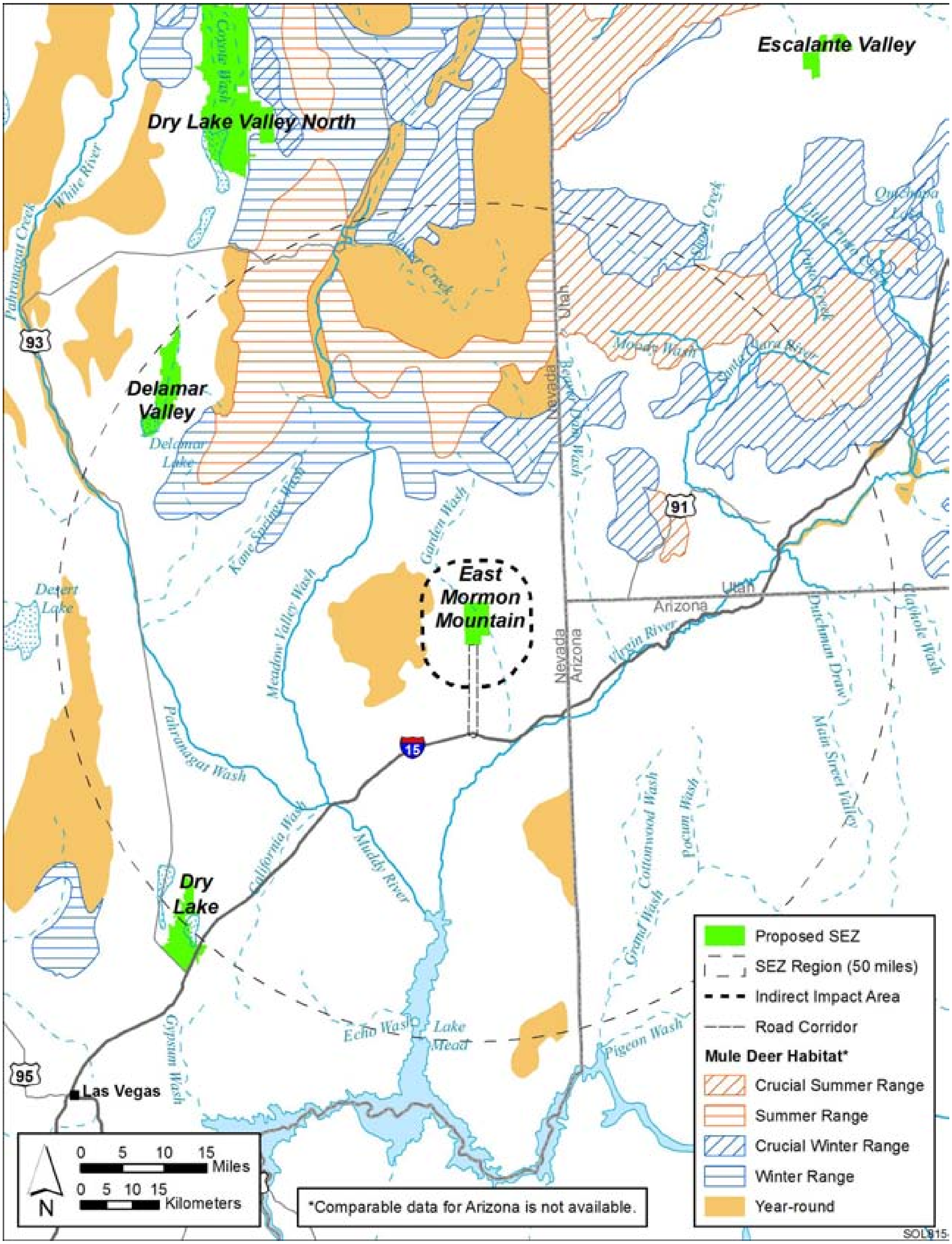

FIGURE 11.5.11.3-1 Location of the Proposed East Mormon Mountain SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)

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TABLE 11.5.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur in the Affected Area of the Proposed East Mormon Mountain SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Big Game					
Cougar (*Puma concolor*)	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,801,300 acres[h] of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	102,989 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Mule deer (*Odocoileus hemionus*)	Most habitats, including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provides abundant browse and cover. About 3,823,300 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,408 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers					
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 4,394,900 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,149 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,861,000 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	104,567 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Bobcat (*Lynx rufus*)	Most habitats except subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 4,563,500 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,270 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Coyote (*Canis latrans*)	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 4,985,600 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	105,323 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 3,687,700 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	85,715 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Gray fox (*Urocyon cinereoargenteus*)	Deserts, open forests, and brush. Prefers wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 3,547,800 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	91,141 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Kit fox (*Vulpes macrotis*)	Desert and semidesert areas with relatively open vegetative cover and soft soils. Seeks shelter in underground burrows. About 3,701,200 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,926 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Red fox (*Vulpes vulpes*)	Most common in open woodlands, pasturelands, riparian areas, and agricultural lands. About 3,414,600 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	83,604 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals					
Big brown bat (*Eptesicus fuscus*)	Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 3,523,900 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	88,962 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	72 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,264 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrops, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Botta's pocket gopher (*Thomomys bottae*)	Variety of habitats, including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 2,628,600 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	85,715 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6.612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 3,787,200 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	91,108 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrops, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Cactus mouse (*Peromyscus eremicus*)	Variety of areas, including desert scrub, semidesert chaparral, desert wash, semidesert grassland, and cliff and canyon habitats. About 4,001,600 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,791 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of wash and rock outcrop habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
California myotis (*Myotis californicus*)	Desertscrub, semidesert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 2,934,600 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	91,032 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrop habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Canyon mouse (*Peromyscus crinitus*)	Associated with rocky substrates in a variety of habitats, including desert scrub, sagebrush shrublands, woodlands, cliffs and canyons, and volcanic rock and cinder lands. Source of free water not required. About 3,417,200 acres of potentially suitable habitat occurs in the SEZ region.	977 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	96,009 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. Avoid rock outcrop habitat.

TABLE 11.5.11.3-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Deer mouse (*Peromyscus maniculatus*)	Tundra; alpine and subalpine grasslands; plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran desert scrub habitats. About 4,713,100 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	102,457 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Desert shrew (*Notiosorex crawfordi*)	Usually in arid areas with adequate cover such as semiarid grasslands, shortgrass plains, desert scrub, chaparral slopes, shortgrass plains, oak savannas and woodlands, and alluvial fans. About 3,527,700 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	105,098 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,851,400 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	105,109 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Hoary bat (*Lasiurus cinereus*)	Chaparral, shortgrass plains, scrub-grassland, desertscrub, forests and woodlands. Usually roosts in trees, also in caves, rock crevices, and houses. About 3,401,900 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	88,976 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	72 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,264 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Little pocket mouse (*Perognathus longimembris*)	Mostly sandy and gravelly soils, but also stony soils and rarely rocky sites. About 3,376,900 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,792 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-legged myotis (*Myotis volans*)	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees are used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 3,564,900 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	88,897 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Merriam's kangaroo rat (*Dipodomys merriami*)	Plains grasslands, scrub-grasslands, desertscrub, shortgrass plains, oak and juniper savannahs, mesquite dunes, and creosote flats. About 3,637,500 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,792 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Northern grasshopper mouse (*Onychomys leucogaster*)	Grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 4,472,300 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	97,149 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Silver-haired bat (*Lasionycteris noctivagans*)	Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savannah, and desertscrub habitats. Roosts under bark, and in hollow trees, caves and mines. Forages over clearings and open water. About 3,756,200 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	88,987 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	72 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,264 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Southern grasshopper mouse (*Onychomys torridus*)	Low, arid, shrub and semiscrub vegetation of deserts. About 3,170,400 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,791 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Western harvest mouse (*Reithrodontomys megalotis*)	Various habitats, including scrub-grasslands, temperate swamps and riparian forests, salt marshes, shortgrass plains, oak savannah, dry fields, agricultural areas, deserts, and desertscrub. Grasses are the preferred cover. About 2,525,700 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	76,480 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	27 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,364 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes in mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 2,789,500 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	88.977 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	72 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,264 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 11.5.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Direct and Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends its nights and other periods of inactivity in underground burrows. About 3,618,600 acres of potentially suitable habitat occurs within the SEZ region.	7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	104,552 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Yuma myotis (*Myotis yumanensis*)	Riparian areas, grasslands, semidesert shrubland, mountain brush, woodlands, and deserts. It occurs where there is open water, regardless of the habitat. Roosts in caves, mines, cliffs, crevices, buildings, and swallow nests. About 2,772,300 acres of potentially suitable habitat occurs in the SEZ region.	7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	89,050 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	71 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,177 acres in area of indirect effect	Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 7,174 acres (29 km^2) of direct effect within the SEZ was assumed.

1 **Footnotes continued on next page.**

TABLE 11.5.11.3-1 (Cont.)

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 7,174 acres (29 km^2) of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] For access road development, direct effects were estimated within a 11-mi (18-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigation measures are suggested here, but final mitigation measures should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

Section 11.5.11.3.3, below, identifies design features of particular relevance to mammals for the proposed East Mormon Mountain SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 11.5.11.3.1 and following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 11.5.11.3.3). Table 11.5.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed East Mormon Mountain SEZ.

Cougar

Up to 7,245 acres (29.3 km^2) of potentially suitable cougar habitat could be lost through solar energy and access road development at the proposed East Mormon Mountain SEZ. This represents about 0.1% of potentially suitable cougar habitat within the SEZ region. Nearly 103,000 acres (417 km^2) of potentially suitable cougar habitat occurs within the area of indirect effect for the SEZ and access road. This is about 2.1% of potentially suitable cougar habitat within the SEZ region. Overall, impacts on cougar from solar energy development in the SEZ would be small.

Mule Deer

Based on land cover analyses, up to 7,250 acres (29.3 km^2) of potentially suitable mule deer habitat could be lost through solar energy and access road development at the proposed East Mormon Mountain SEZ. This acreage represents about 0.2% of potentially suitable mule deer habitat within the SEZ region. About 99,400 acres (402 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effect for the SEZ and access road. This acreage is about 2.6% of potentially suitable mule deer habitat within the SEZ region. Based on mapped range, the closest year-round mule deer habitat is about 3.5 mi (5.6 km) from the SEZ (Figure 11.5.11.3-1). About 3,170 acres (12.8 km^2) of year-round mule deer habitat occurs within the area of indirect effect. This is about 0.6% of the year-round mule deer habitat within the SEZ region. The closest summer range, winter range, and crucial winter range are about 17 mi (27 km), 13 mi (21 km), and 15 mi (24 km), respectively from the SEZ (Figure 11.5.11.3-1). Thus, no direct or indirect effect to these mule deer ranges would be expected. Overall, impacts on mule deer from solar energy development in the SEZ would be small.

Other Mammals

Direct impacts on other representative mammal species would be small, ranging from 0.1 to 0.3%. For most of the species, up to 7,174 acres (29 km^2) of potentially suitable habitat would be lost within the SEZ; while, depending on the species, an additional 27 to 77 acres (0.1 to 0.3 km^2) of potentially suitable habitat could be lost by access road construction (Table 11.5.11.3-1). Larger areas of potentially suitable habitats for the furbearers, small game, and nongame mammal species occur within the area of potential indirect effects (e.g., up to 3.2% of available habitat for the western pipistrelle and Yuma myotis) (Table 11.5.11.3-1). Indirect impacts on mammals could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Summary

Overall, impacts on mammal species would be small (Table 11.5.11.3-1). In addition to habitat loss, other direct impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences). Indirect impacts on mammals could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.5.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important for reducing impacts on mammals are best established when considering specific project details, design features that can be identified at this time include the following:

- The fencing around the solar energy development should not block the free movement of mammals, particularly big game species.

- Playa, wash, and rock outcrop habitats should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on mammals could be reduced. However, potentially suitable habitats for most of the representative mammal species occur throughout most of the SEZ; therefore, species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.5.11.4 Aquatic Biota

11.5.11.4.1 Affected Environment

This section addresses aquatic habitats and biota on the proposed East Mormon Mountain SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ and the presumed new access road. There are no permanent streams or water bodies within the proposed East Mormon Mountain SEZ. About 5 mi (8 km) of Toquop Wash, an intermittent stream, is located within the SEZ. Several large, unnamed ephemeral washes also are present in the SEZ. Streams and washes in the SEZ typically contain water only after substantial rainfall, at which time they carry water across the SEZ to the southeast and eventually drain into the Virgin River (Beck and Wilson 2006). Although intermittent or ephemeral, channel incision indicates that the washes within the SEZ can carry substantial flow during large runoff events. Ephemeral or intermittent streams may contain a diverse seasonal community of invertebrates that are potentially present in a dormant state, even in dry periods (Levick et al. 2008). However, more site-specific data are needed to fully evaluate aquatic biota present in the proposed East Mormon Mountain SEZ. NWI mapping (USFWS 2009) does not indicate any wetlands are present within the SEZ. The assumed access road corridor does not intersect any intermittent or permanent surface water features within the SEZ.

Ten miles (16 km) of intermittent washes are located within the area of indirect effects. Several unnamed ephemeral washes are present as well. The washes are typically dry and are not expected to contain permanent aquatic habitat or communities. The assumed access road corridor intersects ephemeral, but not permanent, surface water features within the area of indirect effects. NWI mapping (USFWS 2009) does not indicate any wetlands are present within the area of indirect effects. However, springs occur in the vicinity of the SEZ, including Tule Spring and Abe Spring, about 2.3 mi (3.7 km) north of the SEZ, and Gourd Spring and Peach Spring, which are about 1 mi (1.6 km) west of the SEZ. These springs may support aquatic habitat and communities, but site specific survey data is needed to characterize the extent to which aquatic habitat and biota are present.

Outside of the area of indirect effects, but within 50 mi (80 km) of the proposed East Mormon Mountain SEZ, are 7,372 acres (30 km^2) of dry lakes and 19,963 acres (81 km^2) of perennial lakes. In addition, there are 319 mi (513 km) of perennial streams and 402 mi (647 km) of intermittent streams. The nearest perennial surface water feature is the Virgin River, about 10 mi (16 km) from the southern border of the SEZ. Intermittent streams are the primary surface water feature present in the area of direct and indirect effects and account for about 4% of the total amount of intermittent stream present in the SEZ region.

11.5.11.4.2 Impacts

Because surface water habitats are a unique feature in the arid landscape in the vicinity of the proposed East Mormon Mountain SEZ, the maintenance and protection of such habitats is important to the survival of aquatic and terrestrial organisms. The types of impacts that aquatic habitats and biota could incur from the development of utility-scale solar energy facilities are described in detail in Section 5.10.3. Aquatic habitats present on or near the locations selected for construction of solar energy facilities could be affected in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality.

The intermittent Toquop Wash and several unnamed ephemeral washes are present in the proposed East Mormon Mountain SEZ and the area of indirect effects, and these features may be directly affected by ground disturbance (SEZ only) and sedimentation from runoff and fugitive dust. However, washes in the SEZ are typically dry, and impacts on aquatic habitat and communities are not likely to occur. The streams present in the SEZ and area of indirect effects flow into the Virgin River. Therefore, the potential exists for sediments deposited in the washes to affect aquatic habitat and communities downstream. However, the distance from the SEZ to the Virgin River (more than 12 mi [19 km]) reduces the chance for sediment to reach the aquatic habitat. Aquatic habitat and biota potentially found in springs present within the area of indirect effects could be affected by fugitive dust associated with solar energy development within the SEZ. However, more site-specific data on these springs is needed to assess the potential for impacts. The implementation of commonly used engineering practices to control the entry of soils and fugitive dust into surface waters such as site watering, building settling basins and silt fences, or directing water draining from the developed areas away from streams, would help minimize the potential for impacts on aquatic organisms.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower facilities, were developed at the site. The associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). No permanent surface waters occur in the proposed East Mormon Mountain SEZ. However, springs are present in the area of indirect effects. Obtaining cooling water from perennial surface water features or from groundwater could potentially reduce habitat size and create more adverse environmental conditions for aquatic organisms in the springs located in the area of indirect effects as well as surface water outside of the area of indirect effects. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

As identified in Section 5.9, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning of a solar energy facility. The potential exists for contaminants to enter intermittent washes within the SEZ, especially if heavy machinery is used in or near these surface water features. The intermittent streams within the SEZ region are typically dry, and are not likely to support aquatic habitat or communities. However, they do drain into the perennial Virgin River; therefore, there is the potential for contaminants entering washes within the SEZ to impact aquatic habitat and biota in the river. However, the distance from the SEZ to the Virgin River (more than 12 mi [19 km]) and the infrequency of flooding reduces the chance for contaminants to reach the aquatic habitat. The introduction of contaminants can be minimized by avoiding construction near washes within the SEZ.

11.5.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, could greatly reduce or eliminate the potential for effects on aquatic biota and aquatic habitats from development and operation of solar energy facilities. While some SEZ-specific design features are best established when specific project details are being considered, design features that can be identified at this time include the following:

- Ground disturbance and contaminant spills near Toquop Wash and the other unnamed washes within the SEZ should be minimized;

- Appropriate engineering controls should be implemented to minimize the amount of surface water runoff and fugitive dust reaching springs, Toquop Wash and unnamed washes in the SEZ and in the area of indirect effects; and

- The impact of groundwater withdrawals on surface water features near the SEZ (such as Tule Spring, Abe Spring, Gourd Spring and Peach Spring) should be eliminated or minimized.

If these SEZ-specific design features are implemented in addition to programmatic design features and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the proposed East Mormon Mountain SEZ would be negligible.

11.5.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, within the potentially affected area of the proposed East Mormon Mountain SEZ. Special status species include the following types of species[3]:

- Species listed as threatened or endangered under the ESA;
- Species that are proposed for listing, under review, or are candidates for listing under the ESA;
- Species that are listed by the BLM as sensitive;
- Species that are listed by the State of Nevada[4]; and
- Species that have been ranked by the State of Nevada as S1 or S2, or species of concern by the State of Nevada or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the center of the proposed East Mormon Mountain SEZ (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the NDOW NNHP (Miskow 2009; NDCNR 2004, 2009a,b, 2010), SWReGAP (USGS 2004, 2005a, 2007), and the USFWS ECOS (USFWS 2010a). Information reviewed consisted of county-level occurrences as determined from Nature Serve, element occurrences provided by the NNHP, as well as modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from SWReGAP. The 50-mi (80-km) SEZ region intersects Clark and Lincoln Counties, Nevada; Mohave County, Arizona; and Iron and Washington Counties, Utah. However, the entire SEZ is located in Lincoln County, Nevada. Appendix M contains additional information on the approach used to identify species that could be affected by development within the SEZ.

11.5.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the proposed East Mormon Mountain SEZ, the area of direct effect included the SEZ and the portion of the road corridor where ground-disturbing activities are assumed to occur. Due to the

[3] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008e). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[4] State-listed species for the state of Nevada are those protected under NRS 501.110 (animals) or NRS 527 (plants).

proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades (see Section 11.5.1.2 for development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and the portion of the access road corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ and road construction area, but did not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary land cover habitat type within the affected area is Sonora-Mojave creosote desert scrub (see Section 11.5.10). Potentially unique habitats in the affected area in which special status species may reside include rocky cliffs and outcrops, desert washes, playas, and riparian habitats. No permanent or perennial surface water features occur on the SEZ or within the area of indirect effects. However, various intermittent streams (washes) and playas are present on the SEZ and throughout the area of indirect effects. In particular, Toquop Wash flows northwest to southeast across the SEZ. Unnamed tributary washes to the Toquop Wash also occur on the SEZ. The nearest permanent or perennial surface water feature is the Virgin River, about 12 mi (19 km) south of the SEZ (Figure 11.5.12.1-1).

All special status species that are known to occur within the proposed East Mormon Mountain SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed (along with their status, nearest recorded occurrence, and habitats) in Appendix J. Thirty-two of these species could be affected by solar energy development on the SEZ on the basis of recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 11.5.12.1-1. The predicted potential occurrence of many of these species in the affected area is based only on a general correspondence between mapped SWReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of special status species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 km) from the SEZ.

NNHP records indicate that three special status species known to occur within the affected area of the proposed East Mormon Mountain SEZ: Las Vegas buckwheat, desert tortoise, and Nelson’s bighorn sheep (Table 11.5.12.1-1). There are no groundwater-dependent species in the vicinity of the SEZ based upon NNHP records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the East Mormon Mountain SEZ region (Section 11.5.9).

11.5.12.1.1 Species Listed under the Endangered Species Act That Could Occur in the Affected Area

In scoping comments on the proposed East Mormon Mountain SEZ, the USFWS expressed concern for impacts of project development within the SEZ on the Mojave population of the desert tortoise—a species listed as threatened under the ESA in the SEZ region (Stout 2009). This species is likely to occur in the affected area of the proposed East Mormon Mountain SEZ. Based upon information from the NNHP and the availability of potentially suitable habitat, no other species listed under the ESA are expected to occur in the affected area of the proposed East Mormon Mountain SEZ. Information on habitats for the desert tortoise and occurrences in relation to the SEZ is presented in Table 11.5.12.1-1; additional basic information on life history, habitat needs, and threats to populations of this species is provided in Appendix J.

The Mojave population of the desert tortoise is known to occur in the SEZ region in desert shrubland habitats. The nearest recorded occurrence of this species is about 2 mi (3 km) south of the SEZ. Designated critical habitat for the desert tortoise occurs within the affected area adjacent to the eastern and southern boundaries of the SEZ in the Beaver Dam Slope and Mormon Mesa critical habitat units, respectively (Figure 11.5.12.1-1).

Desert tortoise surveys in the Mormon Mesa and Beaver Dam Slope critical habitat units conducted by the USFWS have indicated a desert tortoise density of about 3.7 and 1.3 individuals/km^2, respectively (Stout 2009). The USFWS assumed that because the proposed East Mormon Mountain SEZ is not separated by elevated areas from the Beaver Dam Slope strata, there would be more connectivity to this critical habitat unit than to the Mormon Mesa unit. Based on the density estimate for the Beaver Dam Slope critical habitat unit (1.3 individuals/km^2), about 47 desert tortoises have the potential to occur on the SEZ.

According to the SWReGAP habitat suitability model, about 87,800 acres (355 km^2) of potentially suitable habitat for this species occurs in the affected area of the proposed East Mormon Mountain SEZ. The USGS desert tortoise model (Nussear et al. 2009) identifies the SEZ as having overall high habitat suitability for desert tortoise (suitability score greater than or equal to 0.8 out of 1.0). According to the SWReGAP habitat suitability model, about 2,171,300 acres (8,787 km^2) of potentially suitable habitat for this species occurs in the SEZ region (Table 11.5.12.1-1).

11.5.12.1.2 Species That Are Candidates for Listing under the ESA

In scoping comments on the proposed East Mormon Mountain SEZ, the USFWS identified one ESA candidate species that may occur within the affected area of the SEZ—the Las Vegas buckwheat (Stout 2009). This species is endemic to southern Nevada in the vicinity of Las Vegas. It inhabits areas of gypsum soils in washes, drainages, or in areas of low relief at elevations between 1,900 and 3,850 ft (580 and 1,175 m). The nearest recorded occurrence of this species is about 1 mi (1.6 km) east of the SEZ (Figure 11.5.12.1-1; Table 11.5.12.1-1). Additional basic information on life history, habitat needs, and threats to populations of this species is provided in Appendix J.

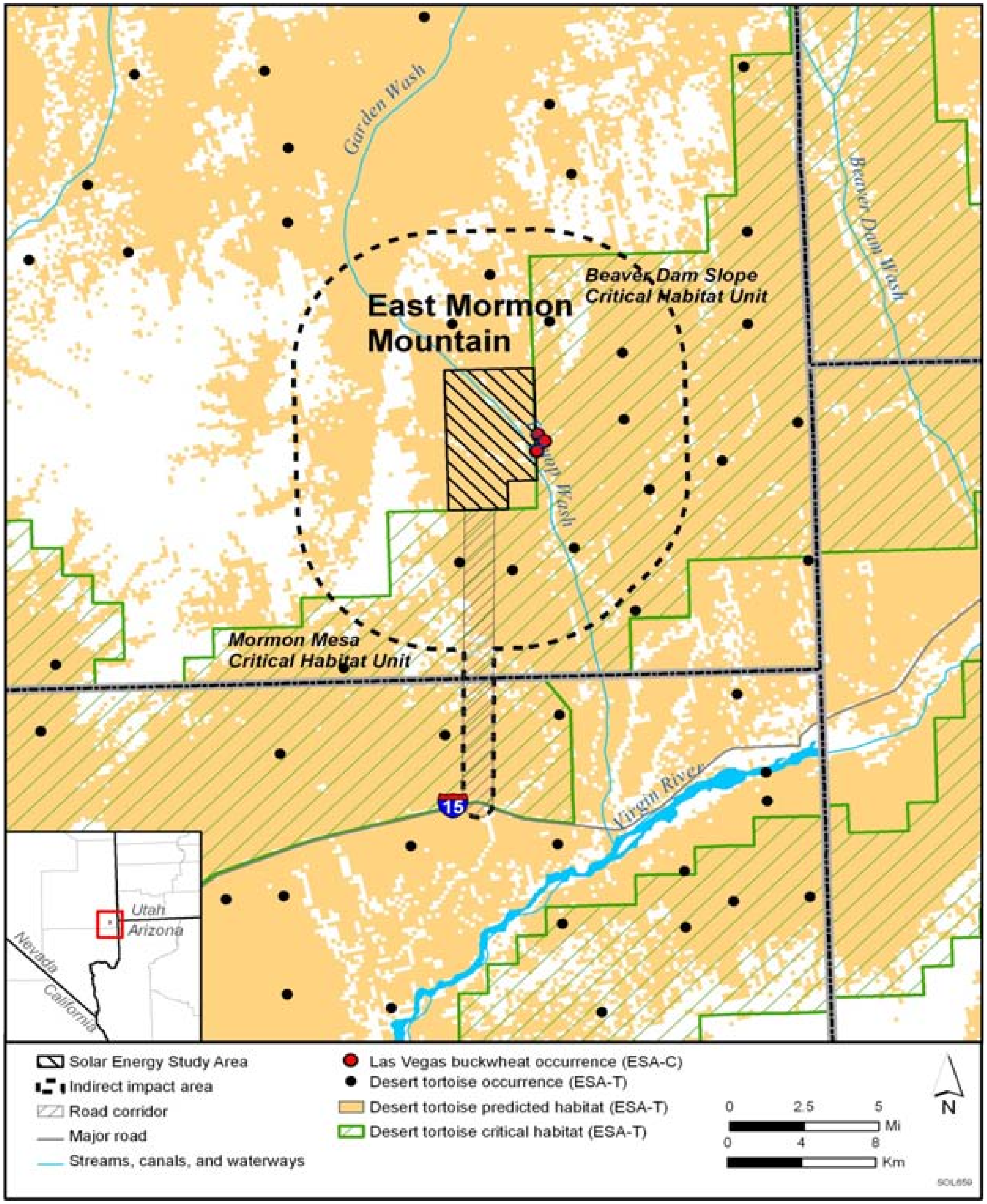

FIGURE 11.5.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA, Candidates for Listing under the ESA, or Species under Review for ESA Listing in the Affected Area of the Proposed East Mormon Mountain SEZ (Sources: Miskow 2009; USGS 2007)

TABLE 11.5.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed East Mormon Mountain SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants							
Antelope Canyon goldenbush	*Ericameria cervina*	NV-S1	Rock crevices and talus in shadscale and Douglas-fir-bristlecone pine communities, often on calcareous substrates, and less commonly on ash flow tuff. Elevation ranges between 3,100 and 8,800 ft.[i] Nearest recorded occurrence is 12 mi[j] west of the SEZ. About 1,064,900 acres[k] of potentially suitable habitat occurs in the SEZ region.	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	0 acres	5,300 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effect; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

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TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Bearded screwmoss	*Pseudocrossidium crinitum*	NV-S1	Known from only 12 occurrences in Nevada. On or near gypsiferous deposits and outcrops or limestone boulders, especially on east to north facing slopes of loose uncompacted soil, often associated with other mosses and lichens at elevations between 1,300 and 2,300 ft. Nearest recorded occurrence is 35 mi southwest of the SEZ. About 209,100 acres of potentially suitable habitat occurs in the SEZ region.	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	0 acres	5,300 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the Antelope Canyon goldenbush for a list of other potential mitigation measures.
Beaver dam breadroot	*Pediomelum castoreum*	FWS-SC	Known from Arizona, California, and Nevada. Occurs in dry, sandy desert communities. Nearest recorded occurrence is 10 mi south of the SEZ. About 2,930,100 acres of potentially suitable habitat occurs in the SEZ region.	7,175 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	95,955 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effect; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Eastwood milkweed	*Asclepias eastwoodiana*	BLM-S; FWS-SC; NV-S2	Endemic to Nevada in Esmeralda, Lander, Lincoln, and Nye Counties in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, or shale outcrops, generally barren and lacking competition. Frequently occurs in small washes or other moisture-accumulating microsites at elevations between 4,700 and 7,100 ft. Known to occur in Lincoln County, Nevada. About 496,700 acres of potentially suitable habitat occurs in the SEZ region.	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat); an unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m]	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	9,090 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Small to large overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops and desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures.
Gold Butte moss	*Didymodon nevadensis*	BLM-S; NV-S1	On or near gypsiferous deposits and outcrops or limestone boulders, especially on east to north-facing slopes of loose uncompacted soil. Typically associated with other mosses and lichens. Elevation ranges between 1,300 and 2,300 ft. Nearest recorded occurrence is 45 mi south of the SEZ. About 224,500 acres of potentially suitable habitat occurs in the SEZ region.	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	0 acres	5,300 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the beaver dam breadroot for a list of other potential mitigation measures.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Las Vegas buckwheat[l]	***Eriogonum corymbosum* var. *nilesii***	ESA-C; BLM-S; NV-S1	Restricted to southern Nevada, where the species is known from 15 occurrences encompassing an area of less than 1,500 acres. Near gypsum soils, in washes, drainages, or in areas of generally low relief. Elevation ranges between 1,900 and 3,850 ft. Known to occur within 1 mi east of the SEZ. About 68,700 acres of potentially suitable habitat occurs in the SEZ region.	An unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m]	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,120 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small to large overall impact. Avoiding or minimizing disturbance to desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures. The potential for impact and need for mitigation should be determined in coordination with the USFWS and NDOW.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Meadow Valley sandwort	*Eremogone stenomeres*	NV-S2	Endemic to Nevada, where it is restricted to Clark and Lincoln Counties on limestone cliffs at elevations between 2,950 and 3,950 ft. Nearest recorded occurrence is 30 mi west of the SEZ. About 209,100 acres of potentially suitable habitat occurs in the SEZ region.	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	0 acres	5,300 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the beaver dam breadroot for a list of other potential mitigation measures.
Needle Mountains milkvetch	*Astragalus eurylobus*	BLM-S; FWS-SC; NV-S2	Gravel washes and sandy soils in alkaline desert and arid grasslands at elevations between 4,250 and 6,250 ft. Nearest recorded occurrence is 40 mi north of the SEZ. About 95,500 acres of potentially suitable habitat occurs in the SEZ region.	25 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat); an unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m]	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,230 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small to large overall impact. Avoiding or minimizing disturbance to desert wash and playa habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Nevada willowherb	*Epilobium nevadense*	BLM-S; FWS-SC; NV-S2	Pinyon-juniper woodlands and oak/mountain mahogany communities, on talus slopes and rocky limestone outcrops. Elevation ranges between 5,000 and 8,800 ft. Nearest recorded occurrence is 35 mi north of the SEZ. About 1,114,900 acres of potentially suitable habitat occurs in the SEZ region.	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	0 acres	5,300 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the beaver dam breadroot for a list of other potential mitigation measures.
New York Mountains catseye	*Cryptantha tumulosa*	NV-S2	Gravelly or clay, granitic or carbonate substrates within Mojave Desert scrub, creosotebush scrub, and pinyon-juniper woodland. Elevation ranges between 4,500 and 9,900 ft. Nearest recorded occurrence is 50 mi southwest of the SEZ. About 3,771,200 acres of potentially suitable habitat occurs in the SEZ region.	8,900 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	94,250 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. See the beaver dam breadroot for a list of potential mitigation measures.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Rock phacelia	*Phacelia petrosa*	BLM-S; NV-S2	Dry limestone and volcanic talus slopes of foothills, washes, and gravelly canyon bottoms on substrates derived from calcareous material. Inhabits mixed desert scrub, creosotebush, and blackbrush communities at elevations between 2,500 and 5,800 ft. Nearest recorded occurrence is 40 mi southwest of the SEZ. About 3,199,400 acres of potentially suitable habitat occurs in the SEZ region.	8,900 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	75 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	101,700 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. See the beaver dam breadroot for a list of potential mitigation measures.
Rosy two-tone beardtongue	*Penstemon bicolor* ssp. *roseus*	BLM-S; FWS-SC	Calcareous, granitic, or volcanic soils in washes, roadsides, scree at outcrop bases, rock crevices, or similar places receiving enhanced runoff, within creosote-bursage, blackbrush, and mixed-shrub communities. Elevation ranges between 1,800 and 4,850 ft. Nearest recorded occurrence is 25 mi southwest of the SEZ. About 315,500 acres of potentially suitable habitat occurs in the SEZ region.	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat); an unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m]	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	7,500 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small to large overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops and desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Threecorner milkvetch	*Astragalus geyeri* var. *triquetrus*	NV-P; FWS-SC; NV-S2	Known only from Clark County, Nevada, and Mohave County, Arizona, on open, deep sandy soils, desert washes, or dunes, generally stabilized by vegetation and/or a gravel veneer. Elevations range between 1,500 and 2,500 ft. Nearest recorded occurrence is 8 mi south of the SEZ. About 83,900 acres of potentially suitable habitat occurs in the SEZ region.	An unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m]	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,120 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small to large overall impact. Avoiding or minimizing disturbance to desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Veyo milkvetch	*Astragalus ensiformis* var. *gracilior*	NV-S1	Restricted to Lincoln County, Nevada, and Washington County, Utah, on stiff clay soil of open washes, valley floors, and hillsides under sagebrush within pinyon-juniper communities. Elevation ranges between 4,200 and 5,000 ft. Nearest recorded occurrence is 20 mi northeast of the SEZ. About 1,273,400 acres of potentially suitable habitat occurs in the SEZ region.	An unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m]	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,120 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small to large overall impact. Avoiding or minimizing disturbance to desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures.
White bearpoppy	*Arctomecon merriamii*	BLM-S	Endemic to the Mojave Desert of California and Nevada in barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft. Nearest recorded occurrence is 30 mi west of the SEZ. About 225,900 acres of potentially suitable habitat occurs in the SEZ region.	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	0 acres	5,300 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the beaver dam breadroot for a list of other potential mitigation measures.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Invertebrates							
Mojave gypsum bee	*Andrena balsamorhizae*	BLM-S; NV-S2	Endemic to Nevada, where the species is restricted to gypsum soils associated with habitats of its single larval host plant *Enceliopsis argophylla*. Such habitats include warm desert shrub communities on dry slopes and sandy washes. Nearest recorded occurrence is 45 mi southwest of the SEZ. About 2,898,175 acres of potentially suitable habitat occurs in the SEZ region.	8,900 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	94,225 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats may also reduce impacts on this species.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Invertebrates (Cont.)							
Mojave poppy bee	*Perdita meconis*	BLM-S; NV-S2	Known only from Clark County, Nevada, where the species is dependent on poppy plants (genus *Arctomecon*) along roadsides, and in washes and barren desert areas on gypsum soils. Nearest recorded occurrence is 30 mi southwest of the SEZ. About 84,400 acres of potentially suitable habitat occurs in the SEZ region.	An unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m]	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,120 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small to large overall impact. Avoiding or minimizing disturbance to desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats may also reduce impacts on this species.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Reptiles							
Desert tortoise	***Gopherus agassizii***	ESA-T; NV-P; NV-S2	Found throughout the Mojave and Sonoran Deserts in desert creosotebush communities on firm soils for digging burrows. Often found along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Known to occur within 2 mi south of the SEZ. About 2,171,300 acres of potentially suitable habitat occurs in the SEZ region.	8,500 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	79,250 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and NDOW.
Birds							
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident in project area in grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodlands throughout the project area. Known to occur in Lincoln County, Nevada. About 660,000 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	7,250 acres of potentially suitable foraging habitat (1.1% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Phainopepla	*Phainopepla nitens*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in project area in desert scrub, mesquite, pinyon-juniper woodland, desert riparian areas, and orchards. Nests in trees or shrubs. Nearest recorded occurrence is 25 mi southwest of the SEZ. About 1,200,000 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	15,500 acres of potentially suitable nesting or foraging habitat (1.1% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.
Swainson's hawk	*Buteo swainsoni*	BLM-S; NV-P; CA-S2; NV-S2	Summer resident in project area in savanna, open pine-oak woodlands, grasslands, and cultivated lands. Nests typically in solitary trees, bushes, or small groves; sometimes nests near urban areas. Known to occur in Lincoln County, Nevada. About 1,974,700 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	15,200 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; FWS-SC	Summer resident in project area in open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports throughout the SEZ region. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Known to occur in Lincoln County, Nevada. About 3,427,000 acres of potentially suitable habitat occurs in the SEZ region.	8,950 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	96,275 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Mammals							
Allen's big-eared bat	*Idionycteris phyllotis*	BLM-S; NV-P; FWS-SC; NV-S1	Year-round resident in project area in primarily mountainous wooded areas composed of ponderosa pine, pinyon-juniper, oak brush, as well as cottonwood riparian woodlands within the range of Mohave desert scrub of low desert ranges to white fir forest zones, with summer ranges occurring at higher elevations. Roosts in caverns, rock fissures, and mines. Nearest recorded occurrence is 15 mi southeast of the SEZ. About 2,513,700 acres of potentially suitable habitat occurs in the SEZ region.	8,900 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	75 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	96,525 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Brazilian free-tailed bat	*Tadarida brasiliensis*	BLM-S; NV-P	Year-round resident in project area, where it forages in desert grassland, old field, savanna, shrubland, and woodland habitats, as well as urban areas. Roosts in old buildings, caves, mines, and hollow trees. Nearest recorded occurrence is 20 mi south of the SEZ. About 3,784,000 acres of potentially suitable habitat occurs in the SEZ region.	8,900 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	75 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	89,525 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts.
Fringed myotis	*Myotis thysanodes*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in project area in a wide range of habitats, including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roost sites have been reported in buildings and caves. Known to occur in Lincoln County, Nevada. About 4,864,100 acres of potentially suitable habitat occurs in the SEZ region.	8,900 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	101,525 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Nelson's bighorn sheep	***Ovis canadensis nelsoni***	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, but may use them as corridors for travel between mountain ranges. Known to occur in the Mormon Mountains within 5 mi west of the SEZ. About 1,252,900 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	4,400 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact; no direct affect. Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to important movement corridors within the area of direct effects.
Silver-haired bat	*Lasionycteris noctivagans*	BLM-S; FWS-SC	Year-round resident in project area in high-elevation (1,600 to 8,500 ft) forested areas of aspen, cottonwood, white fir, pinyon-juniper, subalpine fir, willow, and spruce. Roosts in tree foliage, cavities, or under loose bark. May also forage in arid shrublands. Nearest recorded occurrence is 25 mi southwest of the SEZ. About 3,755,300 acres of potentially suitable habitat occurs in the SEZ region.	8,900 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	70 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	87,425 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 11.5.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]			Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
				Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	
Mammals (Cont.)							
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; NV-P; NV-S2	Year-round resident in project area near forests and shrubland habitats below 9,000 ft elevation throughout the SEZ region. The species may use caves, mines, and buildings for day roosting and winter hibernation. Nearest recorded occurrence is 30 mi southwest of the SEZ. About 3,529,600 acres of potentially suitable habitat occurs in the SEZ region.	8,900 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	70 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	87,875 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts..
Western small-footed myotis	*Myotis ciliolabrum*	BLM-S; FWS-SC	Year-round resident in project area in a variety of woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Known to occur in Lincoln County, Nevada. About 4,715,400 acres of potentially suitable habitat occurs in the SEZ region.	8,900 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	70 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	101,425 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts.

[a] BLM-S = listed as a sensitive species by the BLM; ESA-E = listed as endangered under the ESA; ESA-T = listed as threatened under the ESA; FWS-SC = USFWS species of concern; NV-P = protected in the State of Nevada under NRS 501.110 (animals) or NRS 527 (plants); NV-S1 = ranked as S1 in the state of Nevada; NV-S2 = ranked as S2 in the state of Nevada.

[b] For plant species, potentially suitable habitat was determined by using SWReGAP land cover types. For terrestrial vertebrate species, potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

Footnotes continued on next page.

TABLE 11.5.12.1-1 (Cont.)

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[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] For access road development, direct effects were estimated within a 11-mi (8-km), 60-ft (18-m) wide road corridor from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of potentially suitable habitat within the 1-mi (1.6-km) wide road corridor.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portion of the road corridor where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from project developments. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[g] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: $\leq$1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but $\leq$10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[h] Species-specific mitigation measures are suggested here, but final mitigation measures should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[i] To convert ft to m, multiply by 0.3048.

[j] To convert mi to km, multiply by 1.609.

[k] To convert acres to km^2, multiply by 0.004047.

[l] Species in bold text have been recorded or have designated critical habitat within 5 mi (8 km) of the SEZ boundary.

[m] Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

11.5.12.1.3 Species That Are under Review for Listing under the ESA

On the basis of information provided by the NNHP, USFWS (Stout 2009), and availability of potentially suitable habitats, no species under review for ESA listing are expected to occur in the affected area of the proposed East Mormon Mountain SEZ.

11.5.12.1.4 BLM-Designated Sensitive Species

There are 21 BLM-designated sensitive species that may occur in the affected area of the proposed East Mormon Mountain SEZ or may be affected by solar energy development on the SEZ (Table 11.5.12.1-1): (1) plants: Eastwood milkweed, Gold Butte moss, Las Vegas buckwheat, Needle Mountains milkvetch, Nevada willowherb, rock phacelia, rosy two-tone beardtongue, and white bearpoppy; (2) invertebrates: Mojave gypsum bee and Mojave poppy bee; (3) birds: ferruginous hawk, phainopepla, Swainson's hawk, and western burrowing owl; and (4) mammals: Allen's big-eared bat, Brazilian free-tailed bat, fringed myotis, Nelson's bighorn sheep, silver-haired bat, Townsend's big-eared bat, and western small-footed myotis. Of these species, only the Las Vegas buckwheat and the Nelson's bighorn sheep are known to occur in the affected area of the SEZ. Habitats in which BLM-designated sensitive species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are presented in Table 11.5.12.1-1. The Las Vegas buckwheat has been discussed previously in Section 11.5.12.1.2 because of its candidate status under the ESA (Section 11.5.12.1.2). The remaining 20 species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Eastwood Milkweed

The Eastwood milkweed is a perennial forb endemic to Nevada on public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties. It occurs in open areas on a wide variety of basic (pH usually greater than 8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, washes, or shale outcrops at elevations between 4,700 and 7,100 ft (1,430 and 2,150 m). According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops and desert wash habitat may occur in the SEZ, access road corridor, and within the area of indirect effects (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

Gold Butte Moss

The Gold Butte moss is a bryophyte (moss) that is known only from Nevada and Texas on gypsiferous deposits and outcrops or limestone boulders. This species is typically associated with other mosses and lichens at elevations between 1,300 and 2,300 ft (400 and 700 m). This species is known to occur about 45 mi (72 km) south of the SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops may occur in the SEZ and within the area of indirect effects (Table 11.5.12.1-1).

Needle Mountains Milkvetch

The Needle Mountains milkvetch is a perennial forb that occurs on gravel washes and sandy soils in alkaline desert and arid grasslands at elevations between 4,250 and 6,250 ft (1,295 and 1,900 m). The species is known to occur about 40 mi (64 km) north of the SEZ. According to the SWReGAP land cover model, potentially suitable desert wash and playa habitats may occur in the SEZ, access road corridor, and within the area of indirect effects (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

Nevada Willowherb

The Nevada willowherb is a perennial forb endemic to eastern Nevada and western Utah. It occurs in pinyon-juniper woodlands and oak/mountain mahogany communities, on talus slopes and rocky limestone outcrops at elevations between 5,000 and 8,800 ft (1,525 and 2,680 m). The species is known to occur about 35 mi (56 km) north of the SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops may occur in the SEZ and within the area of indirect effects (Table 11.5.12.1-1).

Rock Phacelia

The rock phacelia is an annual forb known only from Arizona, Nevada, and Utah. It inhabits crevices of cliffs and boulders on volcanic substrates in washes of desert shrub communities at elevations between 2,500 and 5,800 ft (750 and 1,750 m). The species is known to occur about 40 mi (64 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat may occur in the SEZ, road corridor, and within the area of indirect effects (Table 11.5.12.1-1).

Rosy Two-Tone Beardtongue

The rosy two-tone beardtongue is a perennial forb that is known from Arizona, California, and Nevada. This species occurs on calcareous, granitic, or volcanic substrates in washes, roadsides, scree and outcrop bases, rock crevices, or similar places receiving enhanced runoff at elevations between 1,800 and 4,850 ft (550 and 1,480 m). The species is known to occur about 25 mi (40 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops and desert wash habitat may occur in the

SEZ, access road corridor, and within the area of indirect effects (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

White Bearpoppy

The white bearpoppy is a perennial forb endemic to the Mojave Desert of California and Nevada. This species inhabits barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft (610 and 1,800 m). This species is known to occur as close as 30 mi (48 km) west of the SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops may occur in the SEZ and within the area of indirect effects (Table 11.5.12.1-1).

Mojave Gypsum Bee

The Mojave gypsum bee is an insect that is endemic to Nevada, where the species is restricted to gypsum soils associated with habitats of its single larval host plant, silverleaf sunray. Such habitats include warm desert shrub communities; dry, open, relatively barren areas on gypsum badlands; and volcanic gravels. This species is known to occur about 45 mi (72 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat may occur in the SEZ, road corridor, and within the area of indirect effects (Table 11.5.12.1-1).

Mojave Poppy Bee

The Mojave poppy bee is an insect known only from Clark County, Nevada, where it is dependent on poppy plants (*Arctemocon* spp.). Suitable habitats include roadsides, washes, and barren desert areas. The nearest recorded occurrence of this species is about 30 mi (48 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable desert wash habitat may occur in the affected area (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

Ferruginous Hawk

The ferruginous hawk occurs throughout the western United States. According to the SWReGAP habitat suitability model, only potentially suitable winter habitat for the ferruginous hawk occurs within the affected area of the proposed East Mormon Mountain SEZ, although potentially suitable year-round habitat is expected to occur outside of the affected area within the SEZ region. The species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. This species occurs in Lincoln County, Nevada. According to the

SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ or within the access road corridor. However, potentially suitable foraging habitat may occur in portions of the area of indirect affects (Table 11.5.12.1-1).

Phainopepla

The phainopepla occurs in the southwestern United States and Mexico, where it breeds in suitable habitats throughout much of the proposed East Mormon Mountain SEZ region. The species occurs in desert scrub, mesquite, and pinyon-juniper woodland communities, as well as desert riparian areas and orchards. Nests are typically constructed in trees and shrubs from 3 to 45 ft (1 to 15 m) above the ground. This species occurs in Lincoln County, Nevada. According to SWReGAP, potentially suitable habitat does not occur on the SEZ or within the access road corridor. However, potentially suitable foraging or nesting habitat may occur in the area of indirect effects (Table 11.5.12.1-1). According to the SWReGAP land cover model, there are no riparian areas on the SEZ or in the access road corridor that may be potentially suitable nesting habitats. However, about 10 acres (<0.1 km^2) of riparian woodlands occur in the area of indirect effects that may provide suitable nesting habitat for the phainopepla.

Swainson's Hawk

The Swainson's hawk occurs throughout the southwestern United States. According to the SWReGAP habitat suitability model, only summer breeding habitat occurs in the proposed East Mormon Mountain SEZ region. This species inhabits desert, savanna, open pine-oak woodland, grassland, and cultivated habitats. Nests are typically constructed in solitary trees, bushes, or small groves. This species is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ or within the access road corridor. However, potentially suitable foraging or nesting habitat may occur in portions of the area of indirect affects (Table 11.5.12.1-1).

Western Burrowing Owl

According to the SWReGAP habitat suitability model for the western burrowing owl, the species is a summer (breeding) resident in open, dry grasslands and desert habitats in the proposed East Mormon Mountain SEZ region. The species occurs locally in open areas with sparse vegetation, where it forages in grasslands, shrublands, open disturbed areas and nests in burrows typically constructed by mammals. The species is known to occur in Lincoln County, Nevada, and potentially suitable summer breeding habitat may occur in the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Allen's Big-Eared Bat

The Allen's big-eared bat is known from isolated locations throughout the southwestern United States and is considered to be a year-round resident in the proposed East Mormon Mountain SEZ region. The species roosts in caverns, rock fissures, and mines. Foraging occurs primarily in mountainous wooded areas, such as ponderosa pine, pinyon-juniper, oak, and cottonwood riparian woodlands. However, this species may also forage in arid shrublands. This bat species is known to occur about 15 mi (24 km) southeast of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is about 4 acres (<1 km^2) of potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, and about 5,300 acres (21 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Brazilian Free-Tailed Bat

The Brazilian free-tailed bat is known from isolated locations throughout the southwestern United States and is considered to be a year-round resident in the proposed East Mormon Mountain SEZ region. The species roosts in buildings, caves, mines, and hollow trees. Foraging occurs in desert grasslands, old fields, savannas, shrublands, woodlands, and urban areas. This species is known to occur about 20 mi (32 km) south of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, no potentially suitable roosting habitat (rocky cliffs and outcrops) occurs on the SEZ or access road corridor, but about 5,300 acres (21 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Fringed Myotis

The fringed myotis is a year-round resident in the proposed East Mormon Mountain SEZ region, where it occurs in a variety of habitats including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. Roosting occurs in buildings and caves. This species is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is about 4 acres (<1 km^2) of potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, and about 5,300 acres (21 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is one of several subspecies of bighorn sheep known to occur in the southwestern United States. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats. It may use desert valleys as corridors for travel between range habitats. This species is known to occur in the Mormon Mountains, about 5 mi (8 km) west of the proposed East Mormon Mountain SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ or within the access road corridor. However, information provided by the NDOW indicates that year-round range habitat within the Mormon Mountains intersects the affected area west of the SEZ. Despite the apparent lack of suitable habitat on the SEZ, this species may use portions of the proposed East Mormon Mountain SEZ as a migratory corridor between range habitats. Potentially suitable habitat for the Nelson's bighorn sheep occurs in the area of indirect effects within 5 mi (8 km) of the SEZ boundary (Table 11.5.12.1-1).

Silver-Haired Bat

According to the SWReGAP habitat suitability model, the silver-haired bat is a year-round resident in the proposed East Mormon Mountain SEZ region, where it occurs in montane forested habitats such as aspen, pinyon-juniper, and spruce communities. Foraging may occur in desert shrubland habitats. This species roosts in tree foliage and cavities, or under loose bark. The species is known to occur about 25 mi (40 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (woodlands) on the SEZ or in the access road corridor, but about 5,315 acres (21 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, the species forages year-round in a wide variety of desert and non-desert habitats in the proposed East Mormon Mountain SEZ region. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. Nearest recorded occurrences are about 30 mi (48 km) southwest of the proposed East Mormon Mountain SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is about 4 acres (<1 km^2) of potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, and about 5,300 acres (21 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Western Small-Footed Myotis

The western small-footed myotis is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, this species is a year-round resident in southern Nevada, where it occupies a wide variety of desert and non-desert habitats including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, tunnels, buildings, and other man-made structures, and beneath boulders or loose bark. The species is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is about 4 acres (<1 km^2) of potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, and about 5,300 acres (21 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

11.5.12.1.5 State-Listed Species

There are eight species listed by the State of Nevada that may occur in the proposed East Mormon Mountain SEZ affected area or may be affected by solar energy development on the SEZ (Table 11.5.12.1-1). These state-listed species include (1) plant: threecorner milkvetch; (2) reptile: desert tortoise; (3) birds: phainopepla and Swainson's hawk; and (4) mammals: Allen's big-eared bat, Brazilian free-tailed bat, fringed myotis, and Townsend's big-eared bat. All of these species are protected in the state of Nevada under NRS 501.110 or NRS 527. Of these state-listed species, only the threecorner milkvetch has not been previously discussed; it is described below. Additional life history information for these species is provided in Appendix J.

The threecorner milkvetch is a perennial forb that is known only from Clark County, Nevada, and Mohave County, Arizona. This species inhabits open, deep sandy soils, desert washes, or dunes, generally stabilized by vegetation and/or a gravel veneer at elevations between 1,500 and 2,500 ft (455 and 760 m). The threecorner milkvetch is a USFWS species of concern and is known to occur about 8 mi (13 km) south of the SEZ. According to the SWReGAP land cover model, potentially suitable desert wash habitat may occur in the access road corridor and within the area of indirect effects (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

11.5.12.1.6 Rare Species

There are 28 rare species (i.e., state rank of S1 or S2 in the state of Nevada or a species of concern by the State of Nevada or USFWS) that may be affected by solar energy development on the proposed East Mormon Mountain SEZ (Table 11.5.12.1-1). Six of these species (all plants) have not been previously discussed because of their known or pending status under the ESA (Sections 11.5.12.1.1 or 11.5.12.1.2) or the BLM (Section 11.5.12.1.4). The six species are Antelope Canyon goldenbush, bearded screwmoss, beaver dam breadroot, Meadow Valley sandwort, New York Mountains catseye, and Veyo milkvetch. The habitats and known occurrences of these species relative to the SEZ are shown in Table 11.5.12.1-1. Additional life history information is provided in Appendix J.

11.5.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed East Mormon Mountain SEZ is presented in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 11.5.12.1 and following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 11.5.12.3).

Solar energy development within the proposed East Mormon Mountain SEZ could affect a variety of habitats (see Sections 11.5.9 and 11.5.10). Impacts on these habitats could in turn affect special status species that are dependent on those habitats. Based on NNHP records, the Las Vegas buckwheat, desert tortoise, and Nelson's bighorn sheep are the only special status species known to occur within the affected area of the proposed East Mormon Mountain SEZ boundary. As discussed in Section 11.5.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur there and may, therefore, overestimate impacts on some special status species. No groundwater-dependent species occur within the affected area of the proposed East Mormon Mountain SEZ based upon NNHP records, information provided by the USFWS (Stout 2009), and the evaluation of groundwater resources from the Virgin River Valley groundwater basin within the SEZ region (Section 11.5.9).

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities occur in areas where special status species are known to or could occur. As presented in Section 11.5.1.2, an 11-mi (18-km) long access road corridor is assumed to be needed to serve solar facilities within this SEZ. Impacts of transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ and the access road construction area where ground-disturbing activities are expected to occur. Indirect impacts could result from depletions of groundwater resources, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project developments are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful incorporation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., desert washes). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust.

11.5.12.2.1 Impacts on Species Listed under the ESA

One species listed under the ESA may be affected by solar energy development on the proposed East Mormon Mountain SEZ—the Mojave population of the desert tortoise. This species is listed as threatened under the ESA and is known to occur about 2 mi (3 km) south of the SEZ (Figure 11.5.12.1-1). According to the USFWS (Stout 2009), desert tortoise populations have the potential to occur in the area of direct effects, and designated critical habitat for this species occurs in the Mormon Mesa and Beaver Dam Slope critical habitat units south and east of the SEZ, respectively (Figure 11.5.12.1-1). According to the SWReGAP habitat suitability model, about 8,500 acres (34 km^2) of potentially suitable habitat on the SEZ and 70 acres (0.3 km^2) of potentially suitable habitat within the access road corridor could be directly affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). This direct effects area represents about 0.4% of available suitable habitat of the desert tortoise in the region. About 79,250 acres (321 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.6% of the available suitable habitat in the region (Table 11.5.12.1-1).

On the basis of estimates of desert tortoise density in the Beaver Dam Slope critical habitat unit adjacent to the eastern border of the SEZ, the USFWS estimated that full-scale solar energy development on the SEZ may directly affect up to 47 desert tortoises on the SEZ (Stout 2009). In addition to direct impacts, development on the SEZ could indirectly affect desert tortoises by fragmenting and degrading habitats between the Mormon Mesa and Beaver Dam Slope critical habitat units and other potentially suitable habitats in the vicinity of the proposed East Mormon Mountain SEZ. Fragmentation would be exacerbated by the installation of exclusionary fencing at the perimeter of the SEZ or individual project areas.

The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to reduce these impacts to negligible levels. Avoidance of potentially suitable habitats for this species is not a feasible means of mitigating impacts because these habitats (desert scrub) are widespread throughout the area of direct effect. Pre-disturbance surveys to determine the abundance of desert tortoises on the SEZ and the implementation of a desert tortoise translocation plan and compensation plan could further reduce direct impacts.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions of incidental take statements) for the desert tortoise, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, translocation actions, and compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. Consultation with NDOW should also occur to determine any state mitigation requirements.

There are inherent dangers to tortoises associated with their capture, handling, and translocation from the SEZ. These actions, if done improperly, can result in injury or death. To minimize these risks, and as stated above, the desert tortoise translocation plan should be developed in consultation with the USFWS and follow the *Guidelines for Handling Desert Tortoises during Construction Projects* (Desert Tortoise Council 1994) and other current translocation guidance provided by the USFWS. Consultation will identify potentially suitable recipient locations, density thresholds for tortoise populations in recipient locations, procedures for pre-disturbance clearance surveys and tortoise handling, as well as disease testing and post-translocation monitoring and reporting requirements. Despite some risk of mortality or decreased fitness, translocation is widely accepted as a useful strategy for the conservation of the desert tortoise (Field et al. 2007).

To offset impacts of solar development on the SEZ, compensatory mitigation may be needed to balance the acreage of habitat lost with acquisition of lands that would be improved and protected for desert tortoise populations (USFWS 1994). Compensation can be accomplished by improving the carrying capacity for the desert tortoise on the acquired lands. Other mitigation actions may include funding for the habitat enhancement of the desert tortoise on existing federal lands. Consultation with the USFWS and NDOW would be necessary to determine the appropriate mitigation ratio to acquire, enhance, and preserve desert tortoise compensation lands.

11.5.12.2.2 Impacts on Species That Are Candidates for Listing under the ESA

One species that is a candidate for listing under the ESA may be affected by solar energy development on the proposed East Mormon Mountain SEZ–the Las Vegas buckwheat. This species is known to occur within 1 mi (1.6 km) east of the SEZ (Figure 11.5.12.1-1) and, according to the USFWS (Stout 2009), has the potential to occur on the SEZ and within the access road corridor. According to the SWReGAP land cover model, potentially suitable desert wash habitat for this species does not occur on the SEZ, but about 5 acres (<0.1 km^2) of potentially suitable desert wash habitat in the access road corridor may be directly affected by construction and operations of solar energy facilities on the SEZ. This direct effects area represents less than 0.1% of available suitable habitat in the region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ

(Table 11.5.12.1-1). About 2,120 acres (9 km^2) of potentially suitable mapped desert wash habitat occurs in the area of potential indirect effects; this area represents about 3.1% of the available potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the Las Vegas buckwheat cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat in the area of direct effects could reduce direct impacts on this species to negligible levels. In addition, conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization are not feasible options, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development. The potential for impact and need for mitigation should be developed in coordination with the USFWS and NDOW.

11.5.12.2.3 Impacts on Species That Are under Review for Listing under the ESA

On the basis of information provided by the NNHP, USFWS (Stout 2009), and availability of potentially suitable habitats, there are no species under review for ESA listing that may be affected by solar energy developments on the proposed East Mormon Mountain SEZ.

11.5.12.2.4 Impacts on BLM-Designated Sensitive Species

BLM-designated sensitive species that may be affected by solar energy development on the proposed East Mormon Mountain SEZ and were not previously discussed as ESA-listed (Section 11.5.12.2.1), candidates for ESA listing (Section 11.5.12.2.2), or under review for ESA listing (Section 11.5.12.2.3) are discussed below.

Eastwood Milkweed

The Eastwood milkweed is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 5 acres (<0.1 km^2) of potentially suitable habitat on the SEZ and 5 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is consists of rocky cliffs and outcrops (SEZ only) and desert wash habitat (road corridor only) and represents less than 0.1% of potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 9,090 acres (37 km^2) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 1.8% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the Eastwood milkweed cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to rocky cliffs and outcrops and desert wash habitat in the area of direct effects could reduce direct impacts on the Eastwood milkweed. In addition, conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization are not feasible options, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Gold Butte Moss

The Gold Butte moss is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, about 5 acres (<0.1 km^2) of potentially suitable rocky cliffs and outcrops on the SEZ could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. No suitable habitat for this species occurs in the access road corridor. About 5,300 acres (21 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.4% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

The overall impact on the Gold Butte moss from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Needle Mountains Milkvetch

The Needle Mountains milkvetch is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 25 acres (0.1 km^2) of potentially suitable habitat on the SEZ and 5 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is composed of desert playa habitat (SEZ only) and desert wash habitat (road corridor only) and represents less than 0.1% of potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 2,230 acres (9 km^2) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 2.3% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the Needle Mountains milkvetch cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash and playa habitats in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Nevada Willowherb

The Nevada willowherb is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, about 5 acres (<0.1 km^2) of potentially suitable rocky cliffs and outcrops on the SEZ could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. There is no suitable habitat for this species in the access road corridor. About 5,300 acres (21 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.5% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

The overall impact on the Nevada willowherb from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Rock Phacelia

The rock phacelia is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, about 8,900 acres (36 km^2) of potentially suitable habitat on the SEZ and 75 acres (0.3 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the SEZ region. About 101,700 acres (412 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.2% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

The overall impact on the rock phacelia from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the rock phacelia because potentially suitable desert shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Eastwood milkweed. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Rosy Two-Tone Beardtongue

The rosy two-tone beardtongue is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 5 acres (<0.1 km^2) of potentially suitable habitat on the SEZ and 5 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is composed of rocky cliffs and outcrops (SEZ only) and desert wash habitat (road corridor only) and represents less than 0.1% of the available potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 7,500 acres (30 km^2) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 2.4% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the rosy two-tone beardtongue cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to rocky cliffs and outcrops and desert wash and playa habitats in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White Bearpoppy

The white bearpoppy is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 5 acres (<0.1 km^2) of potentially suitable rocky cliffs and outcrops on the SEZ could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. No suitable habitat for this species occurs in the access road corridor. About 5,300 acres (21 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.3% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

The overall impact on the white bearpoppy from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Gypsum Bee

The Mojave gypsum bee is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 8,900 acres (36 km^2) of potentially suitable habitat on the SEZ and 70 acres (0.3 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the SEZ region. About 94,225 acres (381 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.3% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

The overall impact on the Mojave gypsum bee from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Mojave gypsum bee because potentially suitable desert shrubland habitat is widespread throughout the area of direct effects. Direct impacts could also be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Mojave Poppy Bee

The Mojave poppy bee is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ. However, about 5 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is composed of desert wash habitat and represents less than 0.1% of the available potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 2,120 acres (9 km^2) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 2.5% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the Mojave poppy bee cannot be quantified without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat in the area of direct effects and the implementation of mitigation measures described previously for the Mojave gypsum bee could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Ferruginous Hawk

The ferruginous hawk is a winter resident in the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ or within the access road corridor (Table 11.5.12.1-1). However, about 7,250 acres (29 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Phainopepla

The phainopepla is a year-round resident in the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ or within the access road corridor (Table 11.5.12.1-1). However, about 15,500 acres (63 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

The overall impact on the phainopepla from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Swainson's Hawk

The Swainson's hawk is considered a summer breeding resident within the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ or within the access road corridor (Table 11.5.12.1-1). However, about 15,200 acres (62 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

The overall impact on the Swainson's hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Western Burrowing Owl

The western burrowing owl is considered a summer breeding resident within the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, about 8,950 acres (36 km^2) of potentially suitable habitat on the SEZ and 70 acres (0.3 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.3% of potentially suitable habitat in the SEZ region. About 96,275 acres (390 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.8% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging and nesting habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the western burrowing owl because potentially suitable shrubland habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. Impacts on the western burrowing owl could be reduced through the implementation of programmatic design features and by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows and habitat on the SEZ. If avoidance or minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Allen's Big-Eared Bat

Allen's big-eared bat is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur about 15 mi (24 km) southeast of the SEZ. According to the SWReGAP habitat suitability model, about 8,900 acres (36 km^2) of potentially suitable habitat on the SEZ and 75 acres (0.3 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.4% of potentially suitable habitat in the SEZ region. About 96,525 acres (390 km^2) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 3.8% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 km^2) of potentially suitable roost habitat (rocky cliffs and outcrops) occurs on the SEZ, and about 5,300 acres (21 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the Allen's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the East Mormon Mountain SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoiding or minimizing direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect and readily available in other portions of the affected area. Impacts on the Allen's big-eared bat could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied roosts in the area of direct effects. If avoidance or minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat in the area of direct effects.

Brazilian Free-Tailed Bat

The Brazilian free-tailed bat is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur about 20 mi (32 km) south of the SEZ. According to the SWReGAP habitat suitability model, about 8,900 acres (36 km^2) of potentially suitable habitat on the SEZ and 75 acres (0.3 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 89,525 acres (362 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.4% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 km^2) of potentially suitable roost habitat (rocky cliffs and outcrops) occurs on the SEZ, and about 5,300 acres (21 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the Brazilian free-tailed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the Brazilian free-tailed bat because potentially suitable habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the Allen's big-eared bat could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Fringed Myotis

The fringed myotis is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, about 8,900 acres (36 km^2) of potentially suitable habitat on the SEZ and 70 acres (0.3 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 101,525 acres (411 km^2) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 2.1% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 km^2) of potentially suitable roost habitat (buildings and caves) occurs on the SEZ, and about 5,300 acres (21 km^2) of potentially suitable roost habitat (rocky cliffs and outcrops) may occur in the area of indirect effects.

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the fringed myotis because potentially suitable habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the Allen's big-eared bat could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is known to occur within the affected area of the proposed East Mormon Mountain SEZ, but suitable range habitat is not expected to occur on the SEZ or within the access road corridor. However, about 4,400 acres (18 km^2) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 0.4% of the available suitable habitat in the region (Table 11.5.12.1-1). Despite the apparent lack of suitable habitat on the SEZ and the access road corridor, the Nelson's bighorn sheep may use portions of these areas as migratory corridors between range habitats.

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of the potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Impacts on the Nelson's bighorn sheep could be further reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats and important movement corridors within in the area of direct effects. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Silver-Haired Bat

The silver-haired bat is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur about 25 mi (40 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, about 8,900 acres (36 km^2) of potentially suitable habitat on the SEZ and 70 acres (0.3 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 87,425 acres (354 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.3% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (woodland habitat) does not occur on the SEZ, but about 10 acres (<1 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the silver-haired bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because such habitat is widespread throughout the area of direct effects and is readily available in other portions of the SEZ region.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur about 30 mi (48 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, about 8,900 acres (36 km^2) of potentially suitable habitat on the SEZ and 70 acres (0.3 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.3% of potentially suitable habitat in the SEZ region. About 87,875 acres (356 km^2) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 2.5% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 km^2) of potentially suitable roost habitat (rocky cliffs and outcrops) occurs on the SEZ, and about 5,300 acres (21 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of such habitat in the SEZ region.

The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the Townsend's big-eared bat because potentially suitable habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the Allen's big-eared bat could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Western Small-Footed Myotis

The western small-footed myotis is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, about 8,900 acres (36 km^2) of potentially suitable habitat on the SEZ and 70 acres (0.3 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 101,425 acres (410 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.2% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 km^2) of potentially suitable roost habitat (rocky cliffs and outcrops) occurs on the SEZ, and about 5,300 acres (21 km^2) of such habitat may occur in the area of indirect effects.

The overall impact on the western small-footed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of such habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the western small-footed myotis because potentially suitable habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the Allen's big-eared bat could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

11.5.12.2.5 Impacts on State-Listed Species

There are eight species listed by the State of Nevada that may occur in the proposed East Mormon Mountain SEZ affected area or may be affected by solar energy development on the SEZ (Table 11.5.12.1-1). Of these species, only impacts on the threecorner milkvetch have not been previously discussed. Impacts on the threecorner milkvetch are discussed below.

The threecorner milkvetch is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ; however, about 5 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is composed of desert wash habitat and represents less than 0.1% of the available potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 2,120 acres (9 km^2) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 2.5% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the threecorner milkvetch cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed (Section 11.5.12.2.4) could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

11.5.12.2.6 Impacts on Rare Species

There are 28 rare species (state rank of S1 or S2 in Nevada or a species of concern by the State of Nevada or USFWS) that may be affected by solar energy development on the proposed East Mormon Mountain SEZ. Impacts on 22 of these species have been previously discussed because of their known or pending status under the ESA (Sections 11.5.12.2.1 or 11.5.12.2.2) or designation under the BLM (Section 11.5.12.2.4). The remaining six species that have not been previously discussed include the following plants: Antelope Canyon goldenbush, bearded screwmoss, beaver dam breadroot, Meadow Valley sandwort, New York Mountains catseye, and Veyo milkvetch. Impacts and potentially applicable mitigation measures (if necessary) for each of these species is provided in Table 11.5.12.1-1. Additional life history information is provided in Appendix J.

11.5.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when specific project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 11.5.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Avoiding or minimizing disturbance to desert wash and playa habitats, could reduce or eliminate impacts on the following seven special status species: Eastwood milkweed, Las Vegas buckwheat, Needle Mountains milkvetch, rosy two-tone beardtongue, threecorner milkvetch, Veyo milkvetch, and Mojave poppy bee.

- Avoiding or minimizing disturbance to rocky cliffs and outcrops within the area of direct effects could reduce or eliminate impacts on the following twelve special status species: Antelope Canyon goldenbush, bearded screwmoss, Eastwood milkweed, Meadow Valley sandwort, Nevada willowherb, rosy two-tone beardtongue, white bearpoppy, Allen's big-eared bat, Brazilian free-tailed bat, fringed myotis, Townsend's big-eared bat, and western small footed-myotis.

- Consultation with the USFWS and the NDOW should be conducted to address the potential for impacts on the desert tortoise. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Coordination with the USFWS and the NDOW should be conducted for the Las Vegas buckwheat, a candidate species for listing under the ESA. Coordination would identify an appropriate survey protocol and mitigation requirements, which may include avoidance, minimization, translocation, or compensation.

- Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protective measures based upon consultation with the USFWS and NDOW.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species could be reduced.

11.5.13 Air Quality and Climate

11.5.13.1 Affected Environment

11.5.13.1.1 Climate

The proposed East Mormon Mountain SEZ is located in the southeast corner of Lincoln County in southeastern Nevada. Nevada lies on the eastern lee side of the Sierra Nevada Range, which markedly influences the climate of the state under the prevailing westerlies (NCDC 2010a). In addition, the mountains east and north of Nevada act as barriers to cold arctic air masses, and thus long periods of extremely cold weather are uncommon. The SEZ lies at an average elevation of about 2,710 ft (826 m) in the northeastern portion of the Mojave Desert, which has an arid climate marked by mild winters and hot summers, large daily temperature swings due to dry air, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Las Vegas McCarran International Airport, about 75 mi (121 km) southwest of the East Mormon Mountain SEZ boundary, and at the Lytle Ranch, Utah, about 15 mi (24 km) northeast, are summarized below.

A wind rose from the Las Vegas McCarran International Airport, based on data collected 33 ft (10 m) above the ground over the 5-year period 2005 to 2009, is presented in Figure 11.5.13.1-1 (NCDC 2010b).[5] During this period, the annual average wind speed at the airport was about 7.1 mph (3.2 m/s); the prevailing wind direction was from the south-southwest (about 15.3% of the time) and secondarily from the southwest (about 12.7% of the time). South-southwesterly winds occurred most frequently throughout the year. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 18.3% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds were highest in spring at 8.6 mph (3.8 m/s); lower in summer and fall at 7.6 mph (3.4 m/s) and 6.2 mph (2.8 m/s), respectively; and lowest in winter at 6.0 mph (2.7 m/s).

In southern Nevada, the summers are long and hot, while the winters are short and mild (NCDC 2010a). For the period 1988 to 2010, the annual average temperature at the Lytle Ranch, Utah, was 60.7°F (15.9°C) (WRCC 2010a). December was the coldest month, with an average minimum of 25.5°F (–3.6°C), and July was the warmest, with an average maximum of 102.3°F

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[5] Associated with the Toquop Energy Project, wind data were collected in the southeastern SEZ between April 20, 2006 and April 30, 2007 (BLM 2009f). Although this represents only one year of data, onsite wind data, which are more affected by nearby mountains to the west, are quite dissimilar to the Las Vegas data. Wind speed onsite is about 10.0 mph (4.5 m/s), about 40% higher than that in Las Vegas, and prevailing wind direction is primarily from the north-northwest (about 32% of the time) and secondarily from the south-southwest (about 15% of the time). Therefore, the wind data summaries and air quality impact analysis presented here, based on Las Vegas wind data, may not be representative for the site. Based on the onsite wind data, prevailing wind direction is toward nearby towns such as Bunkerville and Mesquite, about 12 mi (19 km) from the SEZ. Predicted concentrations using onsite wind data could be lower at site boundaries (due to high wind speeds) but a little higher at nearby towns (due to higher wind speeds and a long distance from the SEZ) than those presented in Section 11.5.13.2.1.

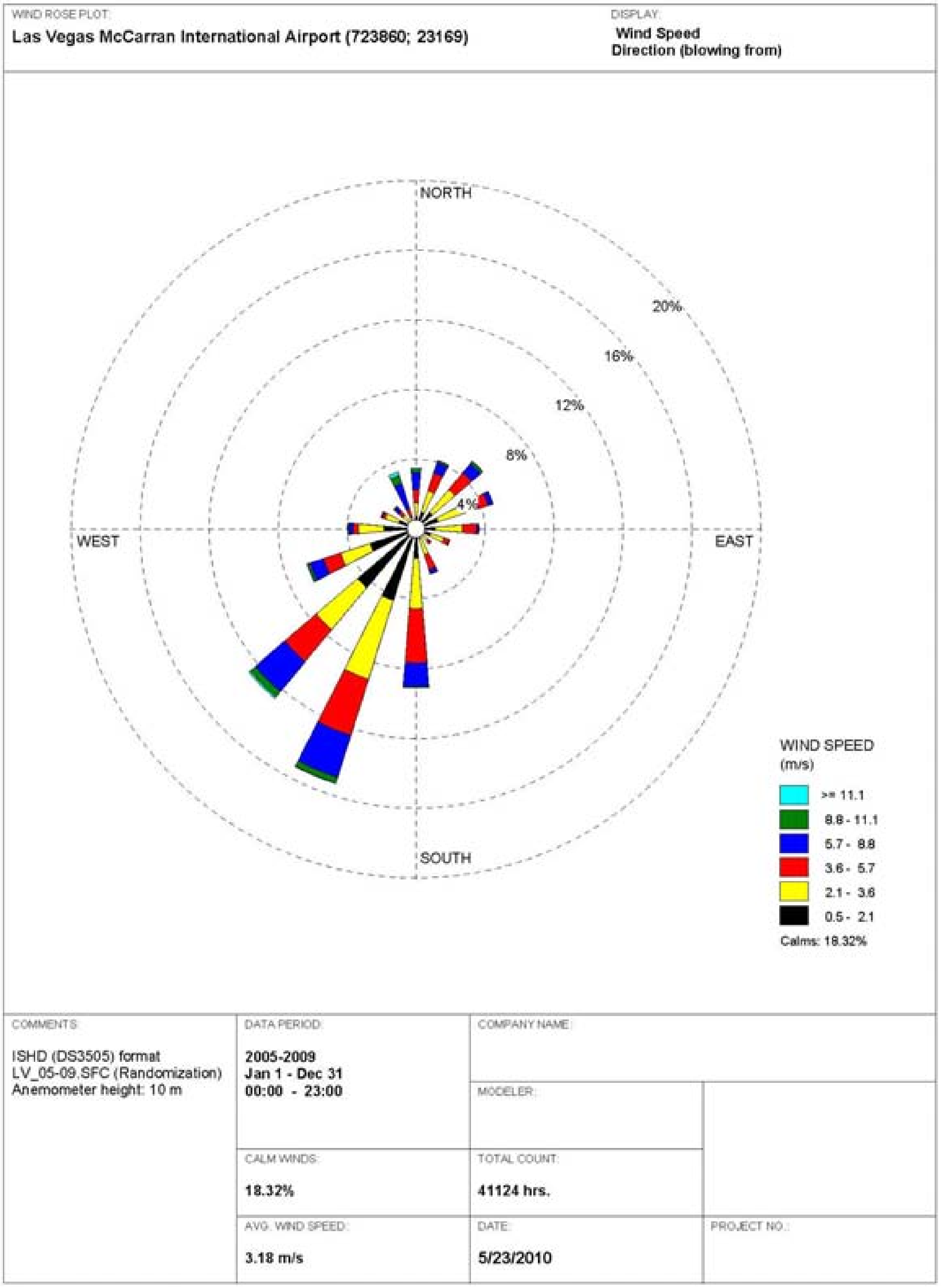

FIGURE 11.5.13.1-1 Wind Rose at 33 ft (10 m) at the Las Vegas McCarran International Airport, Nevada, 2005 to 2009 (Source: NCDC 2010b)

(39.1°C). In summer, daytime maximum temperatures higher than 100°F (37.8°C) are common, and minimums are in the mid-50s. The minimum temperatures recorded were below freezing (≤32°F [0°C]) during the colder months (from October to May, with a peak of about 23 days in January and about 26 days in December), but subzero temperatures were never recorded. During the same period, the highest temperature, 115°F (46.1°C), was reached in July 2001 and the lowest, 3°F (−16.1°C), in January 2004. In a typical year, about 125 days had a maximum temperature of at least 90°F (32.2°C), while about 98 days had minimum temperatures at or below freezing.

Because of rain shadow effects caused by the Sierra Nevada Range to the west, very little precipitation occurs in Nevada (NCDC 2010a). For the 1988 to 2010 period, annual precipitation at the Lytle Ranch, Utah, averaged about 10.43 in. (26.5 cm) (WRCC 2010a). On average, 29 days a year have measurable precipitation (0.01 in. [0.025 cm] or higher). Seasonally, precipitation is the highest in winter (about 42% of the annual total), lower in spring (about 24%) and fall (about 19%), and the lowest in summer. Snow occurs mostly from December to February but is a rarity in the area. The annual average snowfall at the Lytle Ranch, Utah, was about 1.1 in. (2.8 cm), with the highest monthly snowfall of 9.0 in. (22.9 cm) in December 2008.

The proposed East Mormon Mountain SEZ is far from major water bodies (more than 310 mi [499 km] to the Pacific Ocean). Severe weather events, such as severe thunderstorms, hurricanes, and tornadoes, are rare in Lincoln County, which encompasses the proposed East Mormon Mountain SEZ (NCDC 2010c).

In Nevada, flooding could occur from melting of heavy snowpack. On occasion, heavy summer thunderstorms also cause flooding of local streams, usually in sparsely populated mountainous areas, but they are seldom destructive (NCDC 2010a). Since 1996, 18 floods (17 flash floods and 1 flood), most of which occurred in July and August (NCDC 2010c), were reported in Lincoln County. These floods caused no deaths or injuries, but they did cause significant property and some crop damage. In January 2005, heavy rain and rapid snow melt caused extensive flooding in southern Lincoln and northeast Clark Counties, which brought about significant property damage.

In Lincoln County, 7 hail events have been reported since 1981, none of which caused property damage (NCDC 2010c). Hail measuring 1.5 in (3.8 cm) in diameter was reported in 1981. In Lincoln County, 22 high wind events have been reported since 1995, which caused some property damage. Such events, with a maximum wind speed of up to 83 mph (37 m/s), have occurred at any time of the year, with a peak during spring months. In addition, 4 thunderstorm wind events have been reported since 1964. Thunderstorm winds, with a maximum wind speed of up to 69 mph (31 m/s), occurred mostly during summer months; one of these caused minor property damage.

In Lincoln County, no dust storm events were reported (NCDC 2010c). However, the ground surface of the SEZ is covered primarily with fine sandy loams of the Mormon Mesa association (covering about 84%) and Bracken gravelly fine sandy loams (covering about 10%), which have relatively moderate dust storm potential. High winds can trigger large amounts of blowing dust in areas of dry and loose soils with sparse vegetation in Lincoln County. Dust storms can deteriorate air quality and visibility and may have adverse effects on health, particularly for people with asthma or other respiratory problems. No dust storm data are available for the Lincoln County, but dust storm data for Clark County might be applicable to the East Mormon Mountain SEZ, considering that the SEZ is located in the Mojave Desert along with Clark County, and such storms are prevalent over a wide area. From 2002 to 2004, Clark County experienced between two and four high-wind events per year when dust levels exceeded federal health standards (Clark County DAQEM 2005). In Clark County, dust storm events with unhealthy PM_{10} levels are likely to occur during late winter and early spring.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes never hit Nevada. Historically, one tropical depression passed within 100 mi (160 km) of the proposed East Mormon Mountain SEZ (CSC 2010). In the period from 1950 to July 2010, a total of six tornadoes (0.1 per year each) were reported in Lincoln County (NCDC 2010c). Most tornadoes occurring in Lincoln County were relatively weak (i.e., one was F [uncategorized[6]], four were F0, and one was F1 on the Fujita tornado scale), and these tornadoes caused no deaths or injuries, although they did cause some property damage. Most of these tornadoes occurred far from the SEZ; the nearest one hit about 27 mi (43 km) southwest of the SEZ.

11.5.13.1.2 Existing Air Emissions

Lincoln County has several industrial emission sources scattered over the county, but their emissions are relatively small. No emission sources are located around the proposed East Mormon Mountain SEZ. Because of the sparse population, only a handful of major roads exist in Lincoln County; these include U.S. 93 and State Routes 318, 319, and 375. Thus, onroad mobile source emissions are not substantial. Data on annual emissions of criteria pollutants and VOCs in Lincoln County are presented in Table 11.5.13.1-1 for 2002 (WRAP 2009). Emissions data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total SO_2 and NO_x emissions (about 56% and 57%, respectively). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions contributed primarily to CO emissions (about 56%) and secondarily to NO_x emissions (about 22%), and accounted for most of the VOC emissions (about 99%). Fire sources were primary contributors to PM_{10} and $PM_{2.5}$ emissions (about 60% and 83%, respectively) and secondary contributors to SO_2 and CO emissions (41% and 33%, respectively). Area sources accounted for about 37% of PM_{10} and 13% of $PM_{2.5.}$ In Lincoln County, point sources were minor contributors to criteria pollutants and VOCs.

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6 Not categorized by the Fujita tornado scale because damage level was not reported.

In 2005, Nevada produced about 56.3 MMt of *gross*[7] carbon dioxide equivalent (CO_2e)[8] emissions, which is about 0.8% of total U.S. GHG emissions in that year (NDEP 2008). Gross GHG emissions in Nevada increased by about 65% from 1990 to 2005 because of Nevada's rapid population growth, compared to 16.3% growth in U.S. GHG emissions during the same period. In 2005, electrical generation (48%) and transportation (30%) were the primary contributors to gross GHG emission sources in Nevada. Fuel use in the residential, commercial, and industrial sectors combined accounted for about 12% of total state emissions. Nevada's *net* emissions were about 51.3 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in Nevada. Its estimate of CO_2 emissions from fossil fuel combustion was 49.6 MMt, which was comparable to the state's estimate. Electric power generation and transportation accounted for about 52.7% and 33.6% of the CO_2 emissions total, respectively, while the residential, commercial, and industrial sectors accounted for the remainder (about 13.7%).

TABLE 11.5.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Lincoln County, Nevada, Encompassing the Proposed East Mormon Mountain SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)[c]
SO_2	230
NO_x	3,453
CO	47,458
VOCs	172,491
PM_{10}	2,586
$PM_{2.5}$	1,604

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

[c] To convert tons to kilograms, multiply by 907.

Source: WRAP (2009).

11.5.13.1.3 Air Quality

The EPA set NAAQS for six criteria pollutants (EPA 2010a): SO_2, NO_2, CO, O_3, PM (PM_{10} and $PM_{2.5}$), and Pb. Nevada has its own SAAQS, which are similar to the NAAQS with some differences (NAC 445B.22097). In addition, Nevada has set standards for 1-hour H_2S, which is not addressed by the NAAQS. The NAAQS and Nevada SAAQS for criteria pollutants are presented in Table 11.5.13.1-2.

Lincoln County is located administratively within the Nevada Intrastate AQCR, along with the 10 other counties in Nevada, other than the Las Vegas Intrastate AQCR (Clark County only), which encompasses Las Vegas, and the Northwest Nevada Intrastate AQCR (five northwest counties), which encompasses Reno. Currently, the area surrounding the proposed SEZ is designated as being in unclassifiable/attainment of NAAQS for all criteria pollutants (40 CFR 81.329).

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[7] Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

[8] A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

TABLE 11.5.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed East Mormon Mountain SEZ in Lincoln County, Nevada, 2004 to 2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	SAAQS	Concentration[b,c]	Data Source[d]
SO_2	1-hour	75 ppb[e]	NA[f]	NA	NA
	3-hour	0.5 ppm	0.5 ppm	0.009 ppm (1.8%)	Las Vegas, 2005
	24-hour	0.14 ppm	0.14 ppm	0.008 ppm (5.7%)	Las Vegas, 2005
	Annual	0.030 ppm	0.030 ppm	0.006 ppm (20%)	Las Vegas, 2005
NO_2	1-hour	100 ppb[g]	NA	NA	NA
	Annual	0.053 ppm	0.053 ppm	0.007 ppm (13%)	Mesquite, 2007
CO	1-hour	35 ppm	35 ppm	5.7 ppm (16%)	Las Vegas, 2004
	8-hour	9 ppm	9 ppm	3.9 ppm (43%)	Las Vegas, 2005
O_3	1-hour	0.12 ppm[h]	0.12 ppm	0.098 ppm (82%)	Mesquite, 2005
	8-hour	0.075 ppm	NA	0.073 ppm (97%)	Mesquite, 2004
PM_{10}	24-hour	150 $\mu g/m^3$	150 $\mu g/m^3$	142 $\mu g/m^3$ (95%)	Mesquite, 2006
	Annual	NA	50 $\mu g/m^3$	26 $\mu g/m^3$ (52%)	Mesquite, 2005
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	NA	10.2 $\mu g/m^3$ (29%)	North Las Vegas, 2005
	Annual	15.0 $\mu g/m^3$	NA	4.1 $\mu g/m^3$ (27%)	North Las Vegas, 2005
Pb	Calendar quarter	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	NA	NA
	Rolling 3-month	0.15 $\mu g/m^3$ [i]	NA	NA	NA

[a] Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

[b] Monitored concentrations are the second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5}$, and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

[c] Values in parentheses are background concentration levels as a percentage of NAAQS or SAAQS, respectively. Calculation of 1-hour SO_2 and NO_2 to NAAQS was not made, because no measurement data based on new NAAQS are available.

[d] All air monitoring stations listed are located in Clark County.

[e] Effective August 23, 2010.

[f] NA = not applicable or not available.

[g] Effective April 12, 2010.

[h] The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard (“anti-backsliding”).

[i] Effective January 12, 2009.

Sources: EPA (2010a,b); NAC 445B.22097.

Because of Lincoln County's low population density, it has no significant emission sources of its own and only minor mobile emissions along major highways. Accordingly, ambient air quality in Lincoln County is relatively good. There are no ambient air-monitoring stations in Lincoln County. To characterize ambient air quality around the SEZ, four monitoring stations in Clark County were chosen. Mesquite is located about 13 mi (21 km) southeast of the SEZ and has recorded ambient concentrations of NO_2, O_3, and PM_{10}. Apex, which is located in the northeast corner of North Las Vegas, about 51 mi (82 km) southwest and upwind of the SEZ, was the closest $PM_{2.5}$ monitoring station. CO concentrations at the East Tonopah station in Las Vegas, which is the farthest downwind station of Las Vegas, were presented. The East Sahara Avenue station, which is on the outskirts of Las Vegas, has the only SO_2 monitor in the area. No Pb measurements have been made in the State of Nevada because of low Pb concentration levels after the phaseout of leaded gasoline. The highest background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 11.5.13.1-2 (EPA 2010b). Except for 8-hour O_3 and 24-hour PM_{10}, which approach their respective standards, the highest concentration levels were lower than their respective standards (up to 82%).

The PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, the EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. Several Class I areas are located in Arizona and Utah; two of these are within 62 mi (100 km) of the proposed SEZ. The nearest is Grand Canyon NP in Arizona (40 CFR 81.403), about 58 mi (93 km) southeast of the East Mormon Mountain SEZ. This Class I area is not located downwind of prevailing winds at the East Mormon Mountain SEZ (Figure 11.5.13.1-1). The next nearest Class I areas include Zion and Bryce Canyon NPs in Utah, which are located about 62 mi (100 km) and 111 mi (178 km) east–northeast of the SEZ, respectively.

11.5.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low levels of emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using HTFs, fuel could be used to maintain the temperature of the HTFs for more efficient daily start up.) Conversely, use of solar facilities to generate electricity could offset air emissions that would otherwise be released from fossil fuel power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed East Mormon Mountain SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.5.13.3 below identifies SEZ-specific design features of particular relevance to the East Mormon Mountain SEZ.

11.5.13.2.1 Construction

The East Mormon Mountain SEZ site has a relatively flat terrain; thus, only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[9] However, no receptors were modeled for PSD analysis at the nearest Class I areas, Grand Canyon NP in Arizona and Zion NP in Utah, because they are about 58 mi (93 km) and 62 mi (100 km) from the SEZ, respectively, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Instead, several regularly spaced receptors in the direction of the Grand Canyon NP and Zion NP were selected as surrogates for the PSD analysis. For the East Mormon Mountain SEZ, the modeling was conducted based on the following assumptions and input:

- Emissions of 3,000 acres (12.1 km^2) total were uniformly distributed in the southern portion of the SEZ, close to the nearest residences and towns such Bunkerville and Mesquite;

- Surface hourly meteorological data came from the Las Vegas McCarran International Airport and upper air sounding data came from the Mercury/Desert Rock Airport for the 2005 to 2009 period; and

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9 To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/SAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

- A receptor grid was regularly spaced over a modeling domain of 62 mi × 62 mi (100 km × 100 km), centered on the proposed SEZ, and there were additional discrete receptors at the SEZ boundaries.

Results

Modeling results are summarized in Table 11.5.13.2-1 for concentration increments and total concentrations (modeled plus background concentrations) of both PM_{10} and $PM_{2.5}$ that would result from construction-related fugitive emissions. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 567 $\mu g/m^3$, which far exceeds the relevant standard level of 150 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 709 $\mu g/m^3$ would also exceed the standard level at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 10 $\mu g/m^3$ at Mesquite (closest town, about 12 mi [19 km] southeast of the SEZ), about 5 $\mu g/m^3$ at Bunkerville, and less than 4 $\mu g/m^3$ at Moapa Valley towns such as Moapa Valley and Overton. Annual average modeled concentration increments and total concentrations (increment plus background) for PM_{10} at the SEZ boundary would be about 63.7 $\mu g/m^3$ and 89.7 $\mu g/m^3$, respectively, which are higher than the SAAQS level of 50 $\mu g/m^3$. Annual PM_{10} increments would be much lower, about 0.1 $\mu g/m^3$ or less, at all aforementioned towns.

Total 24-hour $PM_{2.5}$ concentrations would be 47.8 $\mu g/m^3$ at the SEZ boundary, which is higher than the NAAQS level of 35 $\mu g/m^3$; modeled increments contribute more than three times the amount of background concentration to this total. The total annual average $PM_{2.5}$ concentration would be 10.4 $\mu g/m^3$, which is lower than the NAAQS level of 15.0 $\mu g/m^3$. At Mesquite, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 0.1 and 0.01 $\mu g/m^3$, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearby Class I Area—Zion NP, Utah—would be about 10.8 $\mu g/m^3$ and 0.17 $\mu g/m^3$, or 135% and 4.2% of the PSD increments for the Class I area, respectively. These surrogate receptors are more than 33 mi (54 km) from the Zion NP; thus, predicted concentrations in Zion NP would be lower than the above values (about 66% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Annual $PM_{2.5}$ concentration levels are predicted to be lower than its standard level. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearby federal Class I areas (Grand Canyon NP and Zion NP). Construction activities are not subject to the PSD program, and the comparison provides only a

TABLE 11.5.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed East Mormon Mountain SEZ

			Concentration (µg/m^3)				Percentage of NAAQS/SAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ SAAQS	Increment	Total
PM_{10}	24 hours	H6H	567	142	709	150	378	473
	Annual	–[d]	63.7	26.0	89.7	50	127	179
$PM_{2.5}$	24 hours	H8H	37.6	10.2	47.8	35	107	136
	Annual	–	6.4	4.1	10.4	15.0	42	69

a $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 µm; PM_{10} = particulate matter with a diameter of ≤10 µm.

b Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

c See Table 11.5.13.1-2.

d A dash indicates not applicable.

screen for gauging the magnitude of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Emissions from the engine exhaust of heavy construction equipment and vehicles have the potential to cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearby federal Class I areas. However, SO_x emissions from engine exhaust would be very low, because programmatic design features would require ultra-low-sulfur fuel with a sulfur content of 15 ppm. NO_x emissions from engine exhaust would be the primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature, and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 500-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ and over a short distance (about 0.25 mi [0.4 km]) to the regional grid. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison to solar facility construction, and would be temporary in nature.

11.5.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power-tower technology, if wet cooling were implemented (drift constitutes low-level PM emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Section M.13.4 of Appendix M.

Estimates of potential air emissions displaced by solar project development at the East Mormon Mountain SEZ are presented in Table 11.5.13.2-2. Total power generation capacity ranging from 797 to 1,435 MW is estimated for the East Mormon Mountain SEZ for various solar technologies (see Section 11.5.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). It is estimated that if the East Mormon Mountain SEZ would eventually have development on 80% of its land, emissions avoided could range from 3.7 to 6.6% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada (EPA 2009c). Avoided emissions could be up to 1.4% of total emissions from electric power systems in the six-state study area. When compared to all source categories, power production from the same solar facilities could displace up to 5.4% of SO_2, 2.0% of NO_x, and 3.6% of CO_2 emissions in the state of Nevada (EPA 2009a; WRAP 2009). These emissions could be up to 0.75% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for about 93% of the total electric power generated in Nevada (EPA 2009c). The contribution of natural gas combustion is about 47%, followed by coal combustion of about 45%. Thus, solar facilities built in the East Mormon Mountain SEZ could displace relatively more fossil fuel emissions than those built in other states that rely less on fossil fuel–generated power.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for high-voltage lines during rain or very humid conditions. Since the proposed East Mormon Mountain SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

TABLE 11.5.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed East Mormon Mountain SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
8,968	797–1,435	1,397–2,514	1,970–3,547	1,690–3,042	0.011–0.020	1,085–1,952
Percentage of total emissions from electric power systems in Nevada[d]			3.7–6.6%	3.7–6.6%	3.7–6.6%	3.7–6.6%
Percentage of total emissions from all source categories in Nevada[e]			3.0–5.4%	1.1–2.0%	–[f]	2.0–3.6%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.79-1.4%	0.46–0.82%	0.38–0.69%	0.41–0.74%
Percentage of total emissions from all source categories in the six-state study area[e]			0.42–0.75%	0.06–0.11%	–	0.13–0.23%

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

[b] A capacity factor of 20% was assumed.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.82, 2.42, 1.6×10^{-5}, and 1,553 lb/MWh, respectively, were used for the state of Nevada.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] A dash indicates not estimated.

Sources: EPA (2009a,c); WRAP (2009).

11.5.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but occur on a more limited scale and are of shorter duration. Potential impacts on ambient air quality would be correspondingly smaller than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.5).

11.5.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed East Mormon Mountain SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

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11.5.14 Visual Resources

11.5.14.1 Affected Environment

The proposed East Mormon Mountain SEZ is located in Lincoln County in southeastern Nevada. It is located 9.3 mi (15.0 km) west of the Arizona and Utah state borders. The SEZ occupies 8,968 acres (36.29 km^2) and extends approximately 5.1 mi (8.2 km) in a north–south direction and is approximately 3.0 mi (4.8 km) wide. The SEZ ranges in elevation from 2,568 ft (782.7 m) in the southeastern portion to 2,840 ft (865.6 m) in the northeastern portion.

The SEZ lies within the Mojave Basin and Range Level III ecoregion, which consists of broad basins and scattered mountains. Heavy use of OHVs and motorcycles in some areas has caused soil erosion, and there is relatively little grazing activity because of the lack of water and forage for livestock. Most land is federally owned. The East Mormon Mountain SEZ is located within the Creosotebush-Dominated Basins Level IV ecoregion, which includes valleys that lie between scattered mountain ranges. These valleys contain stream terraces, floodplains, alluvial fans, isolated hills, mesas, buttes, and eroded washes (Bryce et al. 2003).

The SEZ is located in a valley east of the East Mormon Mountains and south of the Tule Springs Hills. These nearby mountains add significantly to the scenic value of the SEZ. These mountains range in elevation from 3,000 ft (900 m) to more than 5,000 ft (1,500 m). The mountain slopes and peaks surrounding the SEZ generally are visually pristine. The SEZ and surrounding mountain ranges are shown in Figure 11.5.14.1-1.

The SEZ is located within a relatively flat desert floor, with the strong horizon line and surrounding mountain ranges being the dominant visual features. Light-colored, unvegetated playas provide strong color and texture contrast. Toquop Wash is a large, deep wash that roughly bisects the SEZ, running from northwest to southeast, and is a prominent visual feature in some locations within the SEZ. Other washes that generally run from northwest to southeast also add some vertical relief to the SEZ. The surrounding mountains are generally red to brown in color, with distant mountains appearing blue to purple. In contrast, pink to tan gravels dominate the desert floor, which is sparsely dotted with the greens of vegetation. No permanent surface water is present within the SEZ.

Vegetation is generally sparse in much of the SEZ, with widely spaced shrubs growing on more or less barren gravel flats. Vegetation within the SEZ is predominantly scrubland, with creosotebush and other low shrubs dominating the desert floor within the SEZ. Small Joshua trees add short vertical accents and color contrasts that add visual interest to portions of the SEZ. During an August 2009 site visit, the vegetation presented a range of greens (mostly the olive green of creosotebushes) with some grays and tans (from lower shrubs), with medium to coarse textures. Visual interest within the SEZ is generally low.

Other than a few roads and a visually prominent (500-kV) transmission line located outside the SEZ, but within 0.3 mi (0.5 km) of its southeast corner, the area is relatively free of cultural modifications that would detract from scenic qualities of the landscape.

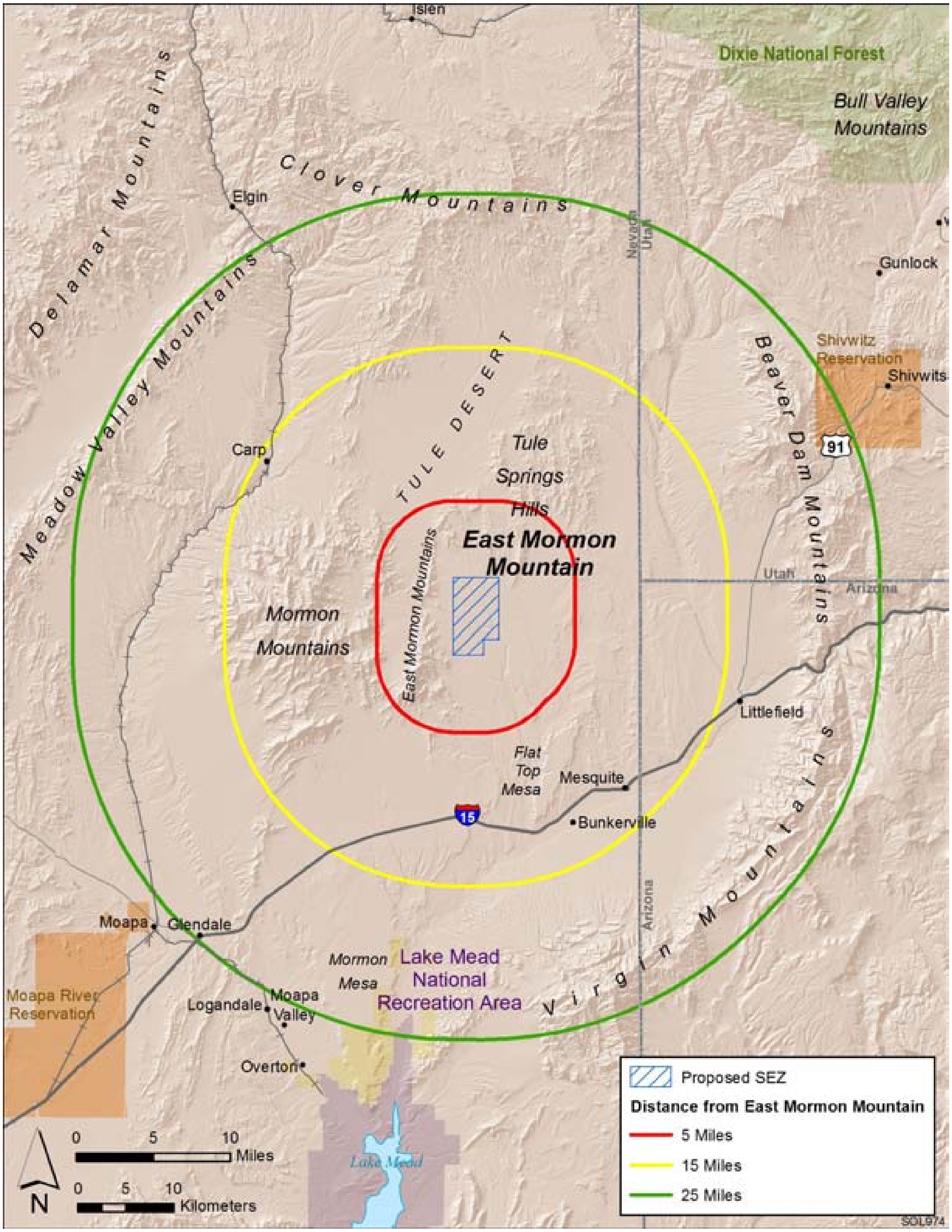

FIGURE 11.5.14.1-1 Proposed East Mormon Mountain SEZ and Surrounding Lands

The general lack of topographic relief, water, and physical variety results in low scenic value within the SEZ itself; however, because of the flatness of the landscape, the lack of trees, and the breadth of the open desert, the SEZ presents a vast panoramic landscape with sweeping views of the surrounding mountains that add significantly to the scenic values within the SEZ viewshed. In general, the mountains appear to be devoid of vegetation; their varied and irregular forms and red to brown colors provide visual contrasts to the strong horizontal line, green vegetation, and pink to tan gravels of the valley floor, particularly when viewed from nearby locations within the SEZ. Panoramic views of the SEZ are shown in Figures 11.5.14.1-2 and 11.5.14.1-3.

The BLM conducted a visual resource inventory (VRI) for the SEZ and surrounding lands in 2007 (BLM 2009d). The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or KOPs. Based on these three factors, BLM-administered lands are placed into one of four VRI Classes, which represent the relative value of the visual resources. Classes I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is presented in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI values for the SEZ are VRI Class III, indicating moderate visual values. Immediately to the west of the SEZ, in the Mormon Mountains, the values are VRI Class II; east of the SEZ, the values are VRI Class IV. The BLM conducted a new VRI for the SEZ and surrounding lands in 2010; however, the VRI was not completed in time for the new data to be included in the draft PEIS. The new VRI data will be incorporated into the analyses presented in the final PEIS.

The *Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement* (BLM 1998b) indicates that the SEZ is managed as VRM Classes III and IV. VRM Class III objectives include partial retention of landscape character and permit moderate modification of the existing character of the landscape. VRM Class IV permits major modification of the existing character of the landscape. More information about the BLM VRM program is presented in Section 5.12 and in *Visual Resource Management,* BLM Manual Handbook 8400 (BLM 1984).

11.5.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed East Mormon Mountain SEZ and surrounding lands, and the impacts of related developments (e.g., access roads and transmission lines) outside of the SEZ, are presented in this section.

FIGURE 11.5.14.1-2 Approximately 180° Panoramic View of the Proposed East Mormon Mountain SEZ Facing North with East Mormon and Mormon Mountains (left) and Tule Hills (center)

FIGURE 11.5.14.1-3 Panoramic View of the Proposed East Mormon Mountain SEZ Facing Southwest toward the East Mormon Mountains (foreground) and Mormon Mountains (background)

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project, a relatively complete and accurate description of its major components, and their layout, it is not possible to precisely assess the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment used in this PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of the PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

11.5.14.2.1 Impacts on the Proposed East Mormon Mountain SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities utilizing highly reflective surfaces or major light-emitting components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby. Additional, and potentially large impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 11.5.22.4.13.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as seen from nearby KOPs. More information about impact determination using the BLM VRM program is presented in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

11.5.14.2.2 Impacts on Lands Surrounding the Proposed East Mormon Mountain SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ would have views of solar facilities in at least some portion of the SEZ (see Appendix M for information on the assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are presented in Appendix N.

Figure 11.5.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, and dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in the figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in this PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]), and for transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 11.5.14.2-2 shows the results of a GIS analysis that overlays selected federal, state, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds in order to illustrate which of these sensitive visual resource areas would have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analyses were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

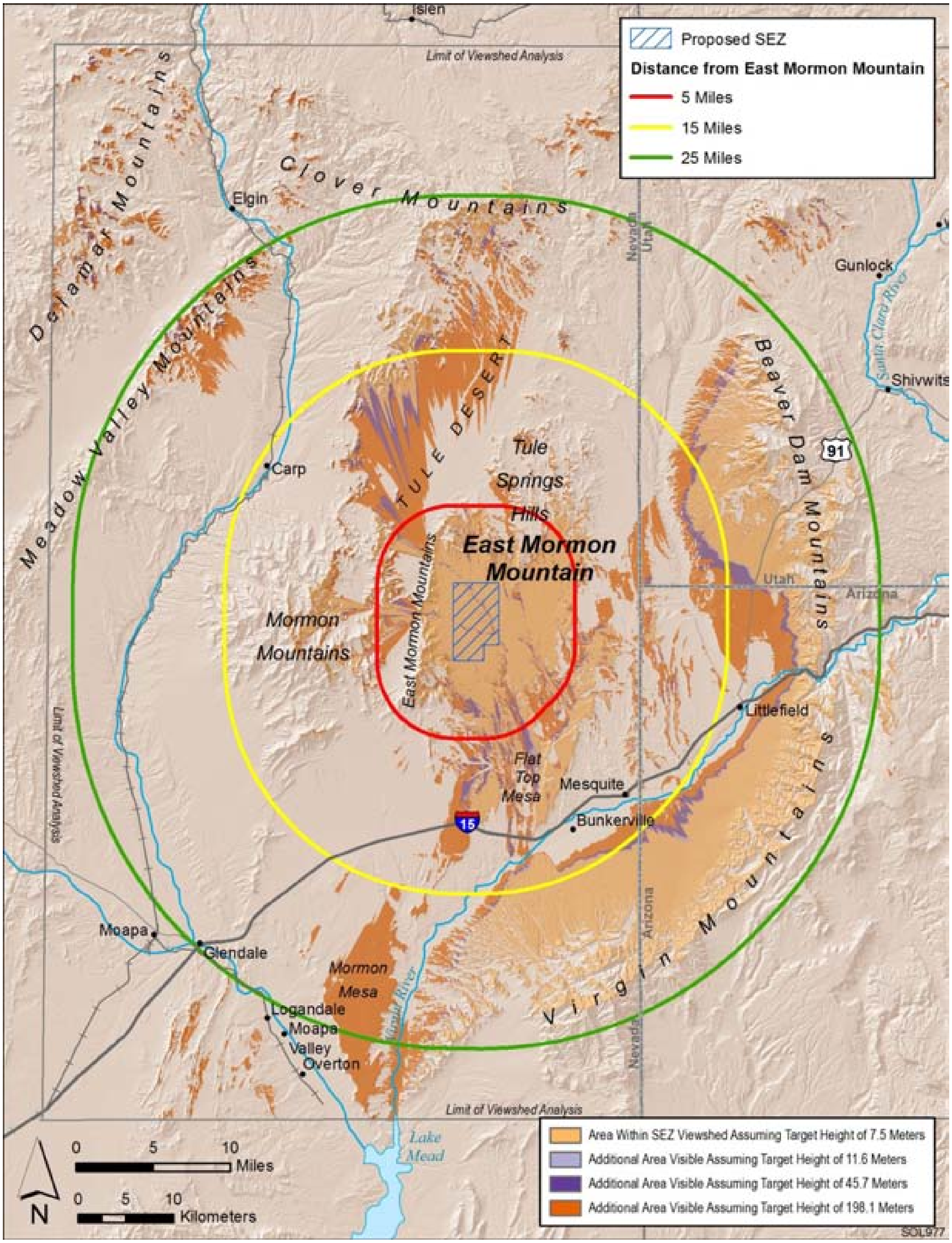

FIGURE 11.5.14.2-1 Viewshed Analyses for the Proposed East Mormon Mountain SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

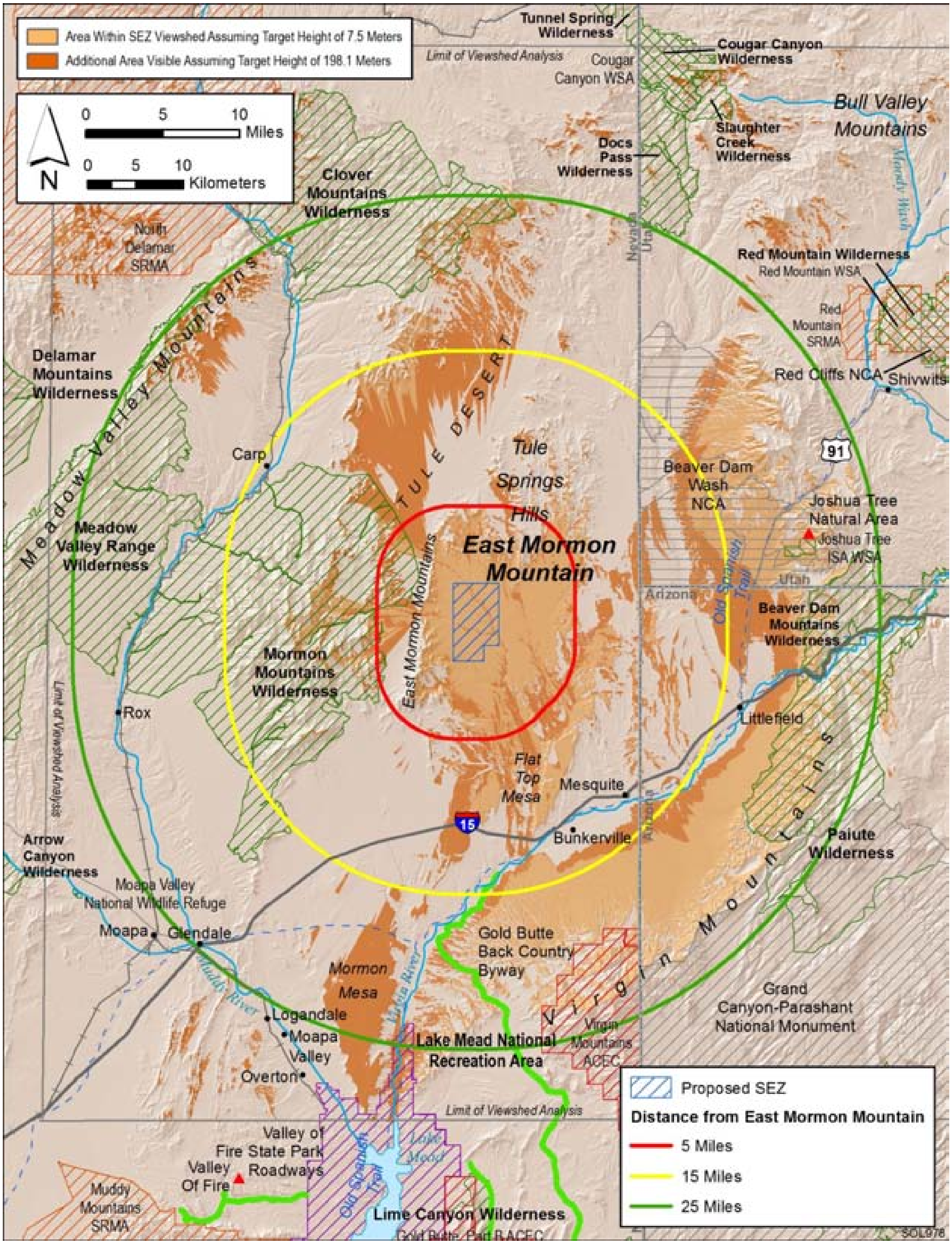

FIGURE 11.5.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed East Mormon Mountain SEZ

- Congressionally authorized Wilderness Areas;
- Wilderness Study Areas;
- National Wild and Scenic Rivers;
- Congressionally authorized Wild and Scenic Study Rivers;
- National Scenic Trails and National Historic Trails;
- National Historic Landmarks and National Natural Landmarks;
- All-American Roads, National Scenic Byways, State Scenic Highways, and BLM- and USFS-designated scenic highways/byways;
- BLM-designated Special Recreation Management Areas; and
- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed East Mormon Mountain SEZ are discussed below. The results of this analysis are also summarized in Table 11.5.14.2-1. Further discussion of impacts on these areas is presented in Sections 11.5.3 (Specially Designated Areas and Lands with Wilderness Character) and Section 11.5.17 (Cultural Resources).

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the landscape as seen by viewers, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations, specific locations from which the project might be viewed, and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12.

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

National Monument

- *Grand Canyon-Parashant*—Grand Canyon-Parashant National Monument occupies 1,045,789 acres (4,232 km^2) and is located about 22 mi (35 km) southeast of the SEZ at the point of closest approach. The National Monument is located on the northern edge of the Grand Canyon, and is jointly managed by the National Park Service (NPS) and the BLM. The National Monument is remote and undeveloped, providing opportunities for solitude. There are no paved roads into the monument and no visitor services.

  As shown in Figure 11.5.14.2-2, within the National Monument, visibility of solar facilities within the SEZ would be limited to the most northwestern portion of the park. The area with views of the SEZ includes about 447 acres (1.8 km^2) in the 650-ft (198.1-m) viewshed, or 0.04% of the total national monument acreage, and 427 acres (1.7 km^2), 0.04%, are within the 24.6-ft (7.5-m) viewshed. The visible area of the National Monument is from the point of closest approach, and a small portion extends to beyond 25 mi (40 km) from the southeastern boundary of the SEZ.

  Within the 25-mi (40- km) SEZ viewshed, solar development in the SEZ could be visible from a number of small areas of land, the largest of which covers approximately 145 acres (0.6 km^2), and the rest are much smaller in size. These areas are located on the peaks and northwest-facing slopes of Virgin Peak Ridge, Lime Kiln Mountain, the Virgin Mountains, and the ridge immediately northwest of Hatchet Valley.

TABLE 11.5.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40-km) Viewshed of the Proposed East Mormon Mountain SEZ, Assuming a Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[b]		
			Visible between	
Feature Type	Feature Name (Total Acreage/Highway Length)[a]	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Monument	Grand Canyon-Parashant, Arizona (1,045,789 acres)	0 acres	0 acres	447 acres (0.04%)
National Recreation Area	Lake Mead National Recreation Area	0 acres	0 acres	558 acres (0.05%)
National Conservation Area	Beaver Dam Wash, Utah (20,667 acres)	0 acres	329 acres (2%)	11,631 acres (56%)
	Beaver Dam Wash Designated Road Area, Utah (51,373 acres)	0 acres	12,335 acres (24%)	9,565 acres (19%)
WAs	Beaver Dam Mountains, Arizona (18,635 acres)	0 acres	0 acres	2,748 acres (15%)
	Clover Mountains (85,621 acres)	0 acres	0 acres	3,471 acres (4%)
	Meadow Valley Range (123,481 acres)	0 acres	0 acres	1,477 acres (1%)
	Mormon Mountains (157,645 acres)	3,143 acres (2%)	12,166 acres (10%)	0 acres
	Pauite, Arizona (87,908 acres)	0 acres	0 acres	15,359 acres (18%)
National Natural Landmark and ISA	Joshua Tree, Utah (1,047 acres)	0 acres	0 acres	744 acres (71%)
National Historic Trail	Old Spanish	0 mi	0.5 mi	15.1 mi (+2.4 mi high potential)
ACECs	Virgin Mountains (35,826 acres)	0 acres	0 acres	6,257 acres (18%)
Scenic Byways	Gold Butte Backcountry (62 mi)	0 mi	0 mi	1.8 mi

[a] To convert acres to km^2, multiply by 0.004047. To convert mi to km, multiply by 1.609.

[b] Percentage of total feature or road length viewable.

Because of the very long distance to the SEZ, the SEZ would occupy a small amount of the horizontal field of view, and the vertical angle of view would be very low, which would reduce the visible area of solar facilities within the SEZ, tending to reduce visual contrasts. Figure 11.5.14.2-3 is a Google Earth visualization of the SEZ as seen from a point on the ridge immediately northwest of Hatchet Valley in the far northwestern portion of the National Monument, about 23 mi (37 km) from the southeastern corners of the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aid for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (140-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, and the tower/heliostat system represents about 100 MW of electric generating capacity. Four power tower models were placed in the SEZ for this and other visualizations shown in this section of this PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 2,400 ft (730 m) higher in elevation than the SEZ. Despite the elevated viewpoint, collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge-on because of the long distance to the SEZ, and they would repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is viewed along its narrower south to north axis, and is far enough away from the viewpoint that it would occupy a very small portion of the horizontal field of view. Operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located, or against the base of the East Mormon Mountains and/or the Tule Hills. If more than 200 ft (61 m) tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Visual contrasts associated with solar facilities within the SEZ would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other visibility factors. Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. Weak levels of visual contrast would also be expected for the other areas in the National Monument contained within the SEZ 25-mi (40-km) viewshed.

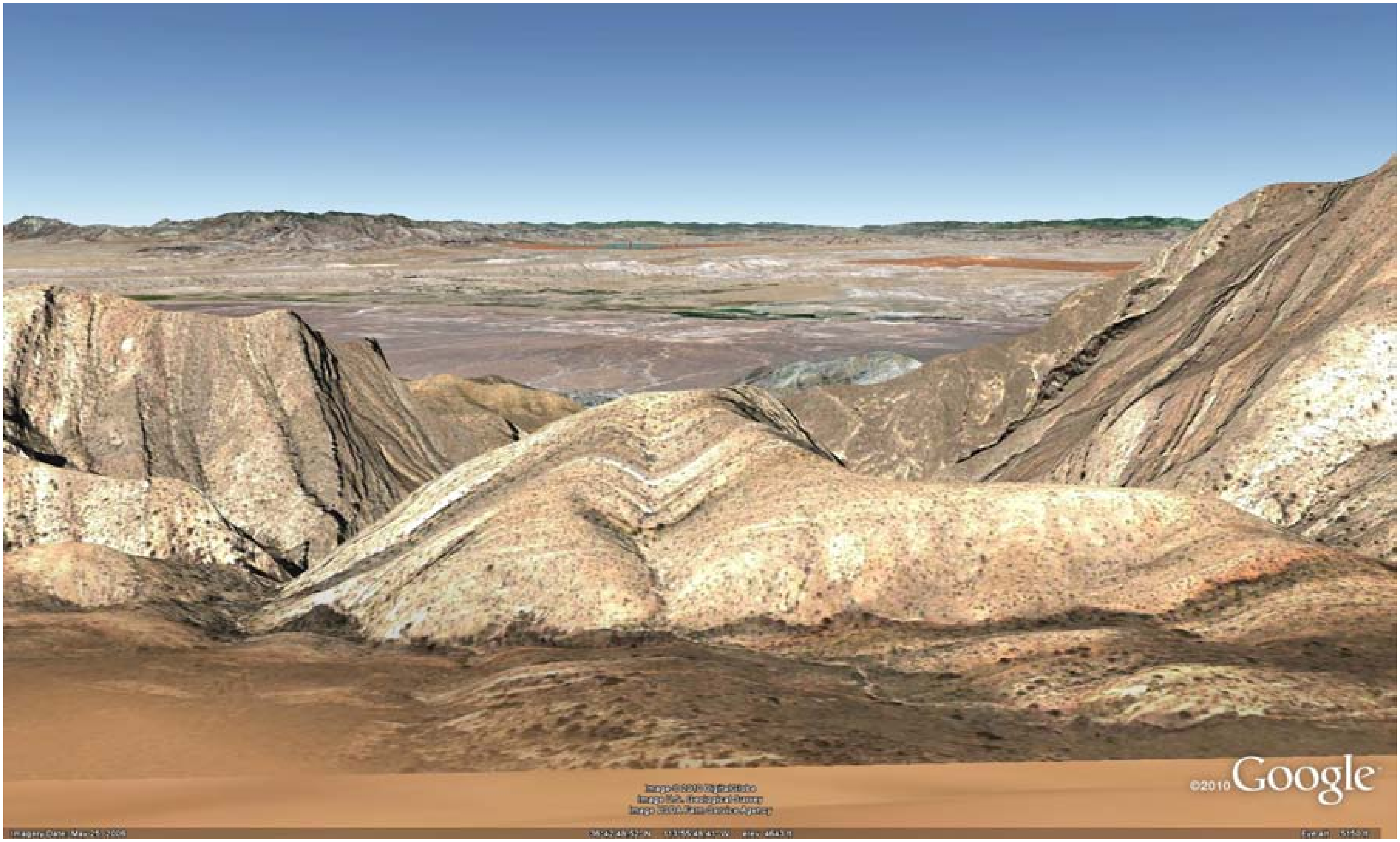

FIGURE 11.5.14.2-3 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint with blue, at center background only) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Grand Canyon-Parashant National Monument

National Recreation Area

- *Lake Mead National Recreation Area*—Lake Mead NRA contains 1,105,951 acres (4,476 km^2) and is located about 24 mi (38 km) south of the SEZ at the point of closest approach. The Lake Mead NRA offers year-round recreational opportunities for boaters, swimmers, and fishermen as well as hikers, wildlife photographers, and roadside sightseers.

  As shown in Figure 11.5.14.2-2, within the NRA, visibility of solar facilities within the SEZ would be limited to the most northern portion of the park. The area within the NRA with views of the SEZ includes about 558 acres (2.3 km^2) in the 650-ft (198.1-m) viewshed, or 0.05% of the total NRA acreage. None of the NRA is within the 24.6-ft (7.5-m) viewshed. The visible area of the NRA extends from the point of closest approach to beyond 25 mi (40 km) from the southern boundary of the SEZ.

  The viewshed analysis indicates that the upper portions of tall power towers located within the SEZ could be visible from the farthest northern sections of the Lake Mead NRA, on and along the Virgin River; however, the river valley is about 1,500 ft (460 m) lower in elevation than the SEZ, and at nearly 24 mi (38 km), the angle of view would be extremely low. If power towers were visible within the SEZ, at most they could span only a very small amount of the horizontal field of view. Furthermore, much of the river valley is heavily vegetated, and some views toward the SEZ are likely screened by vegetation. If visible at all, operating power towers in the SEZ would be seen as distant points of light on the northern horizon. If more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from the NRA at night. Under the 80% development scenario analyzed in the PEIS, visual contrast levels from solar energy development within the SEZ would be expected to be minimal for viewpoints within the Lake Mead NRA.

National Conservation Area

- *Beaver Dam Wash*—The Beaver Dam Wash National Conservation Area (NCA) was designated by Congress through the Omnibus Public Land Management Act of 2009. It is located in southwestern Utah, along the Nevada and Arizona state lines, and is 9.2 mi (14.8 km) from the SEZ at the point of closest approach. The NCA is within an ecological transition zone between the Mojave Desert and the Great Basin. At this time, there are no developed recreational facilities within the NCA.

  The NCA contains 20,667 acres (83.6 km^2), with an additional 51,373 acres (208 km^2) as designated road area. Portions of the Beaver Dam Wash NCA within the 650-ft (198.1-m) viewshed for the East Mormon Mountain SEZ include approximately 11,960 acres (48.4 km^2), or 58% of the total NCA acreage. Portions of the NCA within the 24.6-ft (7.5-m) viewshed encompass about 10,212 acres (41.3 km^2), or 49% of the total NCA acreage. Portions of the Beaver Dam Wash NCA designated road area within the 650-ft (198.1-m) viewshed for the East Mormon Mountain SEZ include approximately 21,900 acres (88.6 km^2), or 43% of the total NCA acreage. Portions of the NCA designated road area within the 24.6-ft (7.5-m) viewshed encompass about 10,845 acres (43.9 km^2), or 21% of the total NCA acreage. The visible area of the NCA extends from the point of closest approach to about 22 mi (35 km) east of the SEZ.

The NCA consists of low-elevation lands in and along Beaver Dam Wash and on the bajada of the Beaver Dam Mountains on the western side of the NCA, and higher-elevation lands in the Beaver Dam Mountains on the eastern side of the NCA. Near Beaver Dam Wash, elevations are similar to or a few hundred feet lower than the SEZ, so the vertical angles of view are very low, and many views are partially or completely screened by intervening topography. In the Beaver Dam Mountains within the NCA, viewpoints are up to 2,300 ft (700 m) or more higher in elevation than the SEZ, with more open views, and slightly higher vertical angles of view, though farther from the SEZ.

Figure 11.5.14.2-4 is a Google Earth visualization of the SEZ as seen from a road on the Beaver Dam Mountains bajada in the western portion of the NCA, on the boundary between the designated road area and the rest of the NCA, about 15 mi (24 km) east–northeast of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 750 ft (240 m) higher in elevation than the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a thin band at the base of the East Mormon and Mormon Mountains. The northern portion of the SEZ would be partially screened by the intervening Tule Hills. Where visible, the collector/reflector arrays of solar facilities within the SEZ would appear edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the line of the valley floor in which the SEZ is located, all of which would tend to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a very small portion of the horizontal field of view, especially given the partial screening by the Tule Hills. Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present), could be visible projecting above the collector/reflector arrays, but depending on visibility factors might not be noticed by casual observers.

At a distance of 15 mi (32 km) or more, operating power tower receivers within the SEZ would likely appear as points of light against the backdrop of the East Mormon and Mormon Mountains. If sufficiently tall, the power

FIGURE 11.5.14.2-4 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint on a Road in the Beaver Dam Wash NCA

towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Given the very low angle of view to the SEZ, the relatively long distance to the SEZ, and partial screening of solar facilities within the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint.

Figure 11.5.14.2-5 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the eastern portion of the NCA, about 19 mi (31 km) east of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 2,400 ft (730 m) higher in elevation than the SEZ, with a slightly elevated and open view of all but the most northern portion of the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a thin band at the base of the East Mormon and Mormon Mountains. The collector/reflector arrays of solar facilities within the SEZ would appear almost edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the line of the valley floor in which the SEZ is located, all of which would tend to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view.

At a distance of 19 mi (31 km) or more, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. In general, under the 80% development scenario analyzed in this PEIS, given the long distance to the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the NCA located within the SEZ 25-mi (40-km) viewshed.

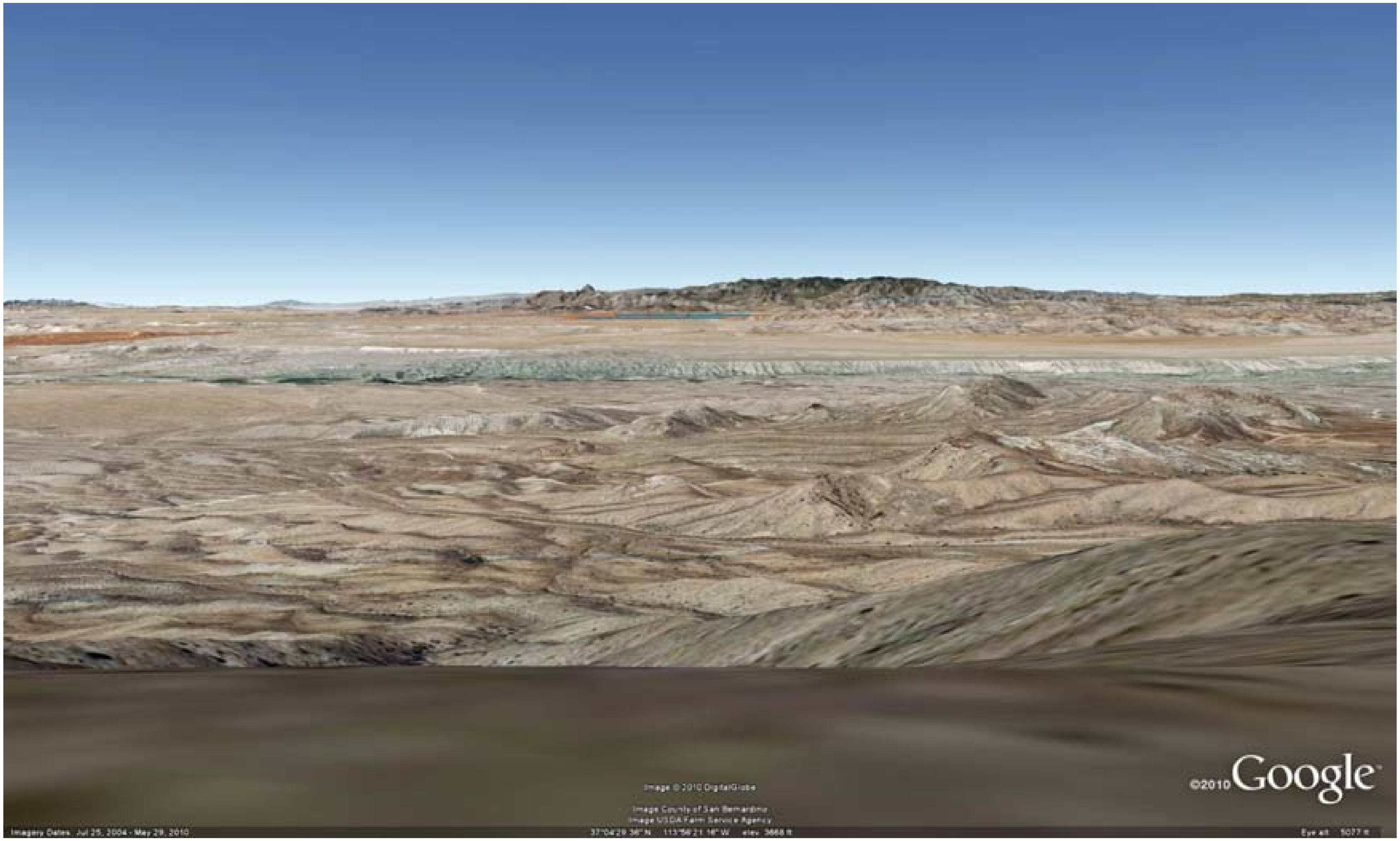

FIGURE 11.5.14.2-5 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Beaver Dam Mountains in Beaver Dam Wash NCA

Wilderness Areas

- *Beaver Dam Mountains*—Beaver Dam Mountains is a 18,635-acre (75.4-km^2) congressionally designated WA located in Arizona, 19 mi (31 km) east of the SEZ. The WA is an increasingly popular destination for primitive recreation. There are no maintained or developed trails within the WA.

  As shown in Figure 11.5.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the western portions of the WA (about 2,748 acres [11.1 km^2] in the 650-ft [198.1-m] viewshed, or 15% of the total WA acreage, and 2,539 acres [10.3 km^2] in the 25-ft [7.5-m] viewshed, or 14% of the total WA acreage). The visible area of the WA extends from the point of closest approach to a small portion beyond 25 mi (40 km) from the eastern boundary of the SEZ.

  Within the WA, many peaks and west-facing slopes within the Beaver Dam Mountains would have open views of the proposed SEZ. Figure 11.5.14.2-6 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the western portion of the WA, about 20 mi (32 km) east of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

  The viewpoint in the visualization is about 800 ft (240 m) higher in elevation than the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a thin band at the base of the East Mormon and Mormon Mountains. The collector/reflector arrays of solar facilities within the SEZ would appear edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the line of the valley floor in which the SEZ is located, all of which would tend to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view.

  At a distance of 20 mi (32 km) or more, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

  Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. In general, under the 80% development scenario analyzed in the PEIS, given the long distance to the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.

FIGURE 11.5.14.2-6 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Beaver Dam Mountains WA

- *Clover Mountains*—Clover Mountains is a 85,621-acre (346.5-km^2) congressionally designated WA located 19 mi (31 km) north to northwest of the SEZ at the point of closest approach. Opportunities for hiking, camping, climbing, and rock scrambling, as well as horseback riding within the WA are outstanding due to the variety of scenic topography.

  As shown in Figure 11.5.14.2-2, within 25 mi (40 km), solar energy facilities within the SEZ could be visible from scattered areas in the southern portion of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total about 3,471 acres (14.1 km^2) in the 650-ft (198.1-m) viewshed, or 4% of the total WA acreage, and 2,396 acres (9.7 km), or 3% of the total WA acreage, are visible within the 24.6-ft (7.5-m) viewshed. The visible area of the WA extends from the point of closest approach to beyond 25 mi (40 km) from the northern boundary of the SEZ.

  Except for the highest elevations in the Clover Mountains, solar facilities within the SEZ would be viewed through narrow gaps in the Tule Hills and would be largely screened from view. In some areas, only the upper portions of tall power towers could be visible, while in a few areas, the upper portions of transmission towers and other taller solar facilities might be seen. Because of the screening, only a very small portion of the SEZ would be visible from these areas; at the long distance to the SEZ, expected visual contrasts would be minimal to weak.

  At higher elevations in the Clover Mountains within the SEZ 25-mi (40-km) viewshed, more of the SEZ would be visible, though much of it would still be screened by the Tule Hills. Figure 11.5.14.2-7 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the southern portion of the WA, about 23 mi (37 km) from the northwest corner of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

  The viewpoint in the visualization is about 4,300 ft (1,300 m) higher in elevation than the SEZ. The mountain top is pinyon-juniper forest, which could partially screen views from this location and other nearby viewpoints. Where visible, solar facilities within the SEZ would be seen just above the Tule Hills. Because of the elevated viewpoint, the tops of collector/reflector arrays of solar facilities within the SEZ would be visible, but because of the very long distance to the SEZ, the facilities would be seen at a very low angle, which would reduce their apparent size and cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a very small portion of the horizontal field of view, particularly in view of the partial screening of the SEZ by the Tule Hills.

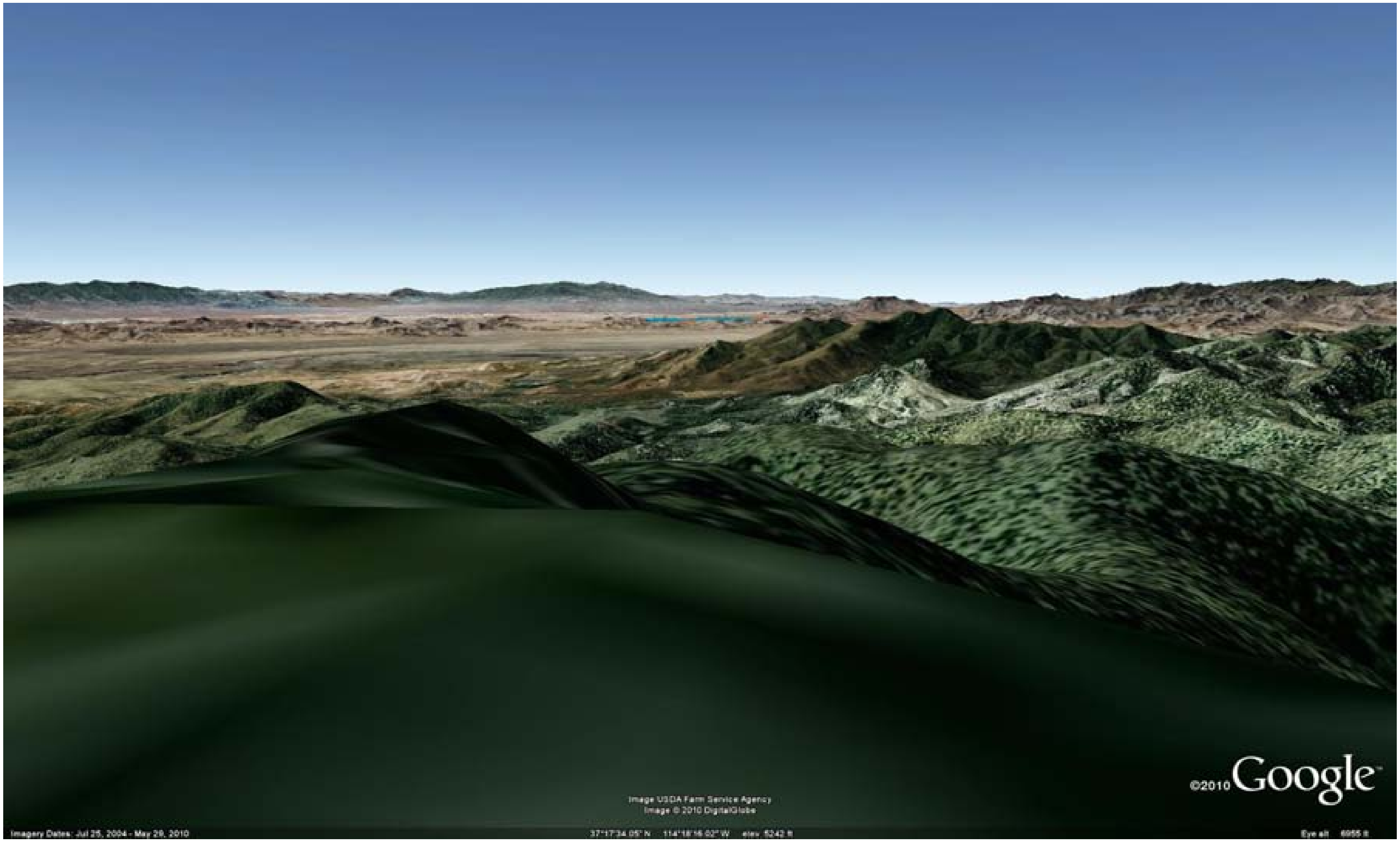

FIGURE 11.5.14.2-7 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint with blue) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Clover Mountains WA

At a distance of 23 mi (37 km) or more, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. In general, under the 80% development scenario analyzed in this PEIS, given the partial screening of solar facilities within the SEZ and the long distance to the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.

- *Meadow Valley Range*—Meadow Valley Range is a 123,481-acre (499.7-km^2) congressionally designated WA located 17 mi (27 km) west to northwest of the SEZ at the point of closest approach. The long ridgeline offers many peaks, narrow canyons and passes to explore.

  As shown in Figure 11.5.14.2-2, within 25 mi (40 km), solar energy facilities within the SEZ could be visible from scattered areas in the far northern portion of the WA, on the southeast-facing slopes of the Meadow Valley Range. Visible areas of the WA within the 25-mi (40-km) radius of analysis total about 1,477 acres (6.0 km^2) in the 650-ft (198.1-m) viewshed, or 1% of the total WA acreage, and 91 acres (0.37 km^2), or 0.07%, are visible in the 24.6-ft (7.5-m) viewshed. The visible area of the WA extends from 23 mi (37 km) northwest of the SEZ, to just within 25 mi (40 km) from the northwestern boundary of the SEZ.

  Views of solar facilities within the SEZ would largely be screened by intervening mountains. In more than 93% of the area within the SEZ 25-mi (40-km) viewshed in the WA, views of low-height solar facilities such as parabolic trough and PV arrays, would be screened from view. In most of these areas, only the upper portions of tall power towers could be visible, although the upper portions of transmission towers and other taller solar facilities might be seen in a few areas. In 12 very small areas totaling 91 acres (0.37 km^2), low-height solar facilities within the SEZ could be visible, but even at these locations, most of the SEZ is screened from view by the Mormon Mountains and East Mormon Mountains, and as a result, the SEZ would occupy a very small portion of the horizontal field of view.

  Despite the elevated viewpoints in the WA, because of the long distance to the SEZ, collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge on, which would reduce their apparent size, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. At more than 17 mi (27 km) away, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located, or against the base of the Virgin Mountains. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Given the partial screening of solar facilities within the SEZ and the long distance to the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.

- *Mormon Mountains*—Mormon Mountains is a 157,645-acre (638.0-km^2) congressionally designated WA located 2.4 mi (3.9 km) west of the SEZ at the point of closest approach. The rocky cliffs, narrow drainages, and rolling bajadas provide numerous opportunities for solitude in the Mormon Mountains WA. Recreational opportunities include camping, hiking, backpacking, hunting, and horseback riding.

  As shown in Figure 11.5.14.2-2, visible areas of the WA within the 25-mi (40-km) radius of analysis total about 15,304 acres (61.9 km^2) in the 650-ft (198.1-m) viewshed, or 10% of the total WA acreage, and 7,803 acres (31.6 km^2) in the 24.6-ft (7.5-m) viewshed, or 5% of the total WA acreage. The visible area of the WA extends from 3.1 mi (5.0 km) to 11 mi (18 km) west of the SEZ's western boundary.

  Solar facilities within the SEZ could be visible from the summits and east-facing slopes of some of the mountains in the eastern part of the WA, at distances from about 3 to 11 mi (5 to 18 km) west of the SEZ's western boundary. From many locations within the WA, views of solar facilities within the SEZ would be largely screened by the intervening East Mormon Mountains, or limited to views of taller solar facilities, or both, but there is a substantial portion of the WA with open or nearly open views of the SEZ. These views are generally through two gaps in the East Mormon Mountains, one directly west of the central portion of the SEZ, and another northwest of the northwest corner of the SEZ.

  Figure 11.5.14.2-8 is a Google Earth visualization of the SEZ as seen through the gap west of the SEZ from a low-elevation viewpoint in the eastern portion of the WA, about 3.9 mi (6.2 km) from the western boundary of the SEZ where visible through the gap. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

FIGURE 11.5.14.2-8 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in blue) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Low-Elevation Viewpoint in Mormon Mountain WA

The viewpoint in the visualization is about 800 ft (240 m) higher in elevation than the SEZ. Solar facilities within the SEZ could be visible through the gap in the East Mormon Mountains, but most of the SEZ would be completely screened from view. Where visible through the gap, collector/reflector arrays of solar facilities within the SEZ would be seen at a very low angle, which would reduce their apparent size, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. However, at 3.9 mi (6.2 km) from the SEZ, if ancillary facilities such as buildings, transmission structures, cooling towers, and plumes (if present) were visible through the gap, they would project above the collector arrays and could create strong visual contrasts with the surrounding landscape in form, line, and color. Furthermore, the view of the SEZ would be "framed" by the gap, which would tend to focus views on the solar facilities within the SEZ, highlighting the contrasts. If operating power towers were visible through the gap, the receivers could appear as brilliant white non-point light sources atop discernable tower structures, viewed against the backdrop of the Virgin Mountains east of the SEZ. They would command visual attention, particularly because of the framed view through the gap. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be conspicuous from this location at night; they would command visual attention, especially given the dark night skies typical of the remote SEZ location. Other lighting associated with solar facilities in the SEZ would likely be visible as well.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, moderate visual contrasts from solar energy development within the SEZ could occur at this viewpoint despite the screening by the East Mormon Mountains if one or more power towers were visible through the gap in the East Mormon Mountains.

Figure 11.5.14.2-9 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the eastern portion of the WA, about 5.6 mi (9.1 km) from the western boundary of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 2,500 ft (760 m) higher in elevation than the SEZ. Solar facilities within the SEZ could be visible through and over the gap in the East Mormon Mountains, and only the southern part of the SEZ would be completely screened from view. From this viewpoint, the SEZ would occupy much of the horizontal field of view. Where visible through and over the gap, collector/reflector arrays of solar facilities within the SEZ would be seen at a relatively high vertical angle, so that the tops of the arrays would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase visual contrast. At 5.6 mi (9.1 km) from the SEZ, ancillary facilities such as buildings, transmission structures, cooling towers, and plumes (if present)

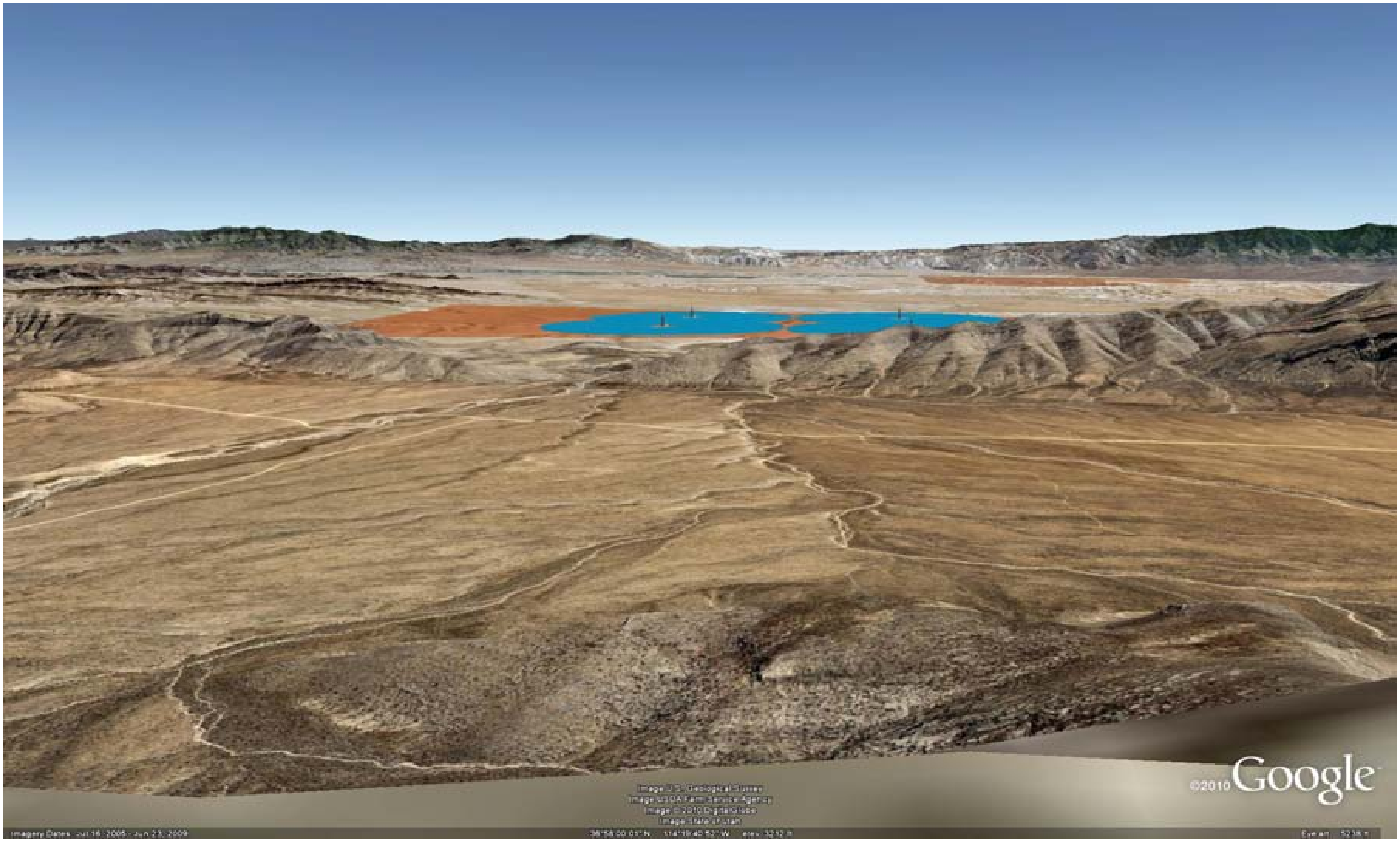

FIGURE 11.5.14.2-9 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from High-Elevation Viewpoint in Mormon Mountain WA

would be visible, and could create strong visual contrasts in form, line, and color with the surrounding landscape, and the strongly horizontal collector/reflector arrays. If operating power towers were visible through the gap, the receivers could appear as very bright non-point light sources atop discernable tower structures, viewed against the backdrop of the valley floor in which the SEZ is located. They would likely strongly command visual attention. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be conspicuous from this location at night; they would command visual attention, especially given the dark night skies typical of the remote SEZ location. Other lighting associated with solar facilities in the SEZ would likely be visible as well.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, under the 80% development scenario analyzed in this PEIS, strong visual contrasts from solar energy development within the SEZ could occur at this viewpoint.

In general, visual contrast levels from solar facilities within the SEZ as seen from viewpoints within the WA would be highly dependent on viewpoint elevation. For low-elevation viewpoints, partial screening and low-angle views would tend to cause weak levels of visual contrast, except where clear views of power towers or highly reflective surfaces were visible through gaps in the East Mormon Mountains; where these views occurred, contrasts could rise to moderate levels. Higher elevation viewpoints on some peaks and high ridges within the WA have clearer views of the SEZ and from higher viewing angles, which would be expected to result in moderate to strong visual contrast levels.

- *Pauite*—Pauite is a 87,908-acre (355.8 km^2) congressionally designated WA located in Arizona, 19 mi (30 km) southeast of the SEZ at the point of closest approach. Mt. Bangs, the highest peak at 8,012 ft (2,442 m), provides a commanding view of the Basin and Range province to the west and the Colorado Plateau to the east (BLM 1990).

  As shown in Figure 11.5.14.2-2, visible areas of the WA within the 25-mi (40-km) radius of analysis total about 15,359 acres (62.2 km^2) in the 650-ft (198.1-m) viewshed, or 18% of the total WA acreage, and 15,087 acres (61.1 km^2) in the 24.6-ft (7.5-m) viewshed, or 17% of the total WA acreage. The visible area of the WA extends from the point of closest approach to beyond 25 mi (40 km) of the SEZ's eastern boundary.

  Within the WA, many peaks and west- and northwest-facing slopes within the Virgin Mountains would have open views of the proposed SEZ. Figure 11.5.14.2-10 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the northern portion of the WA, just east of Hedrick's Canyon, and about 22 mi (35 km) east–southeast of the SEZ.

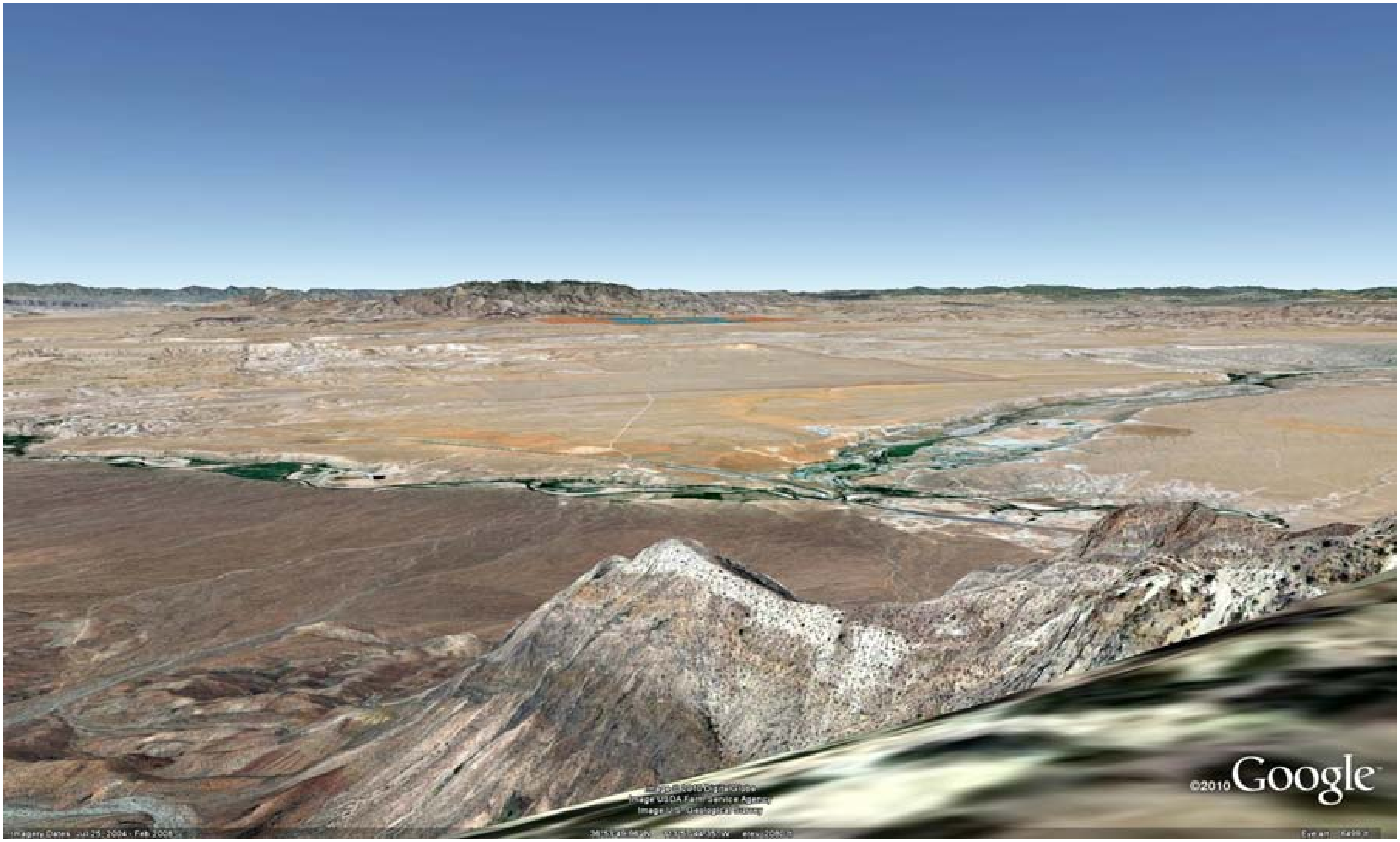

FIGURE 11.5.14.2-10 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Paiute WA

In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 3,800 ft (1,200 m) higher in elevation than the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a thin band at the base of the East Mormon and Mormon Mountains. The collector/reflector arrays of solar facilities within the SEZ would appear nearly edge-on, which would reduce their apparent size, conceal their strong regular geometry, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view.

At a distance of 22 mi (35 km), operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. There are higher elevation viewpoints within the WA that would have higher-angle views of solar facilities within the SEZ, and lower elevation viewpoints that are slightly closer to the SEZ, but in general, because of the long distance to the SEZ, under the 80% development scenario analyzed in this PEIS, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.

Instant Study Area

- *Joshua Tree ISA*—Joshua Tree is a 1,047-acre (4.2-km^2) congressionally designated ISA located 19 mi (31 km) east of the SEZ at the point of closest approach, on the upper slopes of the Beaver Dam Mountains.

  As shown in Figure 11.5.14.2-2, visible areas of the ISA within the 25-mi (40-km) radius of analysis total about 744 acres (3.0 km^2) in the 650-ft (198.1-m) viewshed, or 71% of the total ISA acreage, and 715 acres (2.9 km^2) in the 24.6-ft (7.5-m) viewshed, or 68% of the total ISA acreage. The visible area of the ISA extends about 21 mi (33 km) from the northeastern boundary of the SEZ.

Much of the ISA would have open views of the distant SEZ, but despite elevations more than 2,800 ft (850 m) higher than the SEZ in some locations, because of the long distance to the SEZ the vertical angle of view is low, and the SEZ would occupy only a small portion of the horizontal field of view.

At a distance of 19 mi (31 km) or more, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, where there were unobstructed views, contrasts would be expected to be weak.

National Historic Trail

- *Old Spanish National Historic Trail*—The Old Spanish National Historic Trail is a congressionally designated multi-state historic trail that passes within 12 mi (19 km) of the SEZ at the point of closest approach on the east side of the SEZ. A high potential segment of the trail is located about 18 mi (29 km) south of the SEZ. Nearly 18 mi (29 km) of the trail are within the viewshed to the south and east of the SEZ, including 2.4 mi (3.9 km) of the high-potential segment.

  For about 13 mi (21 km) of the trail within the SEZ 25-mi (40 km) viewshed, including the entirety of the high-potential segment, visibility of solar facilities within the SEZ would be limited to the upper portions of taller power towers. Low-height facility components, such as parabolic trough arrays, heliostats, and PV panels would be potentially visible from about 5 mi (8 km) of the trail, but this section of the trail ranges from about 17 to 22 mi (27 to 35 km) from the SEZ, so the views would be from relatively long distances.

  Solar facilities within the SEZ could be visible from the trail in a number of places. The largest segment with visibility is a 12-mi (19-km) stretch closely paralleling U.S. 91 in a north–south direction between 16 and 19 mi (26 and 31 km) east of the SEZ, after the trail leaves the Virgin Valley and before it enters the Beaver Dam Mountains. Within the southernmost 7 mi (11 km) of this trail segment, visibility would be limited to the upper portions of sufficiently tall power towers within the SEZ, and expected visual contrast levels in this portion of the segment would be minimal. The northern 5 mi (8 km) of the segment would have more or less open views of the SEZ, but at distances exceeding 16 mi (26 km), the SEZ would occupy a very small portion of the horizontal field of view, and the vertical angle of view would be very low. Figure 11.5.14.2-11 is a Google Earth visualization of the SEZ as seen from a point on the trail along U.S. 91 on the bajada of the Beaver Dam Mountains about 18 mi (29 km) east-northeast of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 560 ft (170 m) higher in elevation than the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a very thin band at the base of the East Mormon and Mormon Mountains. The collector/reflector arrays of solar facilities within the SEZ would appear edge-on, which would greatly reduce their apparent size, conceal their strong regular geometry, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view.

At a distance of 18 mi (29 km), operating power tower receivers within the SEZ would likely appear as distant points of light against the backdrop of the East Mormon and Mormon Mountains. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location. Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint.

North of this viewpoint on the trail, viewpoint elevations would be slightly higher, but the viewpoints are farther from the SEZ, and in addition, the trail enters a canyon, the walls of which would screen portions of the SEZ from view. Expected visual contrast levels from solar facilities within the SEZ would not be expected to increase.

South of this viewpoint on the trail, the elevation drops, and views of the SEZ are gradually screened by terrain east of Beaver Dam Wash, resulting in lower visual contrast levels. East of Beaver Dam Wash, the trail elevation drops to 900 to 1,300 ft (280 to 400 m) lower in elevation than the SEZ, greatly limiting visibility of solar facilities in the SEZ and causing the angle of view to be extremely low. Only the upper portions of tall power towers could potentially be visible as distant points of light on the northern horizon. For the 13 mi of the trail within the viewshed where visibility is thus limited, and including the high-potential segment of the trail, the expected visual contrast levels would be minimal. In general, under the 80% development scenario analyzed in this PEIS, minimal to weak visual contrasts would be expected for viewpoints on the Old Spanish National Historic Trail within the SEZ 25-mi (40-km) viewshed.

FIGURE 11.5.14.2-11 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint on Old Spanish National Historic Trail

National Natural Landmark

- *Joshua Tree*—Joshua Tree NNL is about 20 mi (33 km) east of the SEZ, on the upper slopes of the Beaver Dam Mountains. The NNL is located within the Joshua Tree ISA (see analysis above), and where the SEZ is visible within the NNL, expected visual contrasts would be the same as expected for the ISA. Some portions of the NNL may have open views of the distant SEZ, but despite elevations more than 2,800 ft (853 m) higher than the SEZ in some locations, the vertical angle of view is low because of the long distance to the SEZ, and the SEZ would occupy only a small portion of the horizontal field of view. Weak contrast levels would be expected from solar facilities within the SEZ as viewed from the NNL.

Scenic Byway

- *Gold Butte Backcountry Byway*—The Gold Butte Backcountry Byway is a BLM-designated scenic byway that begins approximately 14 mi (23 km) south of the SEZ. As shown in Figure 11.5.14.2-2, approximately 1.8 mi (2.9 km) are within the 650-ft (198.1-m) viewshed of the SEZ, and 0.2 mi (0.3 km) of the byway are within the 24.6-ft (7.5-m) viewshed.

  As the Gold Butte Backcountry Byway traverses the lower slopes of the Virgin Mountains near the Virgin River, there are four short stretches of road where solar facilities within the SEZ could be visible. The longest stretch of the byway with visibility is 1.1 mi (1.7 km) long; in this stretch, visibility would be limited to the upper portions of power towers in the SEZ. If visible, operating power towers would likely appear as points of light against the backdrop of the Tule Hills. Total visibility would not last more than a few minutes, and because the viewpoint is nearly 1,000 ft (304 m) lower in elevation than the SEZ, the angle of view would be extremely low, and the lights would not likely be noticed by the casual viewer. Under the 80% development scenario analyzed in the PEIS, visual contrast levels from solar energy development within the SEZ would be expected to be minimal for viewpoints on the Gold Butte Backcountry Byway.

ACEC Designated because of Outstanding Scenic Qualities

- *Virgin Mountains*—The 35,826-acre (145.0-km^2) Virgin Mountains ACEC is located 19 mi (31 km) southeast of the SEZ at the closest point of approach. The resource values under protection within the Virgin Mountains ACEC include wildlife habitat, scenic, and botanical values (BLM 1998a).

  As shown in Figure 11.5.14.2-2, approximately 6,257 acres (25.32 km^2), or 18% of the ACEC, is within the 650-ft (198.1-m) viewshed of the SEZ, and

6,082 acres (24.6 km^2) is in the 24.6-ft (7.5-m) viewshed, or 17% of the total ACEC acreage. The visible area of the ACEC extends from the point of closest approach to approximately 24 mi (39 km) from the southeastern boundary of the SEZ.

Figure 11.5.14.2-12 is a Google Earth visualization of the SEZ as seen from an unnamed ridge in the far northern portion of the ACEC, about 19 mi (31 km) from the southeast corner of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 1,300 ft (400 m) higher in elevation than the SEZ. Solar facilities within the SEZ would be seen just below the Tule Hills. Despite the elevated viewpoint, because of the long distance to the SEZ, collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge on, which would reduce their apparent size, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view. Operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located, or against the base of the Tule Hills. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. Farther south from this viewpoint within the ACEC, the elevation rises rapidly, so that views of the SEZ would be elevated, which would tend to increase visual contrasts from solar facilities within the SEZ; however, the potentially increased contrast from increased viewing angle is offset by the increased distance to the SEZ, such that expected contrasts would not rise above weak levels for the higher elevation viewpoints. In general, under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would also be expected for viewpoints in the ACEC located within the SEZ 25-mi (40-km) viewshed.

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

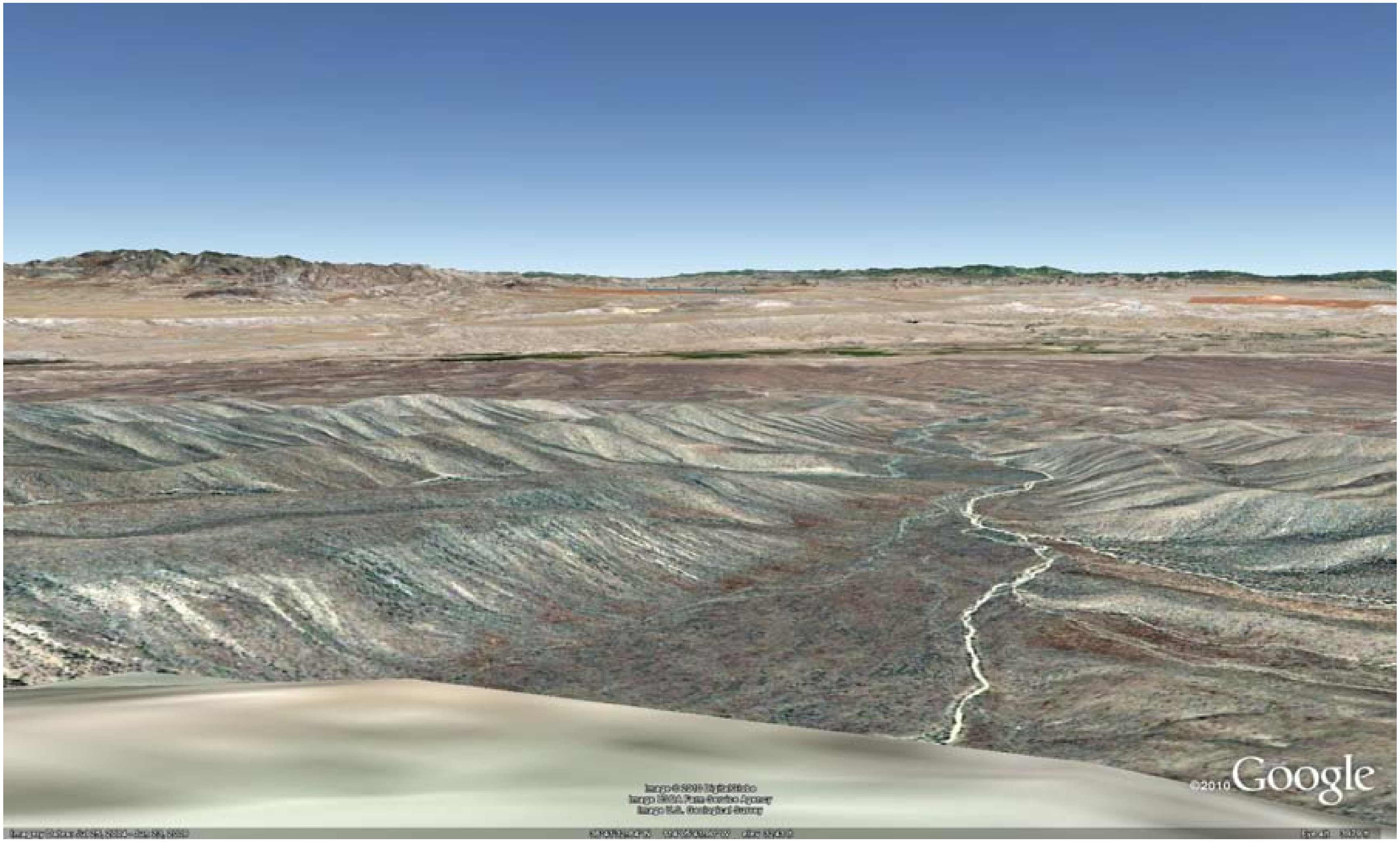

FIGURE 11.5.14.2-12 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint with blue, at center background only) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Virgin Mountains ACEC

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. There is currently a 500-kV transmission line adjacent to the proposed SEZ, so construction and operation of a transmission line outside the proposed SEZ would not be required; however, transmission lines to connect facilities to the existing line would be required. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 500-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. Note that depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

Impacts on Selected Other Lands and Resources

I-15. About 4 mi (6.4 km) of I-15 are within the SEZ viewshed in two segments. One segment a little more than 1 mi (1.6 km) long is located about 11 mi (18 km) south of the SEZ. Visibility of solar facilities within the SEZ in this segment would be limited to the upper portions of tall power towers; views would last less than 1 minute at highway speeds, and expected visual contrast levels would be minimal. The other segment (about 3 mi [5 km] in length) is located about 18 to 20 mi (29 to 32 km) east of the SEZ, east of Littlefield but west of the Beaver Dam Mountains. Visibility of solar facilities within the SEZ in this segment would also be limited to the upper portions of tall power towers. Views would last less than 3 minutes at highway speeds, and expected visual contrast levels would be minimal.

U.S. 91. Almost 11 mi (18 km) of U.S. 91 are within the SEZ viewshed to the east of the SEZ in a stretch running north–south between 16 and 19 mi (26 and 31 km) east of the SEZ, between Littlefield and the Beaver Dam Mountains. Within the southernmost 6 mi (10 km) of the roadway within the viewshed, visibility would be limited to the upper portions of sufficiently tall power towers within the SEZ, and expected visual contrast levels in this portion of the segment would be minimal. The northern 5 mi (8 km) of the segment would have more or less open views of the SEZ, but at distances exceeding 16 mi (26 km) the SEZ would occupy a very small portion of the horizontal field of view, and the vertical angle of view would be very low. Visual contrast levels would be expected to be weak.

Other Impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

11.5.14.2.3 Summary of Visual Resource Impacts for the Proposed East Mormon Mountain SEZ

Under the 80% development scenario analyzed in the PEIS, the SEZ would contain multiple solar facilities utilizing differing solar technologies, as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal, relatively uncluttered, and generally natural appearing landscape of the flat valley in which the SEZ is located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development within the proposed East Mormon Mountain SEZ because of major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within and outside the SEZ.

Under the 80% development scenario analyzed in this PEIS, utility-scale solar energy development within the proposed East Mormon Mountain SEZ is likely to result in strong visual contrasts for some viewpoints within the Mormon Mountains WA, which is within 2.4 mi (3.9 km) of the SEZ at the point of closest approach. Minimal to weak visual contrasts would be expected for some viewpoints within other sensitive visual resource areas within the SEZ 25-mi (40 km) viewshed.

Visitors to the area, workers, and residents of nearby communities may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel other area roads.

11.5.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

The presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

While the applicability and appropriateness of some design features would depend on site- and project- specific information that would only be available after a specific solar energy project had been proposed, there is an SEZ-specific design feature that can be identified for the East Mormon Mountains SEZ at this time.

- The development of power tower facilities should be prohibited within the SEZ.

Application of the SEZ-specific design feature above would substantially reduce visual impacts associated with solar energy development within the SEZ and would substantially also reduce potential visual impacts on Mormon Mountains WA. Application of the SEZ-specific design feature would also reduce impacts on the other sensitive visual resource areas listed above.

11.5.15 Acoustic Environment

11.5.15.1 Affected Environment

The proposed East Mormon Mountain SEZ is located in the southeast corner of Lincoln County in southeastern Nevada. Neither the State of Nevada nor Lincoln County has established quantitative noise-limit regulations applicable to solar energy development.

The proposed East Mormon Mountain SEZ is generally isolated and undeveloped, and its overall character is considered wilderness to rural. No major roads are in proximity to the SEZ. I-15 runs east–west as close as 10 mi (16 km) to the south, and several dirt roads exist in and around the SEZ. A railroad runs north–south 14 mi (23 km) to the northwest. The nearest airport is Mesquite Airport, which is located about 12 mi (19 km) southeast of the SEZ, is under military airspace. The next nearest airport is Overton Municipal Airport, which is located about 27 mi (43 km) south-southwest of the SEZ. There are no agricultural activities in or around the SEZ, but cattle grazing occurs within the SEZ. A local transmission corridor with three large power transmission lines and at least one pipeline runs adjacent to the southeast side of the SEZ. No recreational land use is evident within the SEZ, but some quail and antelope hunting may occur. No sensitive receptors (e.g., residences, hospitals, schools, or nursing homes) exist close to the proposed East Mormon Mountain SEZ. The nearest residences lie about 9 mi (14.5 km) southeast of the SEZ, near Mesquite. Nearby towns include Bunkerville and Mesquite, which are located about 12 mi (19 km) south-southeast and southeast of the SEZ, respectively. Accordingly, noise sources around the SEZ include infrequent road traffic, aircraft flyover, cattle grazing, and possibly hunting. Considering noise sources in and around the SEZ, background noise levels are anticipated to be low.[10] An environmental noise survey has been conducted in the proposed SEZ, and noise levels range from 25 to 50 dBA (BLM 2009f). On the basis of the population density, the day–night average noise level (L_{dn} or DNL) is estimated to be 18 dBA for Lincoln County, well below the range of 33 to 47 dBA L_{dn} typical of a rural area (Eldred 1982; Miller 2002).[11]

11.5.15.2 Impacts

Potential noise impacts associated with solar projects in the East Mormon Mountain SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts on the nearest residences (about 9 mi [14.5 km] to the southeast of the SEZ boundary) associated with operation of heavy equipment would be minimal because of the considerable separation distance. During the operations phase, potential impacts on the nearest residences

[10] The Toquop natural gas–fired power plant is proposed within the southeastern corner of the SEZ (BLM 2009f). If this facility were built and operated, the noise level around the southeast corner of the SEZ would be industrial in character.

[11] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than the daytime level. This can be interpreted as 33 to 47 dBA (mean 40 dBA) during daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

would be anticipated to be minimal as well. If the proposed East Mormon Mountain SEZ were fully developed, potential noise impacts on residences along the roads from commuter, visitor, support, and delivery vehicular traffic to and from the SEZ would be minimal, compared with the current heavy traffic volume along I-15. However, some potential noise impacts on residences along local roads leading to the SEZ would be anticipated if construction-related vehicles travel through either Bunkerville or Mesquite. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed East Mormon Mountain SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional SEZ-specific design features applied (see Section 11.5.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

11.5.15.2.1 Construction

The proposed East Mormon Mountain SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area, where key components (e.g., steam turbine/generator) needed to generate electricity are located; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background levels. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment, and by temperature lapse conditions typical of daytime hours; thus, noise attenuation to a 40-dBA level would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the residences closest to the southern SEZ boundary, estimated noise levels at the nearest residences would be about 17 dBA, which is well below the typical daytime mean rural background level of 40 dBA. In addition, an estimated 40 dBA L_{dn} at these residences[12] (i.e., no

[12] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in a day–night average noise level (L_{dn}) of 40 dBA.

contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas.

In addition, noise levels were estimated at the specially designated areas within a 5-mi (8-km) range of the East Mormon Mountain SEZ, which is the farthest distance at which noise, other than extremely loud noise, would be discernable. There are three specially designated areas within the range where noise might be an issue: Mormon Mesa ACEC, adjacent to the SEZ's southern boundary; Beaver Dam Slope ACEC, about 0.7 mi (1.1 km) east of the SEZ; and Mormon Mountains WA, about 2.3 mi (3.8 km) west of the SEZ. For construction activities occurring near the SEZ boundary close to the specially designated areas, noise levels are estimated to be approximately 74 and 47 dBA at the boundaries of the Mormon Mesa ACEC and Beaver Dam Slope ACEC, respectively, both of which are higher levels than the typical daytime mean rural background level of 40 dBA. As discussed in Section 5.10.2, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, construction noise from the SEZ is not likely to adversely affect wildlife at nearby specially designated areas, except in areas within Mormon Mesa ACEC directly adjacent to the construction site.

Depending on soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet, in contrast to the impulsive impact pile drivers frequently used at large-scale construction sites. Potential impacts on the nearest residences would be anticipated to be negligible, considering the distance to the nearest residences (about 9 mi [14.5 km] from the southern SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction within the proposed East Mormon Mountain SEZ would cause negligible unavoidable, but localized, short-term noise impacts on neighboring communities, even when construction activities occurred near the southern SEZ boundary, close to the nearest residences.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 500-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ and over a short distance (about 0.25 mi [0.4 km]) to the regional grid. Potential noise impacts on nearby residences would be a minor component of construction impacts in comparison to solar facility construction, and would be temporary in nature.

11.5.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area, commuter/visitor/support/delivery traffic within and around the solar facility, and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and firewater pump engines would be additional sources of noise, but their operation would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southern SEZ boundary, the predicted noise level would be about 22 dBA at the nearest residences, located about 9 mi (14.5 km) from the SEZ boundary, which is well below the typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[13]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area, and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. However, day–night average noise levels higher than those estimated above by using simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed East Mormon Mountain SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[14] within 1 or 2 mi (1.6 or 3 km) of the noise source in

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[13] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

[14] A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are lowest. To estimate the day–night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residences (about 9 mi [14.5 km] from the SEZ boundary) would be 32 dBA, which is somewhat higher than the typical nighttime mean rural background level of 30 dBA. The day–night average noise level is estimated to be about 41 dBA L_{dn}, which is still well below the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 41 dBA L_{dn} at the nearest residences, even if TES were used at a solar facility. Consequently, operating parabolic trough or power tower facilities using TES and located near the southern SEZ boundary would result in minimal adverse noise impacts on the nearest residences, depending on background noise levels and meteorological conditions

Associated with operation of solar facilities located near the southern SEZ boundary and using TES, the estimated daytime level of 51 dBA at the boundary of the Mormon Mesa ACEC is higher than the typical daytime mean rural background level of 40 dBA, while the estimated nighttime level of 61 dBA is much higher than the typical nighttime mean rural background level of 30 dBA. For a solar facility located near the eastern SEZ boundary, daytime and nighttime noise levels at the Beaver Dam Slope ACEC are estimated to be 43 and 53 dBA, respectively. However, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988); thus, operations noise from solar facilities with TES is not likely to adversely affect wildlife at the nearby specially designated areas.

In the permitting process, refined noise propagation modeling might be warranted, along with measurement of background noise levels.

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the proposed East Mormon Mountain SEZ, on the basis of the assumption of dish engine facilities of up to 797-MW total capacity (covering 80% of the total area, or 7,174 acres [29.0 km^2]), up to 31,890 25-kW dish engines could be employed. For a large dish engine facility, several hundred step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, about 50 dBA at 1.0 mi (1.6 km) and 46 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field, for example; both values are higher than the typical daytime mean rural background level of 40 dBA. However, these levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed dish engines were placed all over the East Mormon Mountain SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residences, about 9 mi (14.5 km) southeast of the SEZ boundary, would be about 33 dBA, which is below the typical daytime mean rural background level of 40 dBA. On the basis of 12-hr daytime operation, the estimated 40 dBA L_{dn} at these residences (i.e., no contribution from dish engines) is well below the EPA guideline of 55 dBA L_{dn} for residential areas. On the basis of other noise attenuation mechanisms, noise levels at the nearest residences would be lower than the values estimated above. Accordingly, noise from dish engines is not anticipated to cause adverse impacts on the nearest residences, irrespective of background noise levels and meteorological conditions.

For dish engines placed all over the SEZ, estimated noise levels would be about 59 and 50 dBA at the boundaries of the Mormon Mesa ACEC and Beaver Dam Slope ACEC, respectively, both of which are higher levels than the typical daytime mean rural background level of 40 dBA. However, dish engine noise from the SEZ is not likely to adversely affect wildlife at the nearby specially designated areas (Manci et al. 1988), as mentioned above.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the proposed East Mormon Mountain SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be negligible.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and not be heard at the nearest residences, assuming a 9.5-mi (15-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 9 mi [14.5 km] to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be negligible.

For impacts from transmission line corona discharge noise during rainfall events (Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line tower would be about 39 dBA and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. The noise levels at 65 ft (20 m) and 300 ft (91 m) from the center of 500-kV transmission line towers would be about 49 dBA and 42 dBA, typical of high-end and mean, respectively, daytime background noise levels in rural environments. Corona noise includes high-frequency components, which may be judged to be more annoying than other environmental noises. However, corona noise would not likely cause impacts, unless a residence were located close to the source (e.g., within 500 ft [152 m] of a 230-kV transmission line and 0.5 mi [0.8 km] of a 500-kV transmission line). The proposed East Mormon Mountain SEZ is located in an arid desert environment, and incidents of corona discharge would be infrequent. Therefore, potential impacts on nearby residents along the transmission line ROW would be negligible.

11.5.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, as well as disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction, but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minimal and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus negligible.

11.5.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. Due to the considerable separation distances, activities within the proposed East Mormon Mountain SEZ during construction and operation would be anticipated to cause only minimal increases in noise levels at the nearest residences and to have minor impacts on nearby specially designated areas. Accordingly, SEZ-specific design features are not required.

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11.5.16 Paleontological Resources

11.5.16.1 Affected Environment

The surface geology of the proposed East Mormon Mountain SEZ is predominantly thick alluvial deposits (more than 100 ft [30 m] thick), ranging in age from the Pliocene to Holocene, with some discontinuous residual deposits developed in sedimentary rocks in the eastern portion of the SEZ. The total acreage of the alluvial deposits include 8,736 acres (35 km^2), or more than 97% of the proposed SEZ, and the total acreage of the residual materials is 228 acres (0.9 km^2), or 2.5% of the SEZ. Minimal deposits of residual materials developed in fine-grained sedimentary rocks and in igneous and metamorphic rocks occur in the northeast and southwest corners of the SEZ, respectively. These deposits total no more than 2 acres (0.008 km^2) each. In the absence of a PFYC map for Nevada, a preliminary classification of PFYC Class 2 is assumed for the young Quaternary alluvial deposits and the residual materials in sedimentary rocks, similar to that assumed for the Amargosa Valley SEZ (Section 11.1.16; see Section 4.14 for a discussion of the PFYC system). Class 2 indicates a low potential for the occurrence of significant fossil material. Volcanic deposits are typically PFYC Class 1, which indicates that the occurrence of significant fossil materials is nonexistent or extremely rare.

11.5.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in the proposed East Mormon Mountain SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above and are classified as PFYC Class 2 or lower, further assessment of paleontological resources in the SEZ is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found to be present within the proposed East Mormon Mountain SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely, because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new transmission lines are currently anticipated for the proposed East Mormon Mountain SEZ, assuming an existing corridor would be used, but approximately 11 mi (18 km) of a new access road corridor to connect to the nearest interstate is assessed in this PEIS. Approximately 80 acres (0.3 km^2) of disturbance is expected as a result of road construction. The access road corridor would likely be in thick alluvial deposits similar to the SEZ, and would be less likely to impact paleontological resources (preliminary classification of PFYC Class 2). However, depending on the exact location of the access road, some deposits of residual materials developed in carbonate rocks are possible within the corridor, and the potential for paleontological deposits is unknown in these areas. A preliminary classification of PFYC Class 3b is assumed for the residual deposits. A more detailed investigation of the residual deposits is needed prior to project approval. A paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007a, 2008b). Impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

11.5.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features as described in Appendix A, Section A.2.2.

The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations, especially along a potential new access road corridor; however, based on the current level of information, a need for mitigation of areas potentially classified as PFYC Class 2 or lower is not anticipated.

11.5.17 Cultural Resources

11.5.17.1 Affected Environment

11.5.17.1.1 Prehistory

The proposed East Mormon Mountain SEZ is located in the northeastern portion of the Mojave Desert, within the basin and range province in eastern Nevada. The earliest known human use of the area was likely during the Paleoindian Period, sometime between 12,000 and 10,000 years B.P. Surface finds of Paleoindian fluted projectile points, the hallmark of the Clovis culture, have been found in the area, but no sites with any stratigraphic context have been excavated. The Clovis culture is characterized by the aforementioned fluted projectile point and a hunting and gathering subsistence economy that followed migrating herds of Pleistocene mega fauna. The Iola site, located on the western side of the Meadow Valley Mountains in the Kane Spring Valley, about 26 mi (42 km) to the west, is one of the closest Paleoindian sites to the proposed East Mormon Mountain SEZ (BLM 2007c). The ephemeral nature of Paleoindian occupation in the Great Basin has given rise to the idea that Paleoindians may have been inclined to subsist off of the lake and marsh habitats provided by the ancient Pleistocene pluvial lakes that occupied a large portion of the Great Basin; consequently, the sites are difficult to find, because they have been buried by the ebb and flow of the pluvial lakes. This slightly later cultural material associated with the pluvial lake habitations is referred to as the Western Pluvial Lakes Tradition or Lake Mohave cultural complex. It is likely that people from this tradition did not rely entirely on marsh habitats, but were nomadic hunters and gatherers who relied on both wetland resources and those resources located in upland areas. The archaeological assemblage associated with this cultural tradition is characterized by stemmed projectile points, leaf-shaped bifaces, scrapers, crescents, and in some cases groundstone tools for milling plant material. Often the projectile points and tools were made from locally procured obsidian, sources of which were not far from the proposed East Mormon Mountain SEZ; two sources are in Kane Spring Valley and another source is in the Meadow Valley Mountains, about 20 mi (32 km) to the west. Collecting obsidian and other raw materials for tool manufacture, in addition to exploiting different ecological niches for various subsistence resources, was a part of a larger resource exploitation system, in which groups moved in seasonal rounds to take advantage of specific resources in different localities (Jones et al. 2003; Haarklau et al. 2005; Fowler and Madsen 1986).

The Archaic Period in the region began with the recession of most of the pluvial lakes in the area, around 8,000 to 6,000 B.P. Archaic Period groups likely still congregated around the marsh areas but also made use of the vast caves that can be found in the mountains of the Great Basin. The settlement system in some areas was likely based around a central base camp, with temporary camps located on the margins of the territory to exploit resources that were not in the immediate vicinity of the base camp. Other groups may not have had a central base, but were mobile "travelers" rather than "processors" (Jones et al. 2003). Some of the key Archaic sites in the area near the proposed East Mormon Mountain SEZ are Stuart Rockshelter in the lower Meadow Valley Wash area, and Etna Cave, Conaway Shelter, and O'Malley Shelter in the upper portion of the Meadow Valley Wash area. The Archaic archaeological assemblages from these sites maintain some cultural continuity with the previous period; they consist of Pinto points, leaf-shaped bifaces, scrapers, drills, gravers, and manos and metates (Fowler and Madsen 1986).

The Middle Archaic Period, 4,000 to 1,500 B.P., saw the climatic shift known as the Little Pluvial, a wetter and cooler climate that caused some of the pluvial lakes to fill back up. The cultural material of this time period is similar to the Early Archaic, with an increased concentration of milling stones, mortars, and pestles, and the appearance of normally perishable items, such as wicker baskets, split-twig figurines, duck decoys, and woven sandals (Neusius and Gross 2007).

In the vicinity of the proposed East Mormon Mountain SEZ, the Late Archaic Period began around 1,500 B.P. and extended until contact with European explorers. This period saw major technological shifts, evidenced by changes in subsistence techniques, particularly in the use of horticulture, and by smaller projectile points that were more useful because groups began using bow-and-arrow technology instead of the atlatl. During this time period in the Muddy and Virgin River valleys, most groups were a part of the Virgin Anasazi cultural group, an extension of the Puebloan groups from the southwest into the Great Basin region. These groups brought with them the knowledge of horticulture, which they practiced on the floodplains of the river valleys they inhabited. Pueblo Grande de Nevada, located near Overton, Nevada, 31 mi (50 km) south of the SEZ, is a prime example of the Virgin Anasazi culture in the vicinity of the SEZ. The South Fork and Toquop Wash areas in the SEZ may have provided a locale that would have been attractive to Virgin Anasazi groups. Characteristic of this period are Anasazi grey-ware ceramics (sometimes decorated), rock art and intaglios, bedrock milling features, and turquoise mining. Several prehistoric rock alignments have been documented in the proposed East Mormon Mountain SEZ, and there are 9 additional rock alignment sites within 5 mi (8 km) of the SEZ. The Virgin Anasazi groups left the region around 1,000 B.P., at which time Numic-speaking groups migrated into the region, but the exact timing of these events is a subject for further research. These Numic-speaking people were the descendents of the Southern Paiute, and the archaeological assemblage associated with this time period consists of Desert series projectile points, brown-ware ceramics, unshaped manos and milling stones, incised stones, mortars, pestles, and shell beads. The following section describes the cultural history of the time period in greater detail.

11.5.17.1.2 Ethnohistory

The proposed East Mormon Mountain SEZ is located in the heart of the traditional use area of the Southern Paiute. It falls within the territory of the *Paranayi*, or western subtribe, but is close to the lands of the *Yanawant*, or eastern subtribe (Stoffle et al. 1997). It is situated along the Toquop Wash about 13 mi (21 km) upstream from the Virgin River. The Virgin River and its tributaries form the single most important ribbon oasis in Southern Paiute Territory (Stoffle and Dobyns 1983). The proposed SEZ lies in the area where the traditional ranges of the Moapa and the Panaca Bands meet and is close to the territory of the St. George Band (Kelly 1934; Kelly and Fowler 1986). Southern Paiute groups tended to be wide ranging and often shared resources. It is thus likely that neighboring bands were familiar with the area as well. The core settlement and activity areas of the Moapa Band were along the Moapa or Muddy River and the Virgin River. The Panaca Band was centered in Meadow Valley, about 14 mi (23 km) northeast of the proposed SEZ. The St. George Band was centered farther up the Virgin River and on the lower reaches of Santa Clara Creek, about 33 mi (54 km) east-northeast of the proposed SEZ (Kelly 1934).

Southern Paiute

A general account of the Southern Paiutes is given in Section 11.1.17.1.2. This section deals primarily with those Southern Paiutes associated with the Moapa and Virgin Rivers and their neighbors. The Southern Paiute practiced a mixed subsistence economy. They established home bases along the ribbon oases formed by the few streams in the area, maintaining both floodplain and irrigated agricultural fields. They also husbanded wild plants through transplanting, pruning, burning, and irrigation (Stoffle and Dobyns 1983). Seasonally, these groups left their base camps to seek wild plant resources as they became available (Kelly and Fowler 1986). The Southern Paiute supplemented their food supply by hunting and fishing (Kelly and Fowler 1986). Although there are springs in the adjacent hills, the proposed East Mormon Mountain SEZ is arid and Toquop Wash is intermittent. Scatters of lithic and ceramic artifacts, along with stone circles, suggest that Native Americans made use of the area for temporary foraging activities.

The sixteenth-century arrival of Europeans in the southwest initially had indirect, although serious, effects on the Southern Paiutes. The Southern Paiute bands suffered from the spread of Old World diseases and the depredations of the slave trade that supplied Spanish and Mexican markets. The Southern Paiutes retreated from areas such as those along the Old Spanish Trail, where there was an increased presence of Euro-American travelers. In the mid-nineteenth century, the Southern Paiute in Nevada were further displaced by Euro-American settlers, who sought the same limited water supplies the southern Paiutes used Mormon settlers established the “Cotton Mission” on the Virgin River at St. George, Utah, in 1861. As Euro-American settlements grew, the Southern Paiute were drawn into the new economy, often serving as transient wage labor. Settlements or colonies of laborers grew up around Euro-American settlements, farms, and mines, often including individuals from across the Southern Paiute homeland (Kelly and Fowler 1986). A Southern Paiute group had formed around St. George by 1868 (Stoffle and Dobyns 1983).

In 1865, an initial attempt by the U.S. government to settle the Southern Paiutes in northeastern Utah among their traditional enemies, the Utes, failed. The Moapa River Reservation was established in 1875 with the intent of settling all Southern Paiutes there, although the original reservation as authorized by President Ulysses S. Grant was severely reduced by Congress to 1,000 acres (4 km^2) of mostly unirrigable land. Nonetheless, limited commercial farming was established. Though plagued by disease and poor water, the reservation slowly became more prosperous, attracting Southern Paiutes from a variety of bands. Capitalizing on its share of a judgment awarded by the Indian Claims Commission, and the restoration in 1980 of part of the original reservation, Moapa River Reservation has continued to develop into a center of Southern Paiute activity (Stoffle and Dobyns 1983). In 1891, a small reservation was established southwest of St. George for the Shivwits Band. Members of the St. George Band made their way there, and by the end of the century Southern Paiutes no longer farmed along the Santa Clara River. In the first decades of the twentieth century, small reservations were created for the Indian Peak, Koosharem, Kanosh, and Kaibab Bands, and the Southern Paiute colony at Cedar City, Utah, had acquired a small land base. Members of the Panaca Band tended to join the Indian Peak reservation. Where feasible, the Southern Paiute farmed or ranched on these reservations, but mostly the Paiutes served as wage laborers, sometimes travelling great distances. This mobile lifestyle allowed the various bands to retain social and ceremonial ties with one another. In 1954, the four Utah reservations were terminated by the Federal Government and their lands distributed among Tribal members, resulting in the loss of much of the land. The Southern Paiute successfully filed claims with the Indian Claims Commission in the same decade. In 1980, the Paiute Indian Tribe of Utah was created from the terminated Utah bands and the Cedar City colony and restored to federal trust status (Stoffle and Dobyns 1983; Kelly and Fowler 1986).

11.5.17.1.3 History

The earliest documented European presence in the Great Basin region was the Dominguez-Escalante Expedition that began in July of 1776.[15] Two Catholic priests, Fathers Francisco Atanasio Dominguez and Silvestre Velez de Escalante, were looking for a route from the Spanish capital city of Santa Fe to the Spanish settlement of Monterey on the California coast. The group did not initially complete their goal of reaching California. They turned back to Santa Fe when the weather got too bad; however, the maps and journals describing their travels and encounters would prove valuable to later expeditions that traversed the area. These included Spanish/New Mexican traders and Anglo-American fur trappers traveling the Old Spanish Trail in the 1820s and 1830s (BLM 1976).

The Old Spanish National Historic Trail was an evolving trail system generally established in the early nineteenth century. It tended to follow previously established paths used by earlier explorers like Dominguez and Escalante, but also followed those established by Native Americans. Due to a desire to avoid hostile Indian Tribes, as well as natural land formations such as the Grand Canyon, the trail is not a direct route. Several forks and cutoffs were established as more and more travelers made use of the trail system. The 2,700-mi (4,345-km) trail network crosses through six states, and includes various paths between Santa Fe and Los Angeles. It was used primarily between 1829 and 1848 by New Mexican traders exchanging textiles for horses. In 1829, while following the Old Spanish Trail, Antonio Armijio found an oasis that served as a crucial stopping point along the trail. This oasis was named Las Vegas, Spanish for “The Meadows.” By utilizing this oasis, groups traveling on the trail were able to significantly shorten their trip through the harsh desert (Fehner and Gosling 2000). The Old Spanish National Historic Trail is a congressionally designated route; consequently, the trail, trail resources, and setting must be managed in accordance with the National Trail System Act. The closest section of the trail passes about 12 mi (19 km) to the south and east of the

[15] Although it was technically illegal, traders from New Spain (New Mexico) would travel north to acquire Native American slaves for New Mexican settlers from at least the mid-1700s.

proposed East Mormon Mountain SEZ as it follows the Virgin River. A portion of the congressionally designated trail about 15 mi (24 km) southwest of the SEZ near Littlefield, Utah, has been designated a high-potential segment.

With the ratification of the Treaty of Guadalupe Hidalgo in 1848 closing out the Mexican-American War, the area came under American control. In 1847, the first American settlers arrived in the Great Basin, among them Mormon immigrants under the leadership of Brigham Young, who settled in the Valley of the Great Salt Lake in Utah. They sought to bring the entire Great Basin under their control, establishing an independent State of Deseret. From its center in Salt Lake City, the church sent out colonizers to establish agricultural communities in surrounding valleys and missions to acquire natural resources such as minerals and timber. Relying on irrigation to support their farms, the Mormons often settled in the same places as the Fremont and Virgin Anasazi centuries before. The result was a scattering of planned agricultural communities from northern Arizona to southern Idaho and parts of Wyoming, Nevada, and southern California. In 1855, Brigham Young sent 30 men, led by William Bringhurst, to the Las Vegas valley, southwest of the proposed East Mormon Mountain SEZ, in an effort to establish a mission in the southern portion of Nevada. They called their mission Las Vegas Fort, but only stayed in the area for a few years before abandoning the mission because of the harsh climate and the closing of the nearby Potosi mine that provided the majority of the income and patronage at the mission. About 30 mi (48 km) north of the proposed East Mormon Mountains SEZ was a small Mormon settlement, Clover Valley, where Mormons farmed and raised stock beginning in the late 1860s. Neighboring Washington County in Utah was home to the Mormon Cotton Mission, an area that was intensively cultivated for the procurement of cotton in the early 1860s in an effort to allow the Mormons to become more self-sufficient (Paher 1970; Fehner and Gosling 2000).

Nevada's nickname is the "Silver State," so named for the Comstock Lode strike near Virginia City in 1859, about 280 mi (451 km) northwest of the proposed East Mormon Mountain SEZ. This was the first major silver discovery in the United States, and with the news of the strike hopeful prospectors flocked to the area in an effort to capitalize on the possible wealth under the surface of the earth. The discovery of the Comstock Lode led to the creation of Virginia City and other nearby towns that served the burgeoning population. The population increase due to mining was so dramatic that while in 1850 there were less than a dozen non-native people in the State of Nevada, by 1860 there were 6,857, and by 1875 an estimated 75,000 people had settled in the state. The Comstock Lode strike is important to the history of Nevada, not just because of the population growth and significant amount of money that was consequently brought to the area, but also because of technological innovations that were created and employed in the mines. The use of square-set timbering, which kept loose soil from collapsing on miners, was one concept that was eventually employed in other mines around the world (Paher 1970).

Mining for valuable deposits occurred in all regions of the state of Nevada, including in the vicinity of the proposed East Mormon Mountain SEZ. The most notorious mining district in Lincoln County was Pioche, about 65 mi (105 km) north of the proposed East Mormon Mountain SEZ. Pioche was a violent, Wild West town that was one of the most prosperous districts in the county. The closest mining district to the proposed SEZ was the Gourd Spring Mining District.

Located on the eastern slopes of the East Mormon Mountains, this mine produced tungsten, barite, gypsum, and magnesium. Other notable mines near the SEZ were the Whitmore mine in the Mormon Mountains to the west, the Key West Mine, a copper mine near Glendale, Nevada, the Viola and Vigo Mining Districts in the Clover Mountains to the north of the SEZ, and the Delamar Mine about 45 mi (72 km) northwest of the SEZ, which accounted for over half of the state's ore output during the down years at the turn of the nineteenth century. Mining today is not a major concern in the area, and the mineral production was never sufficient to attract large numbers of miners to the area or allow them to construct any permanent camps; most of the camps in the vicinity of the SEZ were temporary and short lived. The construction of railroads in Nevada was often directly related to the mining activities that occurred in the state; the San Pedro–Los Angeles–Salt Lake Railroad acted as a stimulant to the depraved mining economy with its construction in 1905. The still-used railroad runs through the Meadow Valley Wash area, about 20 mi (32 km) to the west of the proposed East Mormon Mountain SEZ (Paher 1970; Tingley 1998; Rusco and Muñoz 1983).

Nevada's desert-mountain landscape has made it a prime region for use by the U.S. government for several decades. In October of 1940, President Franklin D. Roosevelt established the Las Vegas Bombing and Gunnery Range, a 3.5-million-acre (14,000-km^2) parcel of land northwest of Las Vegas, near Indian Springs, Nevada, 82 mi (132 km) southwest of the SEZ. At the start of the Cold War in 1948, the range was renamed the Nellis Air Force Base; three years later, the Nevada Test Site (NTS), a U.S. Department of Energy facility, was established within Nellis Air Force Base. For the next 41 years, testing of nuclear weapons occurred throughout regions of the NTS, in addition to regular Air Force training missions. Although the proposed East Mormon Mountain SEZ does not fall within the specific boundaries of these government installations, they are important contributors to the overall history and context of the region.

11.5.17.1.4 Traditional Cultural Properties—Landscape

The Southern Paiutes have traditionally taken a holistic view of the world, in which the sacred and profane are inextricably intertwined. According to their traditions, they were created in their traditional use territory and have a divine right to the land, along with a responsibility to manage and protect it. Landscapes as a whole are often culturally important. An adverse effect on one part diminishes the rest (Stoffle 2001). From a Southern Paiute perspective, landscapes include places of power. Among the most important such places are sources of water; peaks, mountains, and elevated features; caves; distinctive rock formations; and panels of rock art. Places of power are important to the religious beliefs of the Southern Paiute. They may be sought out for individual vision quests or healing and may also be associated with culturally important plant and animal species. The view from such a point of power or the ability to see from one important place to another can be an important element of its integrity (Stoffle and Zedeño 2001b). Landscapes as a whole are tied together by a network of culturally important trails (Stoffle and Dobyns 1983; Stoffle and Zedeño 2001a).

The proposed East Mormon Mountain SEZ is located in an arid area bisected by Toquop Wash. Scattered archaeological remains of Native American activities within the SEZ suggest that they foraged there. The area was in reach of Southern Paiute base camps, or rancherias, located along the Virgin and Santa Clara Rivers and Meadow Valley Wash. Springs, rock shelters, caves, petroglyphs, and pictographs have been found in the East Mormon Mountains to the west of the proposed SEZ, forming a cultural landscape potentially important to the Southern Paiute. The Salt Song Trail, ritually of great importance to the Southern Paiute, approaches this part of Nevada (BLM 2009f). Consultation with affected Tribes will be necessary to determine whether it will be affected by the development of solar facilities in the proposed SEZ. Descendants of the Moapa, Panaca, and St. George Bands have placed high cultural importance on springs, burial sites, religious sites, trails, shrines, and rock art (Stoffle and Dobyns 1983).

11.5.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources

The proposed East Mormon Mountain SEZ has had seven surveys conducted within its boundaries, encompassing 78 acres (0.31 km^2) and covering 0.9% of the SEZ. An additional 41 surveys have been conducted within 5 mi (8 km) of the SEZ. These surveys have resulted in the recording of four sites within the proposed East Mormon Mountain SEZ and 45 sites within 5 mi (8 km) of the SEZ boundary. The four sites located in the proposed East Mormon Mountain SEZ are all prehistoric in nature; three of the sites are rock alignments and one is a lithic scatter; the sites were determined not to be eligible for listing in the NRHP (de Dufour 2009).

Most of the sites (37 of 45) that have been documented within 5 mi (8 km) of the SEZ are prehistoric, and the remaining eight sites are historic. At least 11 of these 45 sites are potentially eligible for listing in the NRHP. Most of the prehistoric sites are rock shelters, roasting pits, or rock alignments, and the historic sites are either trash scatters or road features (de Dufour 2009).

A portion of the congressionally designated Old Spanish National Historic Trail passes about 12 mi (19 km) to the south of the proposed East Mormon Mountain SEZ, as the trail follows the Virgin River. Some portions of this congressionally designated trail are high potential segments; they are located approximately 15 mi (24 km) to the southeast of the proposed SEZ.

The proposed East Mormon Mountain SEZ has the potential to contain significant cultural resources, in addition to the four previously mentioned sites. The areas near the South Fork and Toquop Wash could have provided temporary sources of water. Petroglyphs have been documented on the eastern portion of the East Mormon Mountains and in the Toquop Gap area, indicating that the area was used by indigenous groups throughout the course of the history of the region.

The BLM has designated an ACEC in the vicinity of the proposed East Mormon Mountain SEZ to protect cultural resource values. This is the Virgin River ACEC 12 mi (19 km) to the south of the SEZ, portions of which are also located in nearby Arizona and maintained by the Arizona Strip Field Office. There are several other ACECs with important cultural resources in the area, but they are more than 25 mi (40 km) from the SEZ.

National Register of Historic Places

There are no sites listed in the NRHP in the proposed East Mormon Mountain SEZ, or within 5 mi (8 km); however, the aforementioned 11 sites that are located within 5 mi (8 km) of the SEZ are considered potentially eligible.

Several sites listed in the NRHP are located in the Mesquite and Bunkerville areas, communities situated about 12 mi (19 km) to the south of the proposed East Mormon Mountain SEZ, along the Virgin River in neighboring Clark County. These sites include the Desert Valley Museum and the Mesquite High School Gymnasium, in Mesquite, and the Hunt, Parley House and Levitt, Thomas House in Bunkerville, as well as the Old Spanish National Historic Trail. Lincoln County maintains nine properties in the NRHP, all of which are farther than 25 mi (40 km) away from the proposed SEZ. Three of the properties are archaeological sites between 45 and 75 mi (72 and 121 km) from the SEZ; the Black Canyon Petroglyph Site in the Pahranagat National Wildlife Refuge west of the SEZ, the Panaca Summit Archaeological District north of the SEZ, and the White River Narrows Archaeological District northwest of the SEZ. The other six properties are historic sites near the towns of Caliente and Pioche.

11.5.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed East Mormon Mountain SEZ; however, further investigation is needed in a number of areas. A cultural resources survey of the entire APE of a proposed project would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP. The proposed East Mormon Mountain SEZ has a high potential for containing archaeological sites in the South Fork and Toquop Wash areas. Possible impacts from solar energy development on cultural resources that are encountered within the SEZ or along related ROWs are described in more detail in Section 5.15. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

Programmatic design features to reduce water runoff and sedimentation would reduce the likelihood of indirect impacts on cultural resources resulting from erosion outside of the SEZ boundary (including along ROWs). No needs for new transmission lines have currently been identified, assuming an existing line would be used. An access road would need to be constructed to the SEZ, the closest road being I-15, about 11 mi (18 km) to the south. The construction of this road would result in the disturbance of approximately 80 acres (0.32 km^2). Impacts on cultural resources are possible in areas related to the access road, since new areas of potential cultural significance could be directly impacted by construction or opened to increased access due to road construction and use. Indirect impacts are also possible from unauthorized collection of artifacts or vandalism, depending on the proximity of the road to historic properties. Impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

The congressionally designated Old Spanish National Historic Trail and aforementioned NRHP sites in the Mesquite/Bunkerville area are located south of the proposed East Mormon Mountain SEZ, and would likely not be physically affected by solar development in the SEZ. However, these cultural resources could be affected from a visual standpoint, although the Flat Top Mesa would probably screen or block the view of the solar development from the southeast portion of the SEZ. The rock art sites that are located on the eastern portions of the East Mormon Mountains and in the Toquop Gap area could potentially be affected. Depending on the significance of these sites and whether they are considered sites of traditional cultural importance, there is a potential for visual and auditory effects on these locations as a result of solar energy development in the proposed SEZ.

11.5.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features, cultural awareness training for the workforce, and measures for addressing possible looting/vandalism issues through formalized agreement documents, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

- Avoidance of the South Fork and Toquop Wash areas is recommended because these areas have a higher potential for containing significant sites.

- Coordination with the Trail Administration for the Old Spanish Trail and Old Spanish Trail Association is recommended to identify potential mitigation strategies for avoiding or minimizing potential impacts, if impacts are identified in future studies, on the congressionally designated Old Spanish National Historic Trail.

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11.5.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns that are specific to Native Americans or to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. Topics of general concern are addressed in Section 4.16. Specifically for the proposed East Mormon Mountain SEZ, Section 11.5.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 11.5.8 discusses mineral resources; Section 11.5.9.1.3 discusses water rights and water use; Section 11.5.10 discusses plant species; 11.5.11 discusses wildlife species, including wildlife migration patterns; Section 11.5.13 discusses air quality; Section 11.5.14 discusses visual resources; Sections 11.5.19 and 11.5.20 discuss socioeconomics and environmental justice, respectively. Issues of human health and safety are discussed in Section 5.21.

11.5.18.1 Affected Environment

The proposed East Mormon Mountain SEZ is within the Tribal traditional use area generally attributed to the Southern Paiute (Kelly and Fowler 1986). All federally recognized Tribes with Southern Paiute roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 11.5.18.1-1. Details of government-to-government consultation efforts are presented in Chapter 14; a listing of all federally recognized Tribes contacted for this PEIS is provided in Appendix K.

TABLE 11.5.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed East Mormon Mountain SEZ

Tribe	Location	State
Chemehuevi Indian Tribe	Lake Havasu	California
Kaibab Paiute Tribe	Fredonia	Arizona
Las Vegas Paiute Tribe	Las Vegas	Nevada
Moapa Band of Paiutes	Moapa	Nevada
Pahrump Paiute Tribe	Pahrump	Nevada
Paiute Indian Tribe of Utah	Cedar City	Utah
Cedar Band	Cedar City	Utah
Indian Peak Band	Cedar City	Utah
Kanosh Band	Kanosh	Utah
Koosharem Band	Cedar City	Utah
Shivwits Band	Ivins	Utah
San Juan Southern Paiute Tribe	Tuba City	Arizona

11.5.18.1.1 Southern Paiute Territorial Boundaries

The traditional territory of the Southern Paiute lies mainly in the Mojave Desert, stretching from California to the Colorado Plateau. It generally follows the northern and western banks of the Colorado River, including its tributary streams and canyons in southern Nevada and Utah. It includes most of Clark and Lincoln Counties in Nevada and extends as far north as Beaver County in Utah (Kelly and Fowler 1986). Most of their traditional range, including the lands for the proposed East Mormon Mountain SEZ, has been judicially recognized as the traditional use area of the Southern Paiute by the Indian Claims Commission (Royster 2008).

11.5.18.1.2 Plant Resources

The Southern Paiutes continue to make use of a wide range of indigenous plants for food, medicine, construction materials, and other uses. The vegetation present at the proposed East Mormon Mountain SEZ is described in Section 11.5.10. The cover type present at the SEZ is almost entirely Sonora–Mojave Creosotebush–White Bursage Desert Shrub, with small pockets of North American Warm Desert Playa (USGS 2005a). The proposed SEZ is sparsely vegetated, at least in part because much of it burned in 2005. The deeply cut Toquop Wash runs diagonally from northwest to southeast across the proposed SEZ. Smaller tributary washes cross much of the SEZ. Creosotebush and white bursage are the dominant species; of these, creosotebush has Native American medicinal uses. As shown in Table 11.5.18.1-2, there are likely to be some plants used by Native Americans for food in the SEZ (Stoffle et al. 1999; Stoffle and Dobyns 1983). Project-specific analyses will be needed to determine the presence of these plants at any proposed building site. Traditional plant knowledge is found most abundantly among Tribal elders, especially female elders (Stoffle et al. 1999).

11.5.18.1.3 Other Resources

Members of the Moapa Band of the Southern Paiutes rate springs as the most important cultural resource in their cultural landscape. Water is an essential prerequisite for life in the arid areas of the Great Basin. As a result, water is a keystone of desert cultures' religion. They consider all water sacred and a purifying agent. Water sources are often associated with rock art. Springs are often associated with powerful beings, and hot springs in particular figure in Southern Paiute creation stories. Water sources are seen as connected, so damage to one damages all (Fowler 1991; Stoffle and Zedeño 2001a). Tribes are also sensitive regarding the use of scarce local water supplies for the benefit of far-distant communities and recommend determination of adequate water supplies as a primary consideration in determining whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

Wildlife likely to be found in the proposed East Mormon Mountain SEZ is described in Section 11.5.11. Although now restricted, in the past, the hunting of sheep was an important part of Southern Paiute culture and had religious significance, as reflected in the many panels of sheep petroglyphs found throughout Southern Paiute territory. Bighorn sheep are present in the East Mormon Mountains and Mormon Mountains of the SEZ and in the Tule Spring Hills to the

TABLE 11.5.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed East Mormon Mountain SEZ

Common Name	Scientific Name	Status
Food		
Desert trumpet (buckwheat)	*Eriogonum inflatum*	Observed
Dropseed	*Sporobolus* spp.	Possible
Indian rice grass	*Oryzopsis hymenoides*	Observed
Iodine bush	*Allenrolfea occidentalis*	Possible
Joshua tree	*Yucca brevifolia*	Observed
Prickly pear cactus	*Opuntia* spp.	Possible
Saltbush	*Atriplex canescens*	Observed
Seablite	*Suaeda diffusa*	Possible
Wolfberry	*Lycium andersonii*	Possible
Medicine		
Creosotebush	*Larrea tridentata*	Observed
Mormon tea	*Ephedra nevadaensis*	Possible
Palmer's phacelia	*Phacelia palermi*	Possible

Sources: Field visit; USGS (2005a); Fowler (1986); Stoffle and Dobyns (1983); Stoffle et al. (1999).

north. Mule deer habitat occurs in the Mormon Mountains about 5 mi (8 km) west (BLM 2009f). The desert tortoise was once a food source for the Moapa Band, but it is now often mentioned by the Moapa Band as a species that should be protected (Stoffle and Dobyns 1983). The SEZ is desert tortoise habitat and borders critical habitat to the south (BLM 2009f). Because of the general aridity of the SEZ, few game species traditionally important to Native Americans occur within the SEZ (see Table 11.5.18.1-3). Among the most important is the black-tailed jack rabbit (*Lepus californicus*) (Stoffle and Dobyns 1983; Kelly and Fowler 1986). Other small game species important to Native Americans that can be found in the SEZ include desert cottontails (*Sylvilagus audubonii*) and woodrats (*Neotoma lepida*). Other animals traditionally important to the Southern Paiute include lizards, which are likely to occur in the SEZ, and the golden eagle (*Aquila chrysaetos*).

Other natural resources traditionally important to Native Americans include clay for pottery, salt, naturally occurring mineral pigments for the decoration and protection of the skin, and turquoise for ritual purposes (Stoffle and Dobyns 1983)

11.5.18.2 Impacts

The Southern Paiutes tend to take a holistic view of their traditional homeland. For them, cultural and natural features are inextricably bound together. Effects on one part have ripple effects on the whole. Western distinctions between the sacred and the secular have no meaning

TABLE 11.5.18.1-3 Animal Species Used by Native Americans as Food with Ranges That Include the Proposed East Mormon Mountain SEZ

Common Name	Scientific Name	Status
Mammals		
Badger	*Taxidea taxus*	All year
Black-tailed jackrabbit	*Lepus californicus.*	All year
Bobcat	*Lynx rufus*	All year
Desert cottontail	*Silvilagusaudubonii*	All year
Desert woodrat	*Neotoma lepida*	All year
Kangaroo rats	*Dipodomys* spp.	All year
Kit fox	*Vulpes macotis*	All year
Mule deer	*Odocoileus hemionus*	All year
Pocket gopher	*Thomomys bottae*	All year
Pocket mouse	*Perognathus* sp.	All year
Pocket mouse	*Chaetodipus* spp.	All year
Porcupine	*Erethizon dorsatum*	All year
Red fox	*Vulpes vulpes*	All year
Rock squirrel	*Spermophilus variegates*	All year
Birds		
Golden eagle	*Aquila chrysaetos*	All year
Greater roadrunner	*Geococcyx californianus*	All year
Mourning dove	*Zenaida macroura*	All year
Reptiles		
Large lizards	Various species	All year

Sources USGS (2005b); Fowler (1986); Stoffle and Dobyns (1983).

in their traditional worldview (Stoffle and Dobyns 1983). While no comments specific to the proposed East Mormon Mountain SEZ have been received from Native American Tribes to date, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. Typically, the Southern Paiute have concerns over adverse effects on a wide range of resources. They consider springs and burial grounds of highest importance (Stoffle and Dobyns 1983). Other sites and features are often seen as important because they are the location of or have ready access to a range of plant, animal, and mineral resources (Stoffle et al. 1997). Resources considered important include plants used for food, medicine, basketry, and in construction; large and small game animals; birds; and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those resources likely to occur within the proposed East Mormon Mountain SEZ are discussed in Section 11.5.18.1.2. Geophysical features and physical cultural remains are discussed in Section 11.5.17.1.4.

The development and operation of utility-scale solar energy facilities in the proposed East Mormon Mountain SEZ would require tapping into the water resources at Tule Spring just north of the SEZ. Other springs are located in the Tule Springs Hills and East Mormon Mountains. Significant drawdown from Tule Springs or groundwater could affect these culturally important traditional resources. However, implementation of programmatic design features, as discussed in Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

The most likely traditional use of the lands proposed for the East Mormon Mountain SEZ is foraging. The development of a solar energy facility would result in the loss of some plants traditionally used by Native Americans. However, vegetation is sparse in the proposed SEZ. The state would require that the developer allow any Joshua trees that would be uprooted to be transplanted prior to the start of development. The same vegetation cover types are wide-spread in the surrounding area. It is therefore likely that effects on these resources would be minimal (see Section 11.5.10). Similarly, although the habitat of traditionally important animal species, such as the black-tailed jackrabbit, would be disturbed, there likewise is an abundance of similar habitat in the area (see Section 11.5.11). This should be confirmed by consultation with affected Native American Tribes when specific projects are proposed.

As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express additional concerns over potential visual, acoustic and other effects on specific resources and any culturally important landscapes within or adjacent to the proposed SEZ.

11.5.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features that would address impacts of potential concern to Native Americans, such as avoidance of sacred sites, water sources, and tribally important plant and animal species, are provided in Appendix A, Section A.2.2. Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 11.5.17.3, in addition to the programmatic design features for historic properties presented in Section A.2.2 in Appendix A.

The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with affected Tribes listed in Table 11.5.18.1-1.

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11.5.19 Socioeconomics

11.5.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed East Mormon Mountain SEZ. The ROI is a three-county area comprising Clark and Lincoln Counties in Nevada and Washington County in Utah. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

11.5.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 984,248 (Table 11.5.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was higher in Lincoln County (5.1%) than in Washington County (4.8%) and Clark County (3.2%). At 3.3%, the growth rate in the ROI as a whole was higher than the average rate for Nevada (2.7%) and Utah (2.1%).

In the ROI in 2006, the services sector provided the highest percentage of employment at 58.7%, followed by wholesale and retail trade at 15.1% and construction at 11.9% (Table 11.5.19.1-2). Within the three counties in the ROI, the distribution of employment across

TABLE 11.5.19.1-1 ROI Employment in the Proposed East Mormon Mountain SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Clark County, Nevada	675,693	922,878	3.2
Lincoln County, Nevada	1,048	1,731	5.1
Washington County, Utah	37,351	59,639	4.8
ROI	714,362	984,248	3.3
Nevada	978,969	1,282,012	2.7
Utah	1,080,441	1,336,556	2.1

Sources: U.S Department of Labor (2009a,b).

TABLE 11.5.19.1-2 ROI Employment in the Proposed East Mormon Mountain SEZ by Sector, 2006

Industry	Clark County, Nevada		Lincoln County, Nevada		Washington County, Utah		ROI	
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	213	0.0	130	16.1	381	0.9	724	0.1
Mining	522	0.1	38	4.7	20	0.1	580	0.1
Construction	100,817	11.6	60	7.4	7,838	7.2	108,715	11.9
Manufacturing	25,268	2.9	0	0.0	3,202	3.0	28,470	3.1
Transportation and public utilities	38,529	4.4	70	8.7	2,832	20.6	41,131	4.5
Wholesale and retail trade	128,498	14.8	259	32.1	9,292	24.1	138,049	15.1
Finance, insurance, and real estate	56,347	6.5	51	6.3	2,139	8.3	58,537	6.4
Services	516,056	59.6	376	46.7	18,818	33.0	535,250	58.7
Other	105	0.0	0	0.0	10	0.0	115	0.0
Total	866,093		806		44,495		911,394	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009a,b).

sectors is different from that of the ROI as a whole, with employment in services (59.6%) and construction (11.6%) higher in Clark County than in the other two counties in the ROI, while employment in transportation and public utilities (4.4%), and agriculture (0.0%) were lower than in the other counties in the ROI.

11.5.19.1.2 ROI Unemployment

The average rate in Lincoln County over the period over the period 1999 to 2008 was 5.2%, slightly higher than the rate in Clark County (5.0%), and higher than the rate for Washington County (Table 11.5.19.1-3). The average rate in the ROI over this period was 5.0%, the same as the average rate for Nevada. Unemployment rates for the first 11 months of 2009 contrast with rates for 2008 as a whole; in Clark County the unemployment rate increased to 11.1%, while in Lincoln County the rate reached 8.0%, and in Washington County it increased to 7.1%. The average rates for the ROI (10.8%) and for Nevada (11.0%) and Utah (5.2%) as a whole were also higher during this period than the corresponding average rates for 2008.

11.5.19.1.3 ROI Urban Population

The population of the ROI in 2008 was 59% urban. The largest city, Las Vegas, had an estimated population of 562,849; other large cities in Clark County are Henderson (253,693) and North Las Vegas (217,975) (Table 11.5.19.1-4). In addition, there are two smaller cities in the county, Mesquite (16,528) and Boulder City (14,954). There are a number of unincorporated urban areas in Clark County that are not included in the urban population, meaning that the percentage of the county population not living in urban areas is overstated. The largest urban area in Washington County, St. George, had an estimated 2008 population of 71,702; other

TABLE 11.5.19.1-3 ROI Unemployment Rates for the Proposed East Mormon Mountain SEZ (%)

Location	1999–2008	2008	2009[a]
Clark County, Nevada	5.0	6.6	11.1
Lincoln County, Nevada	5.2	5.4	8.0
Washington County, Utah	4.1	4.6	7.1
ROI	5.0	6.5	10.8
Nevada	5.0	6.7	11.0
Utah	4.1	3.4	5.2

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

TABLE 11.5.19.1-4 ROI Urban Population and Income for the Proposed East Mormon Mountain SEZ

City	Population 2000	Population 2008	Population Average Annual Growth Rate, 2000–2008 (%)	Median Household Income ($ 2008) 1999	Median Household Income ($ 2008) 2006–2008	Median Household Income ($ 2008) Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Apple Valley	NA[b]	460	NA	NA	NA	NA
Boulder City	14,966	14,954	0.0	65,049	NA	NA
Caliente	1,123	1,191	0.7	33,260	NA	NA
Enterprise	1,285	1,617	2.9	45,957	NA	NA
Henderson	175,381	253,693	4.7	72,035	67,886	–0.7
Hilldale	1,895	1,952	0.4	42,010	NA	NA
Hurricane	8,250	13,149	6.0	42,314	NA	NA
Ivins	4,450	7,729	7.1	53,171	NA	NA
La Verkin	3,392	4,448	3.4	46,285	NA	NA
Las Vegas	478,434	562,849	2.1	56,739	55,113	–0.3
Leeds	547	756	4.1	53,110	NA	NA
Mesquite	9,389	16,528	7.3	52,005	NA	NA
North Las Vegas	115,488	217,975	8.3	56,299	60,506	0.2
Rockville	247	261	0.7	48,819	NA	NA
Santa Clara	4,630	6,767	4.9	67,942	NA	NA
Springdale	457	573	2.9	53,570	NA	NA
St. George	49,663	71,702	4.7	47,001	47,308	0.1
Toquerville	910	1,351	5.1	43,824	NA	NA
Virgin	394	551	4.3	47,578	NA	NA
Washington	8,816	17,452	9.9	45,502	NA	NA

[a] Data are averages for the period 2006 to 2008.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009b–d).

urban areas in the county are Washington (17,452) and Hurricane (13,149) (Table 11.5.19.1-4). In addition, there are 12 other urban areas in the county. Most of these cities are less than 100 mi (160 km) from the site of the proposed SEZ.

Population growth rates in the ROI have varied over the period 2000 to 2008 (Table 11.5.19.1-4). Washington grew at an annual rate of 9.9% during this period, with higher-than-average growth also experienced in North Las Vegas (8.3%), Mesquite (7.3%), Ivins (7.1%) Hurricane (6.0%), and Henderson (4.7%). The cities of Las Vegas (2.1%), Caliente (0.7%), and others experienced a lower growth rate, while Boulder City (0.0%) experienced a static growth rate between 2000 and 2008.

11.5.19.1.4 ROI Urban Income

Median household incomes vary across urban areas in the ROI. Of the four cities for which data are available for 2006 to 2008, Henderson ($67,886) and North Las Vegas ($60,506) had median incomes higher than the average for Nevada ($56,348), while median incomes in Las Vegas ($55,113) were slightly lower than the state average. Median incomes in St. George ($47,308) were also lower than the state average for Utah ($56,484) (Table 11.5.19.1-4).

Growth rates between 1999 and 2006 to 2008 were small in North Las Vegas (0.2%), and St. George (0.1%), and negative in Henderson (–0.7%), and Las Vegas (–0.3%). The average median household income growth rate as a whole over this period was –0.2% for Nevada, and –0.5% in Utah.

11.5.19.1.5 ROI Population

Table 11.5.19.1-5 presents recent and projected populations in the ROI and for the two states as a whole. Population in the ROI stood at 2,019,414 in 2008, having grown at an average annual rate of 4.0% since 2000. Growth rates for ROI were higher than those in Nevada (3.4%) and Utah (2.5%) over the same period.

Each county in the ROI experienced growth in population between 2000 and 2008; population in Clark County grew at an annual rate of 4.0%, while population in Washington County grew by 5.2% and 1.4% in Lincoln County. The ROI population is expected to increase to 2,977,752 by 2021 and to 3,079,077 by 2023.

TABLE 11.5.19.1-5 ROI Population for the Proposed East Mormon Mountain SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Clark County, Nevada	1,375,765	1,879,093	4.0	2,710,303	2,791,161
Lincoln County, Nevada	4,165	4,643	1.4	5,350	5,412
Washington County, Utah	90,354	135.678	5.2	262,099	282,504
ROI	1,470,284	2,019,414	4.0	2,977,752	3,079,077
Nevada	1,998,257	2,615,772	3.4	3,675,890	3,779,745
Utah	2,233,169	2,727,343	2.5	3,546,228	3,666,248

Sources: U.S. Bureau of the Census (2009e,f); Nevada State Demographers Office (2008).

11.5.19.1.6 ROI Income

Total personal income in the ROI stood at $77.5 billion in 2007 and has grown at an annual average rate of 5.0% over the period 1998 to 2007 (Table 11.5.19.1-6). Per-capita income also rose over the same period at a rate of 0.7%, increasing from $35,664 to $38,327.

Per-capita incomes were higher in Clark County ($40,307) than in Lincoln County ($24,121) and Washington County ($23,499) in 2007. Growth rates in total personal income have been higher in Clark County (5.0%) and Washington County (5.1%) than in Lincoln

TABLE 11.5.19.1-6 ROI Personal Income for the Proposed East Mormon Mountain SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Clark County, Nevada			
Total income[a]	45.7	74.1	5.0
Per-capita income	36,509	40,307	1.0
Lincoln County, Nevada			
Total income[a]	0.1	0.1	0.7
Per-capita income	24,711	24,121	-0.2
Washington County, Utah			
Total income[a]	2.0	3.3	5.1
Per-capita income	23,726	23,499	–0.1
ROI			
Total income[a]	47.8	77.5	5.0
Per-capita income	35,664	39,250	1.0
Nevada			
Total income[a]	68.9	105.3	4.3
Per-capita income	37,188	41,022	1.0
Utah			
Total income[a]	61.9	82.4	2.9
Per-capita income	28,567	31,003	0.8

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of the Census (2009e,f).

County (0.7%). Personal income growth rates were higher in the ROI (5.0%) than in Nevada (4.3%) and Utah (2.9%), but per-capita income growth rate in Clark and Lincoln Counties were the same, or slightly less than in Nevada (1.0%) and in Utah (0.8%). The per-capita income growth rates for Lincoln County (-0.2%) and Washington County (−0.1%) were both negative.

Median household income in 2006 to 2008 varied from $41,173 in Lincoln County, to $49,747 in Washington County, to $56,954 in Clark County (U.S. Bureau of the Census 2009d).

11.5.19.1.7 ROI Housing

In 2007, more than 808,400 housing units were located in the three ROI counties; about 93% of these were in Clark County (Table 11.5.19.1-7). Owner-occupied units compose approximately 60% of the occupied units in the three counties, with rental housing making up 40% of the total. Vacancy rates in 2007 were 29.3% in Lincoln County, 17.1% in Washington County, and 12.2% in Clark County; with an overall vacancy rate of 12.6% in the ROI There were 101,695 vacant housing units in the ROI in 2007, of which 40,476 are estimated to be rental units that would be available to construction workers. There were 13,082 units in seasonal, recreational, or occasional use in the ROI at the time of the 2000 Census, with 1.5% of vacant housing units in Clark County, 12.0% in Washington County, and 14.0% in Lincoln County used for seasonal or recreational purposes.

Housing stock in the ROI as a whole grew at an annual rate of 4.4% over the period 2000 to 2007, with 209,990 new units added to the existing housing stock (Table 11.5.19.1-7).

The median value of owner-occupied housing in 2006 to 2008 varied from $80,300 in Lincoln County, $139,500 in Clark County to $139,800 in Washington County (U.S. Bureau of the Census 2009g).

11.5.19.1.8 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 11.5.19.1-8. In addition, three Tribal governments are located in the ROI; members of other Tribal groups are located in the county, but their Tribal governments are in adjacent counties or states.

11.5.19.1.9 ROI Community and Social Services

This section describes educational, health-care, law enforcement, and firefighting resources in the ROI.

TABLE 11.5.19.1-7 ROI Housing Characteristics for the Proposed East Mormon Mountain SEZ

Parameter	2000	2007
Clark County, Nevada		
Owner-occupied	302,834	393,453
Rental	209,419	268,572
Vacant units	47,546	92,144
Seasonal and recreational use	8,416	NA[a]
Total units	559,799	754,169
Lincoln County, Nevada		
Owner-occupied	1,156	1,204
Rental	384	400
Vacant units	638	664
Seasonal and recreational use	305	NA
Total units	2,178	2,268
Washington County, Utah		
Owner-occupied	22,128	30,795
Rental	7,811	12,326
Vacant units	6,539	8,887
Seasonal and recreational use	4,362	NA
Total units	36,478	52,008
ROI		
Owner-occupied	326,118	425,452
Rental	217,614	281,298
Vacant units	54,732	101,695
Seasonal and recreational use	13,082	NA
Total units	598,455	808,455

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h-j).

Schools

In 2007, the three-county ROI had a total of 375 public and private elementary, middle, and high schools (NCES 2009). Table 11.5.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Washington County schools (22.1) is higher than that in Clark County (19.0) and Lincoln County schools (13.3), while the level of service is much higher in Lincoln County (18.2) than elsewhere in the ROI, where there are fewer teachers per 1,000 population (Clark County, 8.7; Washington County, 7.8).

TABLE 11.5.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed East Mormon Mountain SEZ

Governments	
City	
Apple Valley, Utah	Mesquite, Nevada
Boulder City, Nevada	North Las Vegas, Nevada
Caliente, Nevada	Rockville, Utah
Enterprise, Utah	Santa Clara, Utah
Henderson, Nevada	Springdale, Utah
Hilldale, Utah	St. George, Utah
Hurricane, Utah	Toquerville, Utah
Ivins, Utah	Virgin, Utah
La Verkin, Utah	Washington, Utah
Las Vegas, Nevada	
County	
Clark County, Nevada	Washington County, Utah
Lincoln County, Nevada	
Tribal	
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada	
Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada	
Paiute Indian Tribe of Utah	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

TABLE 11.5.19.1-9 ROI School District Data for the Proposed East Mormon Mountain SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Clark County, Nevada	303,448	15,930	19.0	8.7
Lincoln County, Nevada	1,074	81	13.3	18.2
Washington County, Utah	24,357	1,103	22.1	7.8
ROI	328,879	17,113	19.2	8.7

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

Health Care

The total number of physicians and the number of physicians per 1,000 population is higher in Clark County (4,220; 2.3) than in Washington County (277; 2.0) and in Lincoln County (2; 0.4) (Table 11.5.19.1-10).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 11.5.19.1-11). Lincoln County has 26 officers and would provide law enforcement services to the SEZ; there are 3,214 officers in Clark County and 45 officers in Washington County. Levels of service of police protection per 1,000 population are 5.8 in Lincoln County, 1.7 in Clark County, and 0.3 in Washington County. Currently, there are 1,002 professional firefighters in the ROI (Table 11.5.19.1-11).

11.5.19.1.10 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism, illicit drug use, mental health, and divorce, which might be used as indicators of social change, are presented in Tables 11.5.19.1-12 and 11.5.19-1.13, respectively.

There is some variation in the level of crime across the ROI, with higher rates of violent crime in Clark County (8.3 per 1,000 population) than in Washington County (2.0) and Lincoln County (1.3) (Table 11.5.19.1-12). Property-related crime rates are also higher in Clark County

TABLE 11.5.19.1-10 Physicians in the Proposed East Mormon Mountain SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Clark County, Nevada	4,220	2.3
Lincoln County, Nevada	2	0.4
Washington County, Utah	277	2.0
ROI	4,499	2.3

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

TABLE 11.5.19.1-11 Public Safety Employment in the Proposed East Mormon Mountain SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Clark County, Nevada	3,214	1.7	991	0.5
Lincoln County, Nevada	26	5.8	1	0.2
Washington County, Utah	45	0.3	10	0.1
ROI	3,285	1.7	1,002	0.5

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

(34.5) than in Washington County (23.6) and Lincoln County (7.3); overall crime rates in Clark County (42.5) were higher than in Washington County (25.6) and Lincoln County (8.6).

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located. There is slight variation across the three regions in which the three counties are located; rates for alcoholism and mental health are slightly higher in the region in which Clark County is located (Table 11.5.19.1-13).

11.5.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 11.5.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, basing the value of recreational resources in these areas solely on the number of recorded visitors is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar facilities, by

TABLE 11.5.19.1-12 County and ROI Crime Rates for the Proposed East Mormon Mountain SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
Clark County, Nevada	15,505	8.3	66,905	34.5	82,410	42.5
Lincoln County, Nevada	6	1.3	34	7.3	40	8.6
Washington County, Utah	270	2.0	3,197	23.6	3,467	25.6
ROI	15,781	7.8	70,136	34.7	85,917	42.5

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 11.5.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed East Mormon Mountain SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Clark County, Nevada	8.2	2.7	10.5	NA[d]
Nevada rural (includes Lincoln County)	8.0	2.7	9.5	NA
Utah southwest region (includes Washington County)	5.6	2.5	11.3	NA
Nevada				6.5
Utah				3.6

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] NA = data not available.

Sources: SAMHSA (2009); CDC (2009).

identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands; some activity occurs on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 248,507 people were employed in the ROI in the various sectors identified as recreation, constituting 25.8% of total ROI employment (Table 11.5.19.1-14). Recreation spending also produced more than $9,552 million in income in the ROI in 2007. The primary sources of recreation-related employment were hotels and lodging places and eating and drinking places.

11.5.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including those on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of facilities employing various solar energy technologies are analyzed in detail in subsequent sections.

11.5.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and

TABLE 11.5.19.1-14 Recreation Sector Activity in the Proposed East Mormon Mountain SEZ ROI, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	4,933	151.1
Automotive rental	2,927	119.9
Eating and drinking places	111,946	3,291.2
Hotels and lodging places	117,616	5,640.1
Museums and historic sites	315	18.7
Recreational vehicle parks and campsites	398	11.1
Scenic tours	5,519	224.0
Sporting goods retailers	4,853	96.2
Total ROI	248,507	9,552.3

Source: MIG, Inc. (2010).

operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy facilities are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Section A.2.2 of Appendix A.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic, because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar facilities in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodation otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy developments in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures and a consequent increase in alcoholism, depression, suicide, social conflict, divorce, and delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of less than 0.1% in regional population during construction of the trough technology, with smaller increases for the power tower, dish engine and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, because of the lack of available housing to accommodate all in-migrating workers and families in smaller rural communities in the ROI and insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar facilities are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

Livestock Grazing Impacts

Cattle ranching and farming supported 202 jobs, and $1.3 million in income in the ROI in 2007 (MIG, Inc. 2010). The construction and operation of solar facilities in the East Mormon Mountain SEZ could result in a decline in the amount of land available for livestock grazing, resulting in total (direct plus indirect) impacts of the loss of seven jobs and less than $0.1 million in income in the ROI. There would also be a decline in grazing fees payable to the BLM and to the USFS by individual permittees based on the number of AUMs required to support livestock on public land. Assuming the 2008 fee of $1.35 per AUM, grazing fee losses would amount to $667 annually on land dedicated to solar facilities in the SEZ.

Access Road Impacts

The impacts of construction of an access road connecting the SEZ could include the addition of 234 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 11.5.19.2-1). Construction activities in the peak year would constitute less than 1% of total ROI employment. Access road construction would also produce $9.1 million in ROI income. Direct sales taxes would be $0.3 million; direct income taxes in Utah would be less than $0.1 million.

Total operations (maintenance) employment impacts in the ROI (including direct and indirect impacts) of an access road would be less than 1 job during the first year of operation (Table 11.5.19.2-1) and would also produce less than $0.1 million in income. Direct sales taxes would be less than $0.1 million in the first year; direct income taxes less than $0.1 million.

Construction and operation of an access road would not require the in-migration of workers and their families from outside the ROI; consequently, no impacts on housing markets in the ROI would be expected, and no new community service employment would be required in order to meet existing levels of service in the ROI.

11.5.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), BLM acreage rental and capacity payments, population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis can be found in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) would be required for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of one project could be constructed within a given year, with a corresponding maximum land disturbance of up to 3,000 acres (12 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower and 2022 for the minimum facility size and 2023 for the maximum facility size for dish engine and PV. The years of construction and operations were selected as representative of the entire 20-year study period, because they are the approximate midpoint; construction and operations could begin earlier.

TABLE 11.5.19.2-1 ROI Socioeconomic Impacts of an Access Road Connecting the Proposed East Mormon Mountain SEZ[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	134	<1
Total	234	<1
Income[b]		
Total	9.1	<0.1
Direct state taxes[b]		
Sales	0.3	<0.1
Income	<0.1	<0.1
In-migrants (no.)	0	0
Vacant housing[c] (no.)	0	0
Local community service employment		
Teachers (no.)	0	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts assume 11 mi (18 km) of access road is required for the East Mormon Mountain SEZ. Construction impacts are assessed for the peak year of construction. Although gravel surfacing might be used, the analysis assumes the access road will be paved.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 4,438 jobs (Table 11.5.19.2-2). Construction activities would constitute 0.3% of total ROI employment. A solar facility would also produce $268.7 million in income. Direct sales taxes would be $8.7 million; direct income taxes in Utah would be $1.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 743 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 371 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.6% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, seven new teachers, two physicians, and two public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 496 jobs (Table 11.5.19.2-2). Such a solar facility would also produce $18.9 million in income. Direct sales taxes would be $0.2 million; direct income taxes in Utah would be $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.6 million, and solar generating capacity payments at least $9.4 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 40 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 36 owner-occupied units expected to be occupied in the ROI.

TABLE 11.5.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed East Mormon Mountain SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	1,744	313
Total	4,438	496
Income[b]		
Total	268.7	18.9
Direct state taxes[b]		
Sales	8.7	0.2
Income	1.0	0.1
BLM payments[b]		
Rental	NA[d]	0.6
Capacity[e]	NA	9.4
In-migrants (no.)	743	40
Vacant housing[c] (no.)	371	36
Local community service employment		
Teachers (no.)	7	0
Physicians (no.)	2	0
Public safety (no.)	2	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 600 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,435 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] NA = data not available.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability and full build-out of the site. Projects with 3 or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

No new community service employment would be required to meet existing levels of service in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 1,768 jobs (Table 11.5.19.2-3). Construction activities would constitute 0.1% of total ROI employment. Such a solar facility would also produce $107.0 million in income. Direct sales taxes would be $3.5 million; direct income taxes in Utah would be $0.4 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 296 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 148 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.2 % of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, three new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 221 jobs (Table 11.5.19.2-3). Such a solar facility would also produce $7.6 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.6 million, and solar generating capacity payments would total at least $5.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 21 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied

TABLE 11.5.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed East Mormon Mountain SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	695	161
Total	1,768	221
Income[b]		
Total	107.0	7.6
Direct state taxes[b]		
Sales	3.5	<0.1
Income	0.4	<0.1
BLM payments[b]		
Rental	NA[d]	0.6
Capacity[e]	NA	5.2
In-migrants (no.)	296	21
Vacant housing[c] (no.)	148	19
Local community service employment		
Teachers (no.)	3	0
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 797 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] NA = data not available.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability and full build-out of the site. Projects with 3 or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

housing units would not be expected to be large, with 19 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 719 jobs (Table 11.5.19.2-4). Construction activities would constitute less than 0.1% of total ROI employment. Such a solar facility would also produce $43.5 million in income. Direct sales taxes would be $1.4 million; direct income taxes in Utah would be $0.2 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 120 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 60 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 214 jobs (Table 11.5.19.2-4). Such a solar facility would also produce $7.4 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.6 million, and solar generating capacity payments would total at least $5.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 20 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number

TABLE 11.5.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed East Mormon Mountain SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	282	157
Total	719	214
Income[b]		
Total	43.5	7.4
Direct state taxes[b]		
Sales	1.4	<0.1
Income	0.2	<0.1
BLM payments[b]		
Rental	NA[d]	0.6
Capacity[e]	NA	5.2
In-migrants (no.)	120	20
Vacant housing[c] (no.)	60	18
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 797 MW.

b Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d NA = data not available.

e The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability and full build-out of the site. Projects with 3 or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 18 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 444 jobs (Table 11.5.19.2-5). Construction activities would constitute less than 0.1% of total ROI employment. Such solar development would also produce $28.1 million in income. Direct sales taxes would be $0.7 million; direct income taxes in Utah would be $0.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 101 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 50 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 21 jobs (Table 11.5.19.2-5). Such a solar facility would also produce $0.7 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.6 million, and solar generating capacity payments would total at least $4.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with two persons in-migrating into the ROI. Although

TABLE 11.5.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed East Mormon Mountain SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	237	16
Total	444	21
Income[b]		
Total	28.1	0.7
Direct state taxes[b]		
Sales	0.7	<0.1
Income	0.1	<0.1
BLM payments[b]		
Rental	NA[d]	0.6
Capacity [e]	NA	4.2
In-migrants (no.)	101	2
Vacant housing[c] (no.)	50	2
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 797 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

[d] NA = data not available.

[e] The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming full build-out of the site.

in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with two owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

11.5.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed East Mormon Mountain SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

11.5.20 Environmental Justice

11.5.20.1 Affected Environment

On February 11, 1994, the President signed Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” which formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register*, Volume 59, page 76297, Feb. 11, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ’s *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons who identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origins may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income.** Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 11.5.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

Minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Nevada, 26.4% of the population is classified as minority, while 12.0% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

In the Utah portion of the 50-mi (80-km) radius, 21.8% of the population is classified as minority, while 10.2% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does

TABLE 11.5.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed East Mormon Mountain SEZ

Parameter	Arizona	Nevada	Utah
Total population	1,588	22,739	81,757
White, non-Hispanic	1,169	17,780	74,222
Hispanic or Latino	376	3,930	4,454
Non-Hispanic or Latino minorities	43	1,029	3,081
One race	22	747	2,128
Black or African American	0	159	168
American Indian or Alaskan Native	15	320	1,183
Asian	2	185	357
Native Hawaiian or Other Pacific Islander	1	42	348
Some other race	4	41	72
Two or more races	21	282	953
Total minority	419	4,959	7,535
Low-income	190	2,314	8,675
Percentage minority	26.4	21.8	9.2
State percentage minority	36.2	34.8	14.0
Percentage low-income	12.0	10.2	10.6
State percentage low-income	13.9	10.5	9.4

Source: U.S Bureau of the Census (2009k,l).

not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

In the Arizona portion of the 50-mi (80-km) radius, 9.2% of the population is classified as minority, while 10.6% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

Figures 11.5.20.1-1 and 11.5.20.1-2 show the locations of the low-income and minority population groups, respectively, within the 50-mi (80-km) radius around the boundary of the SEZ.

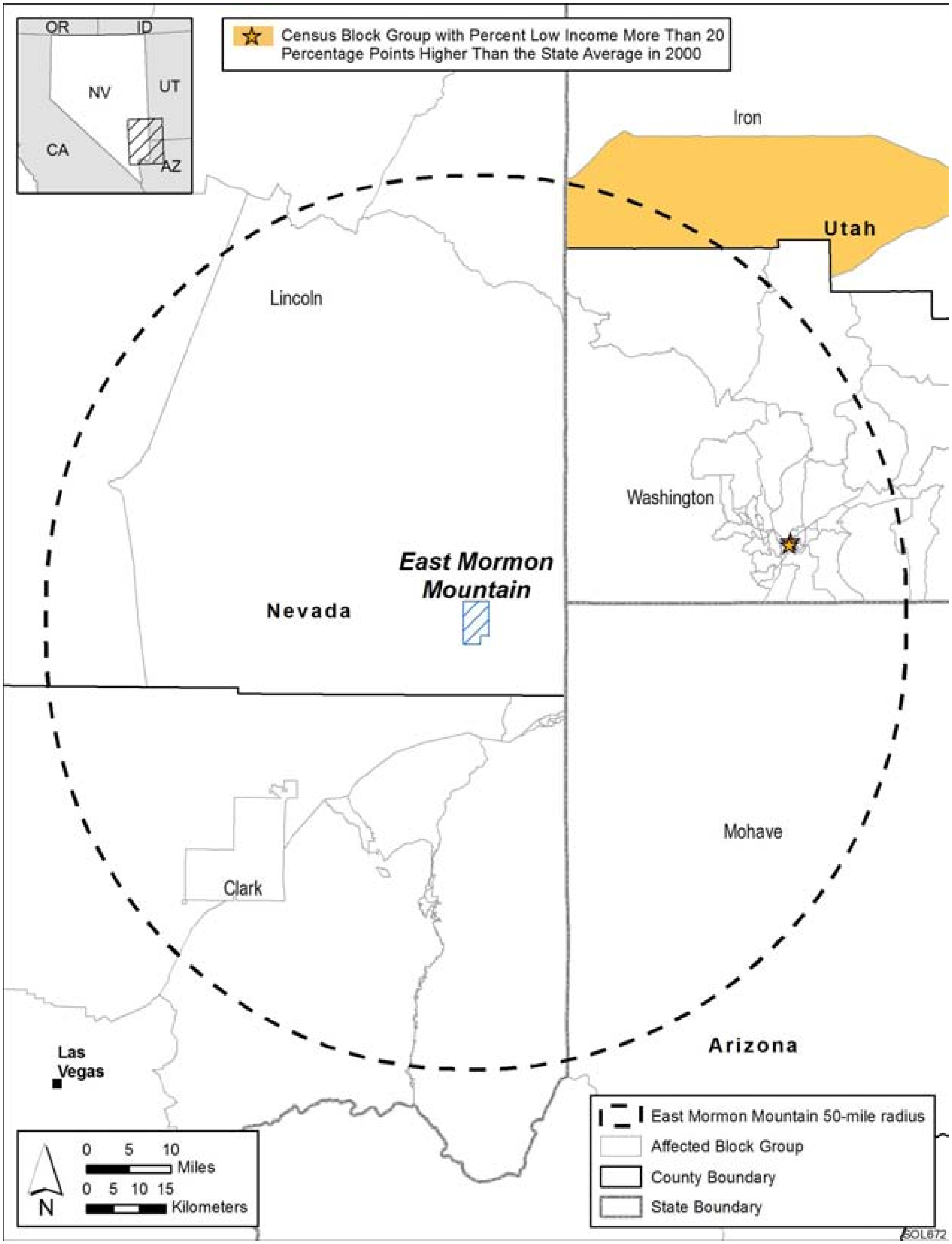

FIGURE 11.5.20.1-1 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed East Mormon Mountain SEZ

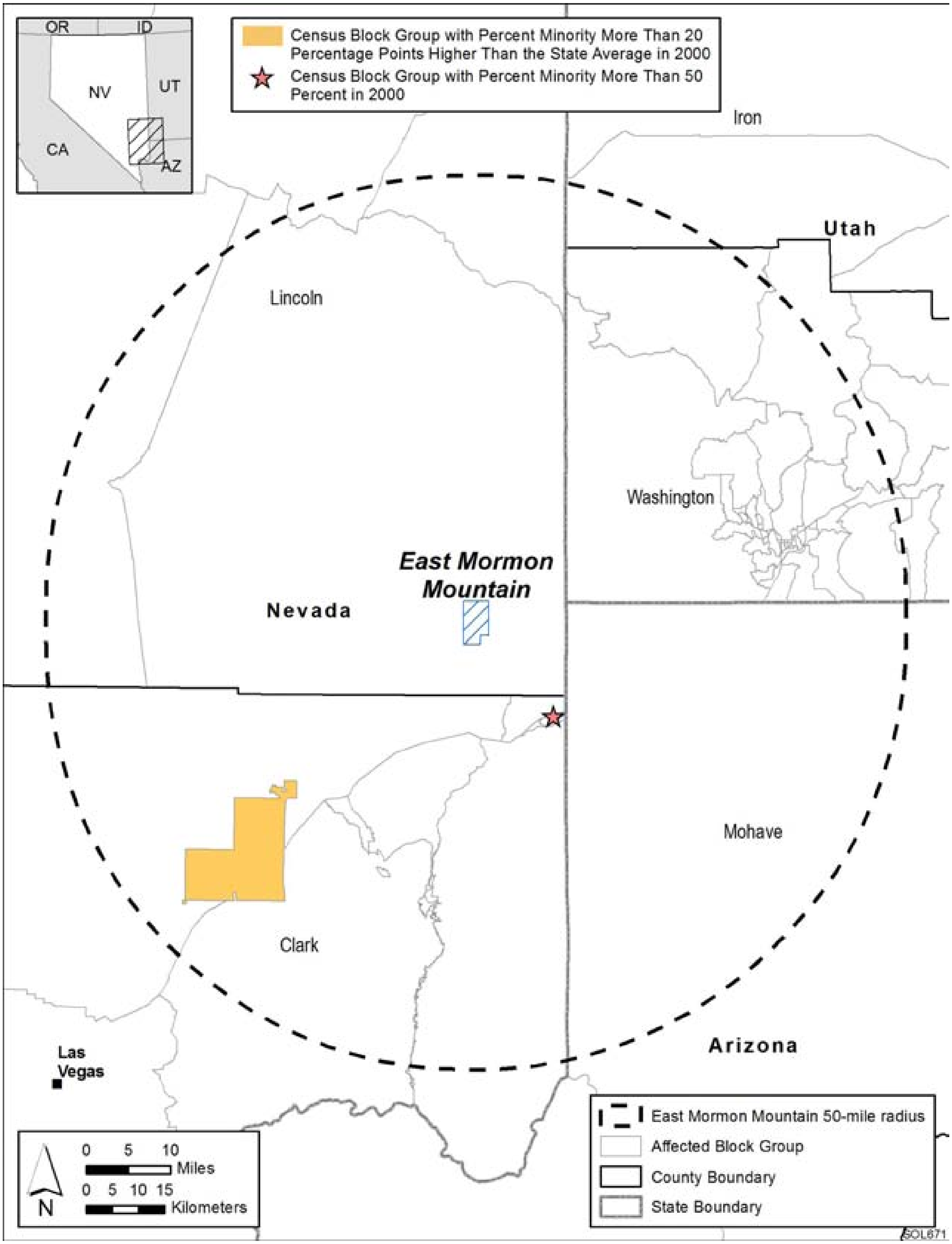

FIGURE 11.5.20.1-2 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed East Mormon Mountain SEZ

11.5.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of the programmatic design features described in Section A.2.2 of Appendix A, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed SEZ include noise and dust during the construction; noise and EMF effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (Section 11.5.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects could disproportionately affect minority populations. Because there are low-income populations within the 50-mi (80-km) radius, there could also be impacts on low-income populations.

11.5.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed East Mormon Mountain SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

11.5.21 Transportation

Although the region of the proposed East Mormon Mountain SEZ contains interstate highways, major railroads, and a major airport, these features are not readily accessible from the SEZ. The interstate highway is 11 mi (18 km) to the south of the SEZ. The nearest rail access is approximately 25 mi (40 km) southwest of the SEZ, and the nearest major airport is about 70 mi (113 km) to the southwest, although several smaller airports are located closer to the SEZ. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

11.5.21.1 Affected Environment

I-15 runs southwest–northeast approximately 11 mi (18 km) to the southeast of the SEZ, as shown in Figure 11.5.21-1. The closest existing exits to the SEZ on I-15 are Exits 112 and 120, with Exit 120 serving the western edge of Mesquite. The Las Vegas metropolitan area is approximately 62 mi (100 km) southwest of the SEZ along I-15. In the opposite direction, Salt Lake City is approximately 340 mi (547 km) away along I-15. There are several local unimproved dirt roads in the vicinity of the SEZ. OHV use in the SEZ and surrounding area has been designated as “Limited to travel on designated roads and trails” (BLM 2008a). As listed in Table 11.5.21-1, I-15 carries an average traffic volume of about 17,000 vehicles per day in the vicinity of the East Mormon Mountain SEZ (NV DOT 2010).

The UP Railroad serves the region. The main line passes through Las Vegas on its way between Los Angeles and Salt Lake City; the railroad passes about 20 mi (32 km) west of the East Mormon Mountain SEZ. The nearest rail access is in Moapa, approximately 25 mi (40 km) southwest of the SEZ.

There are seven public use airports within a driving range of about 80 mi (129 km) of the East Mormon Mountain SEZ, as listed in Table 11.5.21-2. Five of these airports do not have scheduled passenger service; the nearest of these is the Mesquite Airport, a small airport near I-15. North Las Vegas Airport, 70 mi (113 km) to the southwest, does not have scheduled commercial passenger service, but caters to smaller private and business aircraft (Clark County Department of Aviation 2010). In 2008, 22,643 and 23,950 passengers arrived at and departed from North Las Vegas Airport, respectively (BTS 2009).

The nearest airport with scheduled passenger service is the St. George Municipal Airport, 43 mi (69 km) to the northeast in St. George, Utah. Passenger service is provided by Delta Airlines and its partners (City of St. George Airport 2010). In 2008, 47,086 and 46,613 passengers arrived at and departed from this airport, respectively (BTS 2009). In the same year, 485,000 lb (220,000 kg) and 506,000 lb (229,000 kg) of freight arrived at and departed from St. George Airport, respectively (BTS 2009). Farther away in the opposite direction, McCarran International Airport in Las Vegas is served by all major U.S. airlines. In 2008, 20.43 million and 20.48 million passengers arrived at and departed from McCarran International Airport, respectively (BTS 2009). About 83.2 million lb (37.7 million kg) of freight departed and 117 million lb (53.2 million kg) arrived at McCarran in 2008 (BTS 2009).

TABLE 11.5.21-1 AADT on Major Roads Near the Proposed East Mormon Mountain SEZ for 2009

Road	General Direction	Location	AADT
I-15	Southwest–northeast	Between Valley of Fire Highway (exit 75) and Ute interchange (exit 80)	18,000
		Between the Ute and Glendale interchanges (exits 80 and 91)	19,000
		Between the W. Mesa Rest Area (northeast of exit 93) and the West Mesquite interchange (exit 120)	17,000
		Section of I-15 in Arizona	19,000[a]
U.S. 93	North–south	North of I-15 junction (I-15 exit 64)	1,900
Valley of Fire Highway	East–west	5 mi east of I-15 junction (I-15 exit 75)	530
State Route 144 (Mesquite Blvd.)	East–west	0.4 mi west of State Route 170 junction	11,000
State Route 168	Northwest–southeast	At I-15 Glendale interchange (exit 91)	940
State Route 169	North–south	South of I-15 exit 93	4,500
State Route 170 (Bunkerville Road)	North–south	South of I-15 exit 112	240
		0.8 mi south of State Route 144 (southern approach to Mesquite)	4,000

[a] Data for 2008, taken from AZ DOT (2009).

Source: NV DOT (2010).

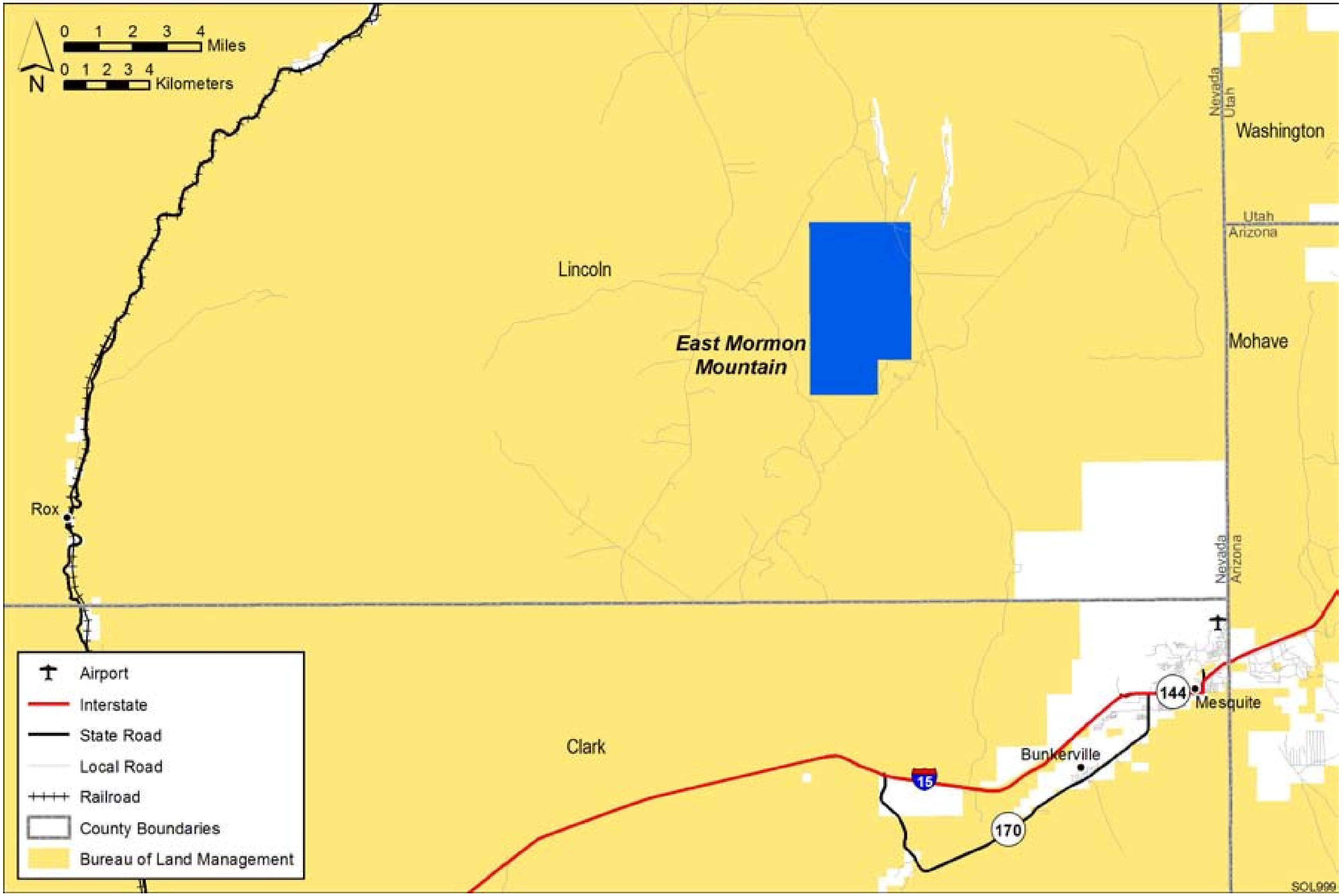

FIGURE 11.5.21.1-1 Local Transportation Network Serving the Proposed East Mormon Mountain SEZ

TABLE 11.5.21-2 Airports Open to the Public in the Vicinity of the Proposed East Mormon Mountain SEZ

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Mesquite	Near I-15, within several miles of any site access road off I-15	City of Mesquite	5,121 (1,561)	Asphalt	Good	–[b]	–	–
Perkins Field	I-15 southwest to State Route 169, south on State Route 169, 31 mi (50 km)	Clark County	4,800 (1,463)	Asphalt	Good	–	–	–
St. George Municipal	To the northeast, 43 mi (69 km) up I-15	City of St. George, Utah	6,606 (2,014)	Asphalt/ Grooved	Good	–	–	–
Echo Bay	South-southwest of the SEZ by Lake Mead, a 52-mi (84-km) drive on State Route 167	Lake Mead National Recreational Area	3,400 (1,036)	Asphalt	Good	–	–	–
General Dick Stout Field	Northeast of the SEZ in Hurricane, Utah; 60 mi (97 km)	City of Hurricane, Utah	3,410 (1,039)	Asphalt	Poor	–	–	–
North Las Vegas	Near I-15 in North Las Vegas, a 70-mi (113-km) drive from the SEZ	Clark County	4,202 (1,281)	Asphalt	Good	5,000 (1,524)	Asphalt	Good
			5,004 (1,525)	Asphalt	Good	–	–	–
McCarran International	Off I-15 in Las Vegas, about 78 mi (126 km)	Clark County	8,985 (2,739)	Concrete	Good	9,775 (2,979)	Concrete	Good
			10,526 (3,208)	Asphalt	Good	14,510 (4,423)	Asphalt	Good
			6,196 (1,889)	Asphalt	Good	7,161 (2,183)	Asphalt	Good

[a] Source: FAA (2010).

[b] A dash indicates not applicable.

11.5.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The volume of traffic on I-15 would represent an increase in traffic of about 12% in the area of the SEZ for one solar project. Because higher traffic volumes would be experienced during shift changes, traffic on I-15 could experience minor slowdowns during these time periods in the area of exits in the vicinity of the SEZ where a project is located. Local road improvements would be necessary in the vicinity of exits from I-15 so as not to overwhelm the local access roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any designated as open within the proposed SEZ, such open routes crossing areas issued ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

11.5.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed East Mormon Mountain SEZ. The programmatic design features described in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

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11.5.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed East Mormon Mountain SEZ in Lincoln County, Nevada. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental effects of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The land surrounding the East Mormon Mountain SEZ is undeveloped with few permanent residents living in the area. The nearest population centers are the small communities of Mesquite (population 21,253) and Bunkerville (population 1,330), approximately 12 mi (19 km) southeast of the southern boundary of the SEZ. The Moab Valley National Wildlife Refuge is 30 mi (48 km) southwest of the SEZ; the Desert National Wildlife Range is 40 mi (64 km) west of the SEZ; the Lake Mead National Recreation Area is about 30 mi (48 km) south of the SEZ; Valley of Fire State Park is 30 mi (48 km) southwest of the SEZ; and Grand Canyon-Parashant National Monument in Arizona is 25 mi (40 km) southeast of the SEZ. The Mormon Mountains WA is a few miles west of the SEZ. Three other WAs are within 50 mi (80 km) of the SEZ. The BLM administers approximately 82% of the lands in the Ely District, which contains the East Mormon Mountain SEZ. In addition, the Delamar Valley SEZ is located about 40 mi (64 km) to the northwest of the East Mormon Mountain SEZ and the proposed Dry Lake SEZ is located about 40 mi (64 km) to the southwest, and for some resources, the geographic extents of impacts from multiple SEZs overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the East Mormon Mountain SEZ is identified in Section 11.5.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 11.5.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 11.5.22.3. Cumulative impacts for each resource area are discussed in Section 11.5.22.4.

11.5.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the East Mormon Mountain SEZ is provided in Table 11.5.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (e.g., the evaluation of air quality may have a greater regional extent of impact than visual resources). Most of the lands around the SEZ are administered by the BLM, the USFWS, or the NPS; there are also some Tribal Lands nearby: the Moapa River Indian Reservation, about 30 mi (48 km) southwest of the SEZ, and the Paiute Shivwits Reservation,

TABLE 11.5.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed East Mormon Mountain SEZ

Resource Area	Geographic Extent
Land Use	Southeast Lincoln County
Specially Designated Areas and Lands with Wilderness Characteristics	Within a 25-mi (40-km) radius of the East Mormon Mountain SEZ
Rangeland Resources	
Grazing	Grazing allotments within 5 mi (8 km) of the East Mormon Mountain SEZ
Wild Horses and Burros	A 50-mi (80-km) radius from the Center of the East Mormon Mountain SEZ
Recreation	Southeast Lincoln County
Military and Civilian Aviation	Southeast Lincoln County
Soil Resources	Areas within and adjacent to the East Mormon Mountain SEZ
Minerals	Southeast Lincoln County
Water Resources	
Surface Water	Toquop Wash, South Fork Toquop Wash, and the Virgin River Valley basin
Groundwater	Lower Virgin River Valley and Tule Desert groundwater basins
Air Quality and Climate	A 31-mi (50-km) radius from the center of the East Mormon Mountain SEZ
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the East Mormon Mountain SEZ, including portions of Lincoln and Clark in Nevada, Washington County in Utah, and Mohave County in Arizona
Visual Resources	Viewshed within a 25-mi (40-km) radius of the East Mormon Mountain SEZ
Acoustic Environment (noise)	Areas adjacent to the East Mormon Mountain SEZ
Paleontological Resources	Areas within and adjacent to the East Mormon Mountain SEZ
Cultural Resources	Areas within and adjacent to the East Mormon Mountain SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the East Mormon Mountain SEZ for other properties, such as traditional cultural properties
Native American Concerns	Areas within and adjacent to the East Mormon Mountain SEZ; viewshed within a 25-mi (40-km) radius of the East Mormon Mountain SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the East Mormon Mountain SEZ
Environmental Justice	A 50-mi (80-km) radius from the center of the East Mormon Mountain SEZ
Transportation	I-15

22 mi (35 km) northeast of the SEZ in Utah. The BLM administers approximately 78.3% of the lands within a 50-mi (80-km) radius of the SEZ.

11.5.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are “reasonably foreseeable”; that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;
- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the *Federal Register* or state publications;
- Proposals for which enabling legislations has been passed; and
- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects that are in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to renewable energy and energy distribution, including potential solar energy projects under the proposed action (Section 11.5.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to fossil energy production, mining and mineral processing, pipelines, water management systems, communication systems, and residential developments (Section 11.5.22.2.2). Together, these actions and trends have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

11.5.22.2.1 Energy Production and Distribution

On February 16, 2007, Governor Gibbons signed an Executive Order to encourage the development of renewable energy resources in Nevada (Gibbons 2007a). The Executive Order requires all relevant state agencies to review their permitting processes to ensure the timely and expeditious permitting of renewable energy projects. On May 9, 2007, and June 12, 2008, the Governor signed Executive Orders creating the Nevada Renewable Energy Transmission Access Advisory Committee Phase I and Phase II, which will propose recommendations for improved access to the grid system for renewable energy industries (Gibbons 2007b, 2008). On May 28, 2009, the Nevada Legislature passed Senate Bill 358 modifying the Renewable Energy Portfolio

Standards. The bill requires that 25% of the electricity sold to be produced by renewable energy sources by 2025.

Reasonably foreseeable future actions related to renewable energy production and energy distribution within 50 mi (80 km) of the proposed East Mormon Mountain SEZ are identified in Table 11.5.22.2-1 and described in the following sections. Three foreseeable solar energy projects on private land were identified, but no solar, wind, or geothermal projects on public land were identified. Four proposed transmission line projects are also discussed.

Renewable Energy Development

Renewable energy applications are considered in two categories, fast-track and regular-track applications. Fast-track applications, which apply principally to solar and wind energy facilities, are those applications on public lands for which the environmental review and public participation process is under way and the applications could be approved by December 2010. A fast-track project would be considered foreseeable, because the permitting and environmental review processes would be under way. Regular-track proposals are considered potential future projects but not necessarily foreseeable projects, since not all applications would be expected to be carried to completion. These pending proposals are considered together as a general level of interest in development of renewable energy in the region.

No fast-track solar, wind, or geothermal projects on public land were identified. However, three reasonably foreseeable solar projects on private land within 50 mi (80 km) of the proposed SEZ were identified, as listed in Table 11.5.22.2-1 and described in the following sections.

BrightSource Energy Coyote Springs Project. BrightSource Energy is planning to build a 960-MW, solar, thermal-power facility on private land at the Coyote Springs Investment Planned Development Project at the junction of U.S. 93 and State Route 168. The facility would utilize the Luz Power Tower, which consists of thousands of mirrors that reflect sunlight onto a boiler filled with water sitting on top of a tower. The high-temperature steam produced would be piped to a conventional turbine that generates electricity. The station would utilize a dry-cooling system. The site, approximately 7,680 acres (31 km^2), would be 38 mi (61 km) southwest of the SEZ (BrightSource Energy 2009).

BrightSource Energy Overton Project. BrightSource Energy is planning to build three 400-MW solar thermal power facilities on private land east of the airport at Overton, Nevada. The facility would utilize the Luz Power Tower, which consists of thousands of mirrors that reflect sunlight onto a boiler filled with water sitting on top of a tower. The high-temperature steam produced would be piped to a conventional turbine that generates electricity. The station would utilize a dry-cooling system. The site would be 30 mi (48 km) southwest of the SEZ. The plan is for initial operation in 2012 (Cleantech 2008).

TABLE 11.5.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed East Mormon Mountain SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Projects on Private Lands			
BrightSource Coyote Springs Project, 960 MW, solar tower, 7,680 acres	Planning stage	Terrestrial habitats, vegetation, wildlife, soil, water, visual, cultural	38 mi (60 km) southwest of the SEZ
BrightSource Overton Project 1,200 MW, solar tower	Planning stage	Terrestrial habitats, vegetation, wildlife, soil, water, visual, cultural	30 mi (48 km) southwest of the SEZ
Sithe Global Flat Top Mesa Solar, 50 MW, PV, 450 acres	Proposed	Terrestrial habitats, wildlife, cultural, visual	10 mi (16 km) northeast of the SEZ
Transmission and Distribution Systems			
One Nevada Transmission Line Project	Draft Supplemental EIS Nov. 30, 2009	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes 40 mi (64 km) west of the SEZ
Southwest Intertie Project	FONSI issued July 30, 2008; in-service in 2010	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes 40 mi (64 km) west of the SEZ
TransWest Transmission Project	Permit Application Nov. 2009	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes southern boundary of SEZ
Zephyr and Chinook Transmission Line Project	Permit Applications in 2011/2012	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes about 40 mi (64 km) west of the SEZ

[a] Projects in later stages of agency environmental review and project development.

Sithe Global Flat Top Mesa Solar. Sithe Global is planning to build a 50-MW solar PV power plant. The 450-acre (1.8-km^2) site would be located on private land 5 mi (8 km) west of Mesquite Nevada and 10 mi (16 km) southeast of the SEZ. Approximately 200 workers would be required during the 15-month construction period (Sithe Global 2010a).

Pending Solar and Wind ROW Applications on BLM-Administered Lands. Applications for ROW-way grants that have been submitted to the BLM include eight pending solar projects, three pending authorizations for wind site testing, and two authorized projects for wind testing that would be located within 50 mi (80 km) of the East Mormon Mountain SEZ (BLM 2010a). No applications for geothermal projects have been submitted. Table 11.5.22.2-2 lists these applications and Figure 11.5.22.2-1 shows their locations.

The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The projects, listed in Table 11.5.22.2-2 for completeness, are an indication of the level of interest in development of renewable energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

Wind testing would involve some relatively minor activities that could have some environmental effects, mainly, the erection of meteorological towers and monitoring of wind conditions. These towers may or may not employ guy wires and may be 200 ft (60 m) high.

Transmission and Distribution Systems

Table 11.5.22.2-1 identifies four major new transmission projects, which are described below.

One Nevada Transmission Line Project. NV Energy proposes to construct and operate a 236-mi (382-km) 500-kV transmission line with fiber optic telecommunication and appurtenant facilities in White Pine, Nye, Lincoln, and Clark counties. It will consist of self-supporting, steel-lattice and steel-pose H-frame structures, placed 900 to 1,600 ft (274 to 488 m) apart. The width of the ROW is 200 ft (61 m). The proposed action includes new substations outside the ROI of the East Mormon Mountain SEZ. The transmission line would be within the SWIP utility corridor 40 mi (64 km) west of the SEZ. Construction could have potential impacts on the Mojave Desert Tortoise (BLM 2009a).

Southwest Intertie Project (SWIP). The SWIP is a 520-mi (830-km) single-circuit, overhead, 500-kV transmission line project. The first phase, the Southern Portion, is a 264-mi (422-km) long transmission line that begins at the existing Harry Allen Substation in Dry Lake, Nevada, and runs north to a proposed substation approximately 18 mi (29 km) northwest of Ely, Nevada. The transmission line will pass 40 mi (64 km) west of the SEZ. It will consist of

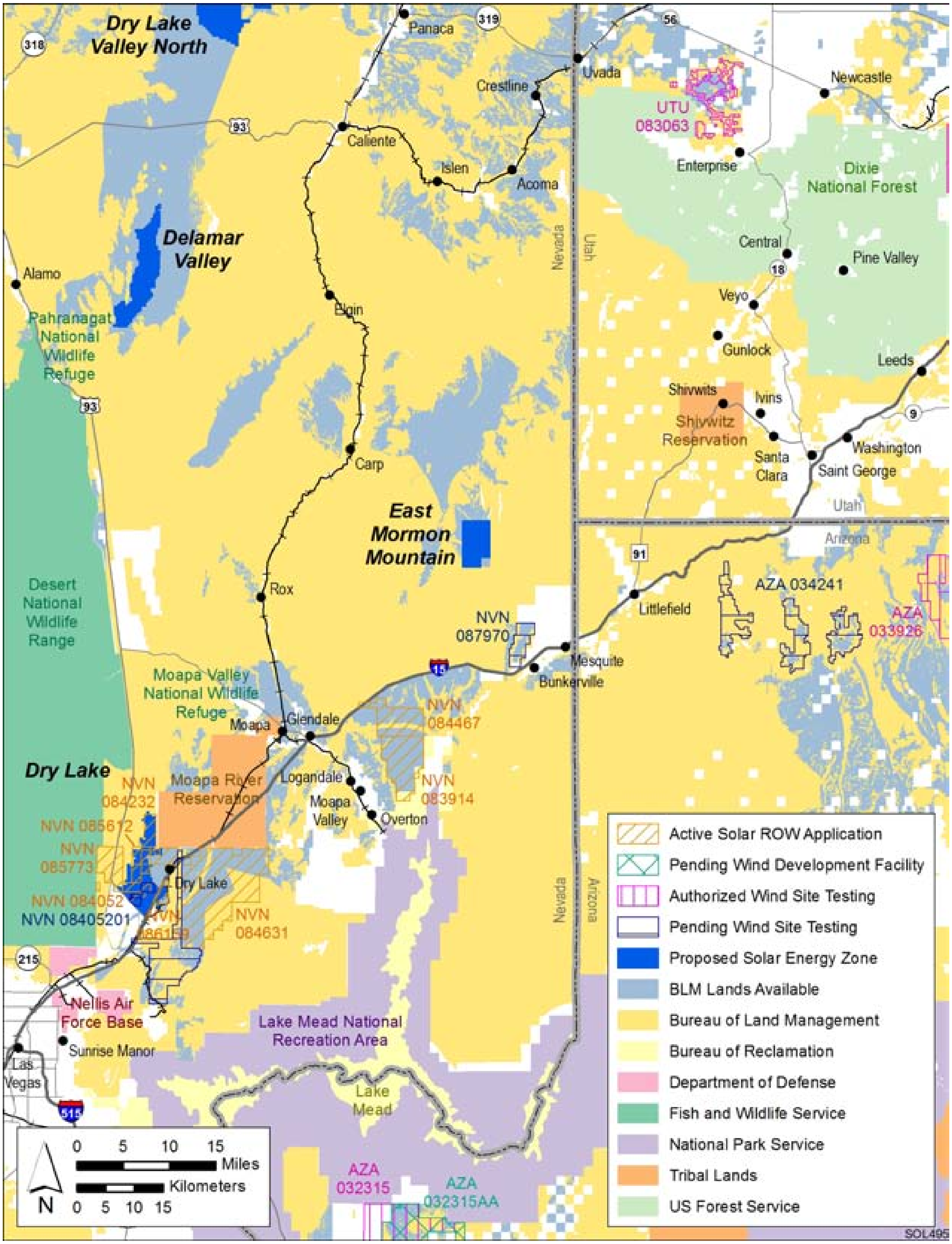

FIGURE 11.5.22.2-1 Locations of Renewable Energy Project ROW Applications on Public Land within a 50-mi (80-km) Radius of the Proposed East Mormon Mountain SEZ

TABLE 11.5.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed East Mormon Mountain SEZ[a,b]

Serial Number	Applicant	Application Received	Size (acres)[c]	MW	Technology	Status	Field Office
Solar Applications							
NVN 83914	BrightSource Energy Solar	Oct. 6, 2008	10,000	500	CSP	Pending	Las Vegas
NVN 84232	First Solar	Oct. 22, 2007	5,500	400	PV	Pending	Las Vegas
NVN 84467	Pacific Solar Investments Inc	Dec. 7, 2007	11,000	1,000	CSP	Pending	Las Vegas
NVN 84631	BrightSource Energy Solar	Jan. 28, 2008	2,000	1,200	CSP	Pending	Las Vegas
NVN 85612	Cogentrix Solar Services, LLC	July, 11, 2008	2,012	240	CSP	Pending	Las Vegas
NVN 85773	Cogentrix Solar Services, LLC	July, 11, 2008	11,584	1,000	CSP	Pending	Las Vegas
NVN 84052	Nevada Power	Aug. 14, 2007	1,775	120	CSP	Pending	Las Vegas
NVN 86159	Power Partners Southwest, LLC	Sept. 19, 2008	1,751	250	CSP	Pending	Las Vegas
Wind Applications							
NVN 87970	Pacific Wind Development	Sept. 29, 2009	5,089	–[d]	Wind	Pending wind site testing	Las Vegas
NVN 8405201	NV Power	Nov. 7, 2008	1,000	–	Wind	Pending wind site testing	Las Vegas
AZA 34241	Foresight Wind	–	29,022	–	Wind	Pending wind site testing	Arizona Strip
AZA 33926	Gamesa Energy USA	Apr. 2, 2007	17,027	–	Wind	Authorized wind site testing	Arizona Strip
UTU 83063	Energy Unlimited Inc.	–	10,013	–	Wind	Authorized wind site testing	Cedar City

a BLM (2010a).

b Information for pending solar (BLM and USFS 2010c) and pending wind (BLM and USFS 2010d) energy projects downloaded from GeoCommunicator.

c To convert acres to km^2, multiply by 0.004047.

d A dash indicates data not available.

self-supporting, steel-lattice and steel-pole H-frame structures, placed 1,200 to 1,500 ft (366 to 457 m) apart. The SWIP is expected to be completed in 2010. Construction could have potential impacts on the Mojave Desert Tortoise (BLM 2007b).

TransWest Transmission Project. TransWest Express proposes to construct a high-voltage electric utility transmission line. The 600-kV direct current transmission line would extend from south central Wyoming to southern Nevada. A terminal/converter station would be located near Boulder, Nevada. A communication system for command and control will require a fiber optic network and periodic regenerative sites. The proposed routes have been sited to parallel existing facilities and occupy designated utility corridors to the extent practicable, and will pass the southern boundary of the SEZ (TransWest Express 2009).

Zephyr and Chinook Transmission Line Project. TransCanada is proposing to construct two 500-kV, high-voltage, direct current transmission lines. The Zephyr project would originate in southeastern Wyoming. The Chinook project would originate in south central Montana. Both would travel along the same corridor from northern Nevada, passing about 40 mi (64 km) west of the SEZ, and terminate in the El Dorado Valley south of Las Vegas. Construction is expected to be complete in 2015 or 2016 (TransCanada 2010).

11.5.22.2.2 Other Actions

There are a number of energy production facilities within a 50-mi (80-km) radius from the center of the East Mormon Mountain SEZ, which includes portions of Clark and Lincoln Counties in Nevada, Washington County in Utah, and Mohave County in Arizona. Other major ongoing and foreseeable actions within 50 mi (80 km) of the proposed East Mormon Mountain SEZ are listed in Table 11.5.22.2-3 and described in the following sections.

Other Ongoing and Foreseeable Energy Projects

Apex Generating Station. The Apex Generating Station is a 600-MW, combined-cycle, natural gas–fired power plant, consisting of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator. The plant is located within the Apex Industrial Park near the intersection of I-15 and U.S. 93. The site is about 50 mi (80 km) southwest of the SEZ (Mirant Las Vegas, LLC 2007).

Chuck Lenzie Generating Station. The Chuck Lenzie Generating Station is an 1,160-MW, combined-cycle, natural gas–fired electric generation facility, located approximately 50 mi (80 km) southwest of the SEZ; it consists of four combustion turbines, four heat recovery steam generators and two steam turbines. The plant, owned by NV Energy, has been operating at full power since 2006. The station utilizes a dry-cooling system (NV Energy 2010a).

TABLE 11.5.22.2-3 Other Major Actions near the Proposed East Mormon Mountain SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Energy Projects			
Apex Generating Station	Operating since 2003	Terrestrial habitats, wildlife, water, air, cultural, visual	50 mi (80 km) southwest of the SEZ
Chuck Lenzie Generating Station	Operating since 2006	Terrestrial habitats, wildlife, water, air, cultural, visual	50 mi (80 km) southwest of the SEZ
Harry Allen Generating Station	Operating since early 1980s	Terrestrial habitats, wildlife, water, air, cultural, visual	50 mi (80 km) southwest of the SEZ
Harry Allen Generating Station Expansion	Under construction	Terrestrial habitats, wildlife, water, air, cultural, visual	50 mi (80 km) southwest of the SEZ
Reid Gardner Generating Station	Operating since 1965	Terrestrial habitats, wildlife, water, air, cultural, visual	30 mi (48 km) southwest of the SEZ
Reid Gardner Expansion	EA and FONSI March 2008	Terrestrial habitats, wildlife, soil, air, water	30 mi (48 km) southwest of the SEZ
Silverhawk Generating Station	Operating since 2004	Terrestrial habitats, wildlife, water, air, cultural, visual	50 mi (80 km) southwest of the SEZ
Toquop Energy Project	Coal-fired plant FEIS 2009, changed to natural gas in 2010	Terrestrial habitats, wildlife, soil, water, air, cultural, visual	Adjacent to SEZ
Distribution Systems			
Kern River Gas Transmission System	Operating since 1992	Disturbed areas, terrestrial habitats along pipeline ROW	Corridor passes just south of SEZ
UNEV Pipeline Project	FEIS April 2010	Disturbed areas, terrestrial habitats along pipeline ROW	Corridor passes just south of SEZ

TABLE 11.5.22.2-3 (Cont.)

Description	Status	Resources Affected	Primary Impact Location
Other Projects			
Clark, Lincoln and White Pine Counties Groundwater Development Project	DEIS expected in 2011	Terrestrial habitats, wildlife, groundwater	43 mi (69 km) northwest of the SEZ
Coyote Springs Investment Planned Development Project	FEIS issued Sept. 2008, ROD issued Oct. 2008	Terrestrial habitats, wildlife, water, socioeconomics	35 mi (56 km) west of the SEZ
East Mormon Mountain Groundwater Testing/Monitoring Wells	EA and FONSI issued Sept. 2009	Terrestrial habitats, wildlife cultural resources	Within the SEZ
Lincoln County Land Act Groundwater Development and Utility ROW	FEIS issued May 2009 ROD Jan. 2010	Terrestrial habitats, wildlife, groundwater	Passes through the SEZ
Caliente Rail Realignment	FEIS June 2008	Terrestrial habitats, wildlife cultural resources	Closest approach 44 mi (70 km) northwest of the SEZ
Meadow Valley Industrial Park	FEIS issued Jan. 2010	Terrestrial habitats, wildlife, socioeconomics	44 mi (70 km) northwest of the SEZ
Ash Canyon Sagebrush Restoration and Fuels Reduction Project	Preliminary EA issued May 2010	Terrestrial habitats, wildlife	38 mi (61 km) northwest of the SEZ
Meadow Valley Gypsum Project	EA and FONSI issued 2008	Terrestrial habitats, wildlife, soils, socioeconomics	10 mi (16 km) west of the SEZ
Mesquite Nevada General Aviation Replacement Airport	DEIS April 2008		10 mi (16 km) southeast of SEZ
NV Energy Microwave and Mobile Radio Project	Preliminary EA March 2010	Terrestrial habitats, wildlife cultural resources	Two of the sites 40 mi (64 km) west of SEZ; one site 50 mi (80 km) northwest of SEZ

[a] Projects ongoing or in later stages of agency environmental review and project development.

Harry Allen Generating Station. The Harry Allen Generating Station is a 144-MW, gas-fired power plant. The plant is located north of the intersection of I-15 and U.S. 93. The site is about 50 mi (80 km) southwest of the SEZ (NV Energy 2010b).

Harry Allen Generating Station Expansion. The Harry Allen Generating Station Expansion is a 484-MW, combined-cycle, natural gas–fired power plant, consisting of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator. The heat rejection system will utilize a cooling system composed of natural-draft dry-cooling towers. The plant is located on the site of the existing 144-MW plant. The site is about 50 mi (80 km) southwest of the SEZ (NV Energy 2010b).

Reid Gardner Generating Station. The Reid Gardner Generating Station is a four-unit, 557-MW coal-fired electric generating facility owned by NV Energy. The first unit went online in 1965. All four units have been operating since 1983. The 480-acre (1.9-km^2) site is located near the town of Moapa, about 30 mi (48 km) southwest of the SEZ. The facility includes evaporation ponds and fly ash, bottom ash, and solids landfills. Pollution control includes wet scrubbers. The heat rejection system consists of wet-cooling towers. Coal is delivered by rail (BLM 2008d).

Reid Gardner Expansion Project. The Reid Gardner Expansion Project will consist of the construction of a 240-acre (0.97-km^2) fly ash landfill and a 315-acre (1.27-km^2) evaporation pond to support the existing Reid Gardner Power Plant. The proposed expansion is located adjacent to the southern boundary of the existing site near the town of Moapa, about 30 mi (48 km) southwest of the SEZ (BLM 2008d).

Silverhawk Generating Station. The Silverhawk Generating Station is a 580-MW, combined-cycle, natural gas–fired power plant, consisting of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator. The plant is located within the Apex Industrial Park near the intersection of I-15 and U.S. 93. The site is about 50 mi (80 km) southwest of the SEZ. The station utilizes a dry-cooling system (NV Energy 2009b).

Toquop Energy Project. The Toquop Energy Project, originally proposed as a 750-MW, coal-fired electric generation facility, is now planned as a 1,100-MW natural gas-fired combined-cycle power plant, located on a 640-acre (2.59-km^2) site 12 mi (19 km) northwest of the town of Mesquite, Nevada, and adjacent to the SEZ. The project will be built in phases. Phase 1 will be a nominal 550 to 600 MW combined-cycle plant. A water supply system, a gas pipeline connecting the power plant to the Kern River pipeline, connection to the existing Navajo-McCullogh transmission line, and road access to I-15 would be required. The heat rejection system will utilize a hybrid cooling system composed of natural draft dry-cooling towers with ability to apply water overspray on the heating surfaces to provide additional cooling at ambient air temperatures greater than about 80°F (27°C). The proposed project would require 600 workers during construction, scheduled to begin in 2012 with commercial operation in 2015 (BLM 2009b; Sithe Global 2010b).

Ongoing and Foreseeable Distribution Systems

Kern River Gas Transmission System. The Kern River Gas Transmission system transports 1.7 billion ft^3 per day (48 million m^3) of natural gas from Wyoming to the Las Vegas area and then southwest as far as San Bernardino, California. The 1,680-mi (2,690-km) pipeline has been in operation since 1992. A two-pipeline delivery system exists along most of the pipeline route. The pipeline passes to the south of the SEZ (Kern River Gas Transmission Company 2010).

UNEV Pipeline Project. Holly Energy Partners proposes to construct and operate a 399-mi (640-km), 12-in. (30.5-cm) petroleum products pipeline that will originate at the Holly Corporation's Woods Cross, Utah, refinery near Salt Lake City and terminate near the Apex Industrial Park near the intersection of I-15 and U.S. 93. The pipeline would generally follow the Kern River ROW within Nevada and pass just south of the SEZ (BLM 2010b).

Other Ongoing and Foreseeable Projects

Clark, Lincoln, and White Pine Counties Groundwater Development Project. The Southern Nevada Water Authority (SNWA) proposes to construct a groundwater development project that would transport approximately 122,755 ac-ft/yr (151 million m^3/yr) of groundwater under existing water rights and applications from several hydrographic basins in eastern Nevada and western Utah. The proposed facilities include production wells, 306 mi (490 km) of buried water pipelines, five pumping stations, six regulating tanks, three pressure reducing stations, a buried storage reservoir, a water treatment facility, and about 323 mi (517 km) of 230-kV overhead power lines, as well as two primary and five secondary substations. The project would develop groundwater in the following amounts in two hydraulically connected valleys that are about 35 mi (56 km) west of the East Mormon Mountain SEZ and in a separate hydrographic basin: Dry Lake Valley (11,584 ac-ft/yr [14.3 million m^3/yr]) and Delamar Valley (2,493 ac-ft/yr [3.1 million m^3/yr]). In addition, an undetermined amount of water could be developed and transferred from Coyote Spring Valley, which is down-gradient of the other two basins (SNWA 2010).

Coyote Springs Investment (CSI) Development Project. CSI intends to develop a new town in southern Lincoln County at the junction of U.S. 93 and State Route 168. The town would be a master-planned community on 21,454 acres (86.8 km^2), and would include residential, commercial, and industrial land uses. Plans call for more than 111,000 residential dwelling units at a density of 5 units per acre (0.004047 km^2). Also included in the community would be public buildings, hotels, resorts, casinos, commercial and light industrial areas, roads, bridges, and a heliport. Utilities and other infrastructure would be developed to serve the town, including power facilities, sanitary sewer and wastewater treatment facilities, stormwater facilities, solid waste disposal transfer stations, and telecommunications facilities. Water supply treatment facilities, monitoring wells, production wells, storage facilities, and transmission and distribution facilities would also be built. Approximately 70,000 ac-ft/yr (86 million m^3/yr) of water would be needed for the community at full build-out, which may occur over a period of about 40 years. Currently, CSI and its affiliates hold approximately 36,000 ac-ft/yr (44.0 million m^3/yr) in certificated groundwater rights in various basins within Lincoln County. CSI currently owns the 21,454-acre (86.82-km^2) development area and holds leases on an additional 7,548 acres (30.6 km^2) of BLM land in Lincoln County and 6,219 acres (25.2 km^2) of BLM land in Clark County within or next to the privately held land. These adjacent areas would be managed by BLM for the protection of federally listed threatened or endangered species; activities would be limited to non-motorized recreation or scientific research. The development is 35 mi (56 km) west of the SEZ (USFWS 2008).

East Mormon Mountain Groundwater Testing/Monitoring Wells. The SNWA intends to construct two to four groundwater wells within two 2.5-acre (0.010-km^2) (1.0-acre [0.004-km^2] long term and 1.5-acre [0.006-km^2] short term) site locations in the East Mormon Mountain SEZ. The dimensions for the long-term ROW would be 168 ft × 260 ft (51 m × 79 m), and the dimensions for the short-term ROW would be 330 ft × 330 ft (100 m × 100 m). Two 12-in. (30.5-cm) and two 20-in. (50.8-cm) wells would be drilled to between 2,200 and 2,400 ft (670 and 730 m) in depth. Access to the well sites would be from both existing roads and a new 809-ft (247-m) long access road. Water generated during the tests would be discharged into the natural drainage network around the sites. At the completion of hydraulic testing, SNWA would continue to record data to establish baseline ranges of the groundwater levels in the area.

Lincoln County Land Act Groundwater Development and Utility ROW. This project involves the construction of the infrastructure required to pump and convey groundwater resources in the Clover Valley and Tule Desert Hydrographic Areas. The construction includes 75 mi (122 km) of collection and transmission pipeline, 30 wells, 5 storage tanks, water pipeline booster stations, transmission lines and substations, and a natural gas pipeline. A total of 240 acres (0.97 km^2) will be permanently disturbed, and 1,878 acres (7.6 km^2) temporarily disturbed. The pipeline will pass through the SEZ (BLM 2009e).

Caliente Rail Alignment. The DOE proposes to construct and operate a railroad for the shipment of spent nuclear fuel and high-level radioactive waste to the geologic repository at Yucca Mountain, Nevada. The rail line would begin near Caliente, Nevada, and extend north, then turn in a westerly direction, passing through the SEZ, to a location near the northwest corner of the Nevada Test and Training Range, and then continue south-southwest to Yucca Mountain. The rail line would range in length from approximately 328 mi (528 km) to 336 mi (541 km), depending upon the exact location of the alignment. The rail line would be restricted to DOE shipments. Over a 50-year period, 9500 casks containing spent nuclear fuel and high-level radioactive waste, and approximately 29,000 rail cars of other materials, including construction materials, would be shipped to the repository. An average of 17 one-way trains per week would travel along the rail line. Construction of support facilities, interchange yard, staging yard, maintenance-of-way facility, rail equipment maintenance yard, cask maintenance facility, and Nevada Rail Control Center and National Transportation Operation Center would also be required. Construction would take 4 to 10 years and cost $2.57 billion. Construction activities would occur inside a 1000 ft (300 m) wide ROW for a total footprint of 40,600 acres (164 km^2) (DOE 2008).

Meadow Valley Industrial Park. The BLM is planning to transfer a 103-acre (0.42-km^2) parcel to the City of Caliente, Nevada, for the construction of the Meadow Valley Industrial Park. The site is located on a previously disturbed area used for agriculture and recreation at the intersection of U.S. 93 and State Route 317, about 20 mi (32 km) northeast of the SEZ. Improvements to the site would include construction of a rail spur, access roads, and water and sewer extensions (USFWS 2010b).

Ash Canyon Sagebrush Restoration and Fuels Reduction Project. The BLM Caliente Field Office is proposing to conduct a sagebrush improvement and fuels reduction project adjacent to Ash Canyon, about 5 mi (8 km) southeast of Caliente, Nevada, and about 38 mi (61 km) northwest of the SEZ. The size of the project area is 870 acres (3.5 km^2). The goal is to reduce pinyon and juniper in order to achieve a desired state where sagebrush is present along with an understory of perennial species; to reduce risk of wild fires by reducing fuel loading; to restore the historic disturbance regime; and to improve the available habitat for resident wildlife (BLM 2010d).

Meadow Valley Gypsum Project. Meadow Valley Gypsum was issued a Finding of No Significant Impact (BLM 2008c) following an Environmental Assessment of proposed mining, processing, and transporting of gypsum on public lands. The project would be located 50 mi (80 km) south of Caliente in Lincoln County, Nevada. The project would disturb 46.7 acres (0.2 km^2) and would consist of an open pit, processing plant, and a 1.5-mi (2.4-km) access road.

Mesquite Nevada General Aviation Replacement Airport. The City of Mesquite, Nevada, is proposing to replace its existing airport with a new airport on Mormon Mesa, adjacent to I-15 near Riverside, Nevada, and about 10 mi (16 km) south of the SEZ. The airport would require BLM to release 2,560 acres (10.4 km^2) of BLM land for acquisition by the City of Mesquite. The airport would include a new runway with associated parallel taxiway and general aviation support and maintenance facilities. The existing airport would be decommissioned, and the site would be released for nonaeronautical uses (FAA 2008).

NV Energy Microwave and Mobile Radio Project. NV Energy is proposing to install a new microwave and radio communications network at 13 sites. Two sites are located 40 mi (64 km) west of the SEZ, and one is located 50 mi (80 km) northwest of the SEZ. The two closest sites are small, about 0.1 acres (0.0004 km^2). The further site is 0.6 acres (0.0024 km^2) but requires 57 acres (0.23 km^2) of land disturbance for access and power line ROWs. Each site would include a communication shelter, two propane tanks, and a generator. Two of the sites have a 160-ft (50-m) self-supporting lattice tower and one, an 80-ft (25-m) tower (BLM 2010a).

Grazing

There are numerous grazing allotments within the BLM Ely District. Restrictions on Season of Use have been placed upon the desert tortoise critical habitat portions of the Gourd Springs and Summit Spring allotments in the Programmatic Biological Opinion for the Bureau of Land Management's Ely District Resource Management Plan.

Mining

The Meadow Valley Gypsum Project is proposing to mine gypsum on public land approximately 10 mi (16 km) west of the SEZ, as noted above. A total of 46.7 acres (0.19 km^2) would be disturbed during the 10-year lifetime of the project. A 1.5-mi (2.5-km) access road and a 1.8-acre (0.0073-km^2) railroad siding would be constructed.

11.5.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change for the proposed East Mormon Mountain SEZ are presented in this section. Table 11.5.22.3-1 lists the relevant impacting factors for the trends.

11.5.22.3.1 Population Growth

Over the period 2000 to 2008, the population in Lincoln County grew annually by 1.4%, in Clark County, 4.0%, and in Washington County, Utah, 5.2%, portions of which make up the ROI for the East Mormon Mountain SEZ (see Section 11.5.19.1.5). The annual growth rate for Nevada as a whole was 3.4% and for Utah, 2.5%. The population of the ROI in 2008 was 2,019,414 and is projected to increase to 2,977,752 by 2021 and to 3,079,077 by 2023.

TABLE 11.5.22.3-1 General Trends Relevant to the Proposed SEZs in Nevada

General Trend	Impacting Factors
Population growth	Urbanization Increased use of roads and traffic Land use modification Employment Education and training Increased resource use (e.g., water and energy) Tax revenue
Energy demand	Increased resource use Energy development (including alternative energy sources) Energy transmission and distribution
Water availability	Drought conditions and water loss Conservation practices Changes in water distribution
Climate change	Water cycle changes Increased wildland fires Habitat changes Changes in farming production and costs

11.5.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in seven SEZ areas in Nevada between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5, 0.4, and 0.1% each year, respectively (EIA 2009).

11.5.22.3.3 Water Availability

As described in Section 11.5.9.1.2, the proposed East Mormon Mountain SEZ is located within the Lower Virgin River Valley groundwater basin. Groundwater recharge from precipitation is estimated to be between 9,500 and 55,000 ac-ft/yr (12 million and 68 million m^3/yr); evaporation from groundwater is estimated to be 30,000 to 70,000 ac-ft/yr (37 million to 86 million m^3/yr); and outflow into Lake Mead is estimated at 29,000 to

40,000 ac-ft/yr (36 million to 49 million m^3/yr). The estimated sustainable yield of the groundwater basin in the three-state region near the SEZ is between 12,600 and 40,000 ac-ft/yr (16 million and 49 million m^3/yr), but is currently set by the NDWR as 3,600 ac-ft/yr (4.4 million m^3/yr) in the Nevada portion of the basin.

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), of which 11% came from surface waters and 89% from groundwater. The largest water use category was irrigation at 55,100 ac-ft/yr (68 million m^3/yr), while public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million m^3/yr). It is estimated that a total of 12,000 ac-ft/yr (15 million m^3/yr) are withdrawn from the Lower Virgin Valley Groundwater basin.

The Lincoln County Water District has proposed a groundwater development and utility ROW project (Lincoln County Land Act project described above) to pump and convey water that is permitted or may be permitted for use by the Nevada State Engineer from the Clover Valley and Tule Desert hydrographic areas for use by Lincoln County customers. The project could pump up to 14,480 ac-ft/yr (17.9 million m^3/yr) from 15 wells in Clover Valley and 9,340 ac-ft/yr (11.5 million m^3/yr) from Tule Desert. A pipeline ROW on public land would convey water to multiple storage tanks for use (BLM 2009e).

11.5.22.3.4 Climate Change

Governor Jim Gibbons' Nevada Climate Change Advisory committee (NCCAC) conducted a study of climate change and its effects on Utah (NCCAC 2008). The report summarized the present scientific understanding of climate change and its potential impacts on Nevada. A report on global climate change in the United States prepared by the U.S. Global Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from these reports indicate the following:

- Precipitation will decrease, and a greater percentage of that precipitation will come from rain, resulting in a greater likelihood of winter and spring flooding and decreased stream flow in the summer.

- The average temperature in the Southwest has already increased by about 1.5ºF compared to a 1960 to 1979 baseline, and by the end of the century, the average annual temperature is projected to rise 4ºF to 10ºF.

- A warming climate and the related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires.

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end.

- Much of the Southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region.

- As temperatures rise, landscape will be altered as species shift their ranges northward and upward to cooler climates.

- Temperature increases, when combined with urban heat island effects for major cities such as Las Vegas, present significant stress to health, electricity, and water supply.

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

11.5.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed East Mormon Mountain SEZ on the basis of the following assumptions: (1) because of the small size of the proposed SEZ (<10,000 acres [<40.5 km^2]), only one project could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 7,174 acres (29 km^2) (80% of the entire proposed SEZ). For purposes of analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. Since an existing 500-kV transmission line runs by the southeast corner of the SEZ, no analysis of impacts has been conducted for the construction of new transmission line outside of the SEZ that might be needed to connect solar facilities to the regional grid (see Section 11.5.1.2). The nearest major road is I-15, which lies 11 mi (18 km) south of the SEZ. It is assumed that a new access road disturbing an additional 80 acres (0.3 km^2) would be constructed to support solar development in the SEZ.

Cumulative impacts that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section in each resource area are discussed below. At this stage of development, because of the uncertain nature of the future projects in terms of size, number, location within the proposed SEZ, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

11.5.22.4.1 Lands and Realty

The proposed East Mormon Mountain SEZ is very isolated and is accessible only by dirt roads. There are no existing rights of way within the SEZ, but two designated 368b transmission corridors pass adjacent to the SEZ and contain three major transmission lines and a natural gas pipeline (Section 11.5.2.1).

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. Solar energy facilities would become a dominating visual presence in the area due to their large size.

As presented in Section 11.5.22.2, foreseeable actions within a 50-mi (80-km) radius of the proposed SEZ include the Toquop power plant, three solar facilities, four transmission lines, two groundwater development projects, a petroleum pipeline project, the proposed 21,454-acre (86.8-km^2) Coyote Springs Investment residential development, and a proposed new community airport. In addition, eight potential solar facilities with pending applications covering over 40,000 acres (160 km^2) and five pending wind applications lie within this distance. Existing facilities include several large gas-fired power plants located 30 to 50 mi (49 to 80 km) to the southwest near the proposed Dry Lake SEZ. The proposed Dry Lake SEZ, located about 40 mi (64 km) to the southwest, and the proposed Delamar Valley SEZ, located about 40 mi (64 km) to the northwest, each lie within 50 mi (80 km) of the proposed East Mormon Mountain SEZ. The number of solar applications, along with the two foreseeable solar energy projects within this distance, indicates a fairly strong interest in solar energy development in the region.

The development of utility-scale solar projects in the proposed East Mormon Mountain SEZ in combination with other ongoing, foreseeable, and potential actions within the 50-mi (80-km) geographic extent of effects could have cumulative effects on land use in the vicinity of the proposed SEZ. Cumulative impacts on accessibility of land for other purposes and on groundwater and visual resources could result, among other resource impacts, depending in part on where and how many potential solar and wind projects are actually built.

11.5.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

There are 20 specially designated areas within 25 mi (40 km) of the proposed East Mormon Mountain SEZ in Nevada, Utah, and Arizona (Section 11.5.3.1). Potential exists for cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and other projects outside the SEZ. The exact nature of cumulative visual impacts on the users of these areas would depend on the specific solar technologies employed and the locations selected within the SEZ for solar facilities. Currently proposed projects and potential solar and wind projects within the geographic extent of effects could cumulatively affect sensitive areas through visual impacts and effects on wilderness characteristics. In addition, projects would produce fugitive dust emissions, and could strain water resources and reduce access to specially designated areas.

11.5.22.4.3 Rangeland Resources

Portions of two grazing allotments overlap the proposed SEZ; they would be reduced by less than 10% in size by solar energy development within the SEZ. One allotment has already been reduced by other factors, so SEZ impacts would result in a small cumulative impact on livestock grazing in this allotment, and the proposed adjacent Toquop power plant could further affect one or both of these allotments. However, the loss of approximately 315 AUMs within the proposed SEZ would be a negligible reduction in the over 54,199 AUMs authorized within the BLM Caliente Field Office (Section 11.5.4.1.2.1).

Because the East Mormon Mountain SEZ is 32 mi (51.5 km) or more from any wild horse and burro HMA managed by the BLM and more than 50 mi (80 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly or indirectly affect wild horses and burros that are managed by these agencies and would not contribute to cumulative impacts on these species (Section 11.5.4.2.2).

11.5.22.4.4 Recreation

Limited outdoor recreation (e.g., backcountry driving, OHV use, and some camping and hunting) occurs on or in the immediate vicinity of the SEZ. Construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. Road closures and access restrictions within the proposed SEZ would affect OHV use and access to undeveloped areas. Foreseeable and potential future actions would similarly affect areas of low recreational use and would have minimal effects on recreation. Thus, cumulative impacts on recreation within the geographic extent of effects are not expected.

11.5.22.4.5 Military and Civilian Aviation

The proposed East Mormon Mountain SEZ is located under two MTRs and 5 mi (8 km) east of a large MOA that extends across southern Nevada just north of Las Vegas. The area is also located within a mandatory DoD Consultation Area. The military has indicated that solar facility structures higher than 200 ft (61 m) would intrude into military airspace and would present safety concerns for military aircraft (Section 11.5.6.2). Foreseeable and potential solar facilities, communication towers, and transmission lines, and the proposed Toquop power plant adjacent to the SEZ, could present additional concerns for military aviation and could result in cumulative impacts on military aviation. The Mesquite and St. George Airports are located far enough away from the facility that there would be no effect on their operations.

11.5.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from construction of the proposed Toquop power plant and nearby transmission lines and pipelines, and from recreational uses. Overall, small cumulative impacts on soil resources near the proposed SEZ could result with mitigations in place.

In addition to soil loss from erosion, landscaping of solar energy facilities and other future projects within and outside the SEZ could alter drainage patterns and lead to increased siltation of surface water streambeds. However, programmatic design features would be in place to minimize impacts from erosion.

11.5.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 11.5.8, there are currently no active oil and gas leases within the proposed East Mormon Mountain SEZ, and there are no pending mining claims or proposals for geothermal energy development in the SEZ. Because of the generally low level of mineral production in the area and the expected low impact of other foreseeable actions on mineral accessibility within the geographic extent of effects, no cumulative impacts on mineral resources are expected.

11.5.22.4.8 Water Resources

Section 11.5.9.2 describes the water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities. The amount of water needed during the peak construction year for all evaluated solar technologies would be 1,039 to 1,492 ac-ft (1.3 million to 1.8 million m^3). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for all evaluated solar technologies would range from 41 to 21,543 ac-ft/yr (51 thousand to 27 million m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. As discussed in Section 11.5.22.2.3, water withdrawals in 2005 in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use categories were irrigation at 55,100 ac-ft/yr (68 million m^3/yr) and public supply/domestic supply at 1,300 ac-ft/yr (1.6 million m^3/yr). Cumulatively, the additional water resources needed for solar facilities in the SEZ during operations would constitute from a very small (0.07%) to a large (38%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Lincoln County) depending on the solar technology used (PV technology at the low end and wet-cooled parabolic trough technology at the high end).

Near the SEZ, the Lower Virgin River Valley groundwater basin has an estimated sustainable yield of between 12,600 and 40,000 ac-ft/yr (16 and 49 million m^3/yr) in the three-state region near the SEZ (Section 11.5.9.1.2). Thus, solar developments on the SEZ would have the capacity to use about half of the sustainable groundwater yield in the local basin using wet cooling. Full development with dry-cooled solar trough technologies would require up to 2,172 ac-ft/yr (2.7 million m^3/yr), or about 5% of this level (Section 11.5.9.2.2).

While solar development of the proposed SEZ with water-intensive technologies would likely be infeasible due to impacts on groundwater supplies and existing demands on water rights, excessive groundwater withdrawals could disrupt the existing groundwater supplies in the Lower Virgin River Valley and in hydraulically connected basins. In addition, land disturbance for solar facility construction could cause localized soil erosion and sedimentation of ephemeral washes, degrade associated habitats, and alter groundwater recharge and discharge processes. Thus, a significant increase in withdrawals from solar development within the proposed SEZ could result in a major impact on groundwater, and further cumulative impacts could occur when combined with other current and future uses in the region. These could include the foreseeable Toquop power plant, which would be adjacent to the SEZ and tap the same groundwater resources of the Tule Desert basin, which is adjacent to the Virgin River Valley basin to the northwest and hydraulically connected. This plant was originally configured to produce 750 MW from coal and use hybrid cooling as analyzed in the 2009 Final EIS (BLM 2009e), requiring an estimated 2,500 ac-ft/yr (3.1 million m^3/yr) of water. The Nevada State Engineer has already permitted 2,100 ac-ft/yr for a power plant at this location; the remaining 400 ac-ft/yr (494,000 m^3/yr) is pending approval. In March 2010, however, project proponents announced revised plans for a 1,100-MW gas-fired plant (Phase 1, 550 to 600 MW) supplemented by 50 to 100 MW of PV solar, which would use 60% less water than the coal-fired version (Sithe Global 2010b). In addition, the proposed Lincoln County Land Act Groundwater Development and Utility ROW project would pump and store groundwater from the Clover Valley and Tule Desert hydrographic areas for use in Lincoln County, including potentially for Toquop power plant. Other foreseeable and potential solar projects are more than 15 mi (24 km) from the SEZ and would not likely affect the same groundwater resources (Section 11.5.22.2).

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 9 to 74 ac-ft (11,000 to 91,000 m^3) during the peak construction year and would range from less than 1 up to 20 ac-ft/yr (up to 25,000 m^3/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to put undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet-cooling systems, there would also be from 226 to 408 ac-ft/yr (0.28 to 0.50 million m^3) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

11.5.22.4.9 Vegetation

The proposed East Mormon Mountain SEZ is located within the Creosotebush–Dominated Basins ecoregion, which is characterized by sparse creosotebush, white bursage, and big galleta grass, with cacti, yucca, ephedra, and Indian ricegrass also common. Sonora–Mojave Creosote–White Bursage Desert Scrub is the predominant cover type within the proposed SEZ. Sensitive habitats on the SEZ include desert dry wash, riparian, and playa habitats. Areas surrounding the SEZ include the Creosotebush–Dominated Basins and Arid Footslopes ecoregions. The dominant cover type in the 5-mi (8-km) area of indirect effects is Sonora–Mojave Creosote–White Bursage Desert Scrub. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the SEZ over 80% of its area would result in small impacts on all cover types in the affected area (Section 11.5.10.2.1). Playa habitats, riparian habitats, or other intermittently flooded areas within or downgradient from solar projects, including riparian plant communities along Toquop Wash and the Virgin River, could be affected by ground-disturbing activities, and increased runoff from facilities could affect the hydrology of these areas. In addition, groundwater drawdown by solar facilities could affect wetland communities associated with springs, including Tule Spring, Abe Spring, Gourd Spring, and Peach Spring. A further concern in disturbed areas is the establishment and spread of noxious weeds and invasive species. An increase in invasive species such as red brome could increase fire frequency within native plant communities.

The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other construction, agriculture, recreation, and transportation. The cumulative dust loading could result in reduced productivity or changes in plant community composition. Similarly, surface runoff from project areas after heavy rains could increase sedimentation and siltation in areas downstream. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

Solar facilities within the SEZ in combination with other ongoing and reasonably foreseeable future actions would have a cumulative effect on both common and uncommon cover types within the 50-mi (80-km) geographic extent of effects. Sensitive habitats, including wetlands, would be of particular concern. The proposed Toquop power plant would draw on groundwater from the Tule Desert region, which would also serve facilities within the SEZ. Many other large-acreage developments exist or are proposed within this distance, including several large power plants, transmission line and pipeline projects, the 21,454-acre (86.8-km^2) Coyote Springs Investment residential development, and a community airport (Section 11.5.22.2). However, many of these projects lie 30 to 50 mi (48 to 80 km) southwest of the proposed East Mormon Mountain SEZ, near the proposed Dry Lake SEZ, although some proposed transmission line and pipeline projects pass near the SEZ. Taken together, current and future projects could have small to moderate cumulative effects on vegetation in the region. The degree of such impacts would depend to some extent on the level of actual solar and wind development in the region. Eight pending solar and five pending wind project applications lie on public land within 50 mi (80 km) of the SEZ; most solar applications lie on or near the East

Mormon Mountain SEZ. The East Mormon Mountain SEZ would make a relatively small contribution to cumulative effects, however, given its modest size in comparison to other developments.

11.5.22.4.10 Wildlife and Aquatic Biota

Wildlife species that could potentially be affected by the development of utility-scale solar energy facilities in the proposed SEZ include amphibians, reptiles, birds, and mammals. The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, and wildlife injury or mortality. In general, impacted species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These design features may include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats.

As noted in Section 11.5.22.2, other ongoing, reasonably foreseeable, and potential future actions within 50 mi (80 km) of the proposed SEZ include three foreseeable large solar facilities on private land, four foreseeable transmission line projects, eight potential solar facilities with pending applications covering over 40,000 acres (160 km^2) on public land, five pending wind applications, several existing large power plants, two pipeline projects, the proposed 21,454-acre (86.8-km^2) Coyote Springs Investment residential development, and a proposed new community airport (Section 11.5.22.2). While impacts from full build-out over 80% of the proposed SEZ would result in small impacts on amphibian, reptile, bird, and mammal species (Section 11.5.11), impacts from foreseeable development within the 50-mi (80-km) geographic extent of effects could be moderate. However, many of the wildlife species present within the proposed SEZ that could be affected by other actions would still have extensive available habitat within the region, while contributions to cumulative impacts from solar facilities within the proposed SEZ would be relatively small due to its modest size.

There are no permanent streams or water bodies within the proposed East Mormon SEZ or within the 5-mi (8-km) area of indirect effects. Toquop Wash is an intermittent stream located within the SEZ, along with several large, unnamed ephemeral washes. Streams and washes typically contain water only after substantial rainfall and carry water to the southeast and eventually drain into the Virgin River. Ephemeral streams and washes in the SEZ may contain a diverse seasonal community of invertebrates adapted to dry conditions, but are not expected to contain permanent aquatic habitat or communities. No NWI-mapped wetlands are present within the SEZ or within area of indirect effects (Section 11.5.11.4.1). Within the 50-mi (80-km) geographic extent of effects, there are 7,372 acres (30 km^2) of dry lakes, 19,963 acres (81 km^2) of perennial lakes, 319 mi (513 km) of perennial streams, and 402 mi (647 km) of intermittent streams. The Virgin River is the nearest perennial surface stream and is located approximately 10 mi (16 km) south of the SEZ (Section 11.5.11.2). Soil disturbance from construction of solar facilities in the SEZ could result in soil transport to surface streams via water and airborne routes, but is expected to be low with mitigations in place. Groundwater drawdown by operating solar facilities within the SEZ could affect aquatic habitats in springs supported by groundwater. Cumulative impacts on aquatic biota from all ongoing and foreseeable development within the 50-mi (80-km) geographic extent of effects could be accrued, given the level of foreseen development. However, most such impacts would occur away from the proposed East Mormon Mountain SEZ, while any contributions to cumulative impacts on aquatic biota from solar development within the proposed SEZ would be small. The proposed Toquop power plant would combine with impacts from the SEZ.

11.5.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

On the basis of recorded occurrences or suitable habitat, as many as 32 special status species could occur within the East Mormon Mountain SEZ. The following three special status species are known to occur within the affected area of the SEZ: Las Vegas buckwheat, desert tortoise, and Nelson's bighorn sheep. No groundwater-dependent special status species have been identified in the affected area. Occurrences of the desert tortoise have been recorded near the SEZ, while critical habitat for the desert tortoise lies with the 5-mi (8-km) area of indirect affects outside the SEZ, adjacent to the eastern and southern boundaries. Numerous species that occur on or in the vicinity of the SEZ are listed as threatened or endangered by the State of Nevada or listed as a sensitive species by the BLM (Section 11.5.12.1). Avoidance of habitat and minimization of erosion, sedimentation, and dust deposition are some of the programmatic design features to be used to reduce or eliminate the potential for effects on these species from the construction and operation of utility-scale solar energy projects in the SEZs and related developments (e.g., access roads and transmission line connections) outside the SEZ. Special-status species are also affected by ongoing actions within the 50-mi (80-km) geographic extent of effects, including from residential areas, roads, transmission lines, and power plants within this distance. Future developments, including the proposed Toquop power plant, two foreseeable large solar facilities on private land, four foreseeable transmission line projects, eight potential solar facilities with pending applications covering over 40,000 acres (160 km^2) on public land, five pending wind applications, the proposed 21,454-acre (86.8-km^2) Coyote Springs Investment residential development, and a proposed new community airport (Section 11.5.22.2), will add further effects. Potential developments cover large areas and long linear distances and are likely to affect special status species. Moderate total cumulative impacts on some species, such as the desert tortoise, within the geographic extent of effects could result. However, contributions to cumulative impacts from solar development with the proposed SEZ would be small. Future projects would employ mitigation measures to limit effects.

11.5.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other nearby projects outside the proposed SEZ, or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. Dust generation from construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency, or road paving or treatment.

Because operation of solar facilities within the SEZ would produce minimal contributions of air emissions to those from operation of existing and future industrial sources in the area, mainly gas-fired power plants, the only type of air pollutant of concern is dust generated during construction of new facilities in addition to that produced by winds. Because there are relatively few other foreseeable and potential actions that could produce fugitive dust emissions near the SEZ, it is unlikely but possible that construction of two or more projects could overlap in both time and affected area and produce small cumulative air quality effects due to dust emissions.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as methods using coal, oil, and natural gas. As discussed in Section 11.5.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the East Mormon Mountain SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 6.6% of all emissions from the current electric power systems in Nevada.

11.5.22.4.13 Visual Resources

The proposed East Mormon Mountain SEZ is located in a valley east of the East Mormon Mountains and south of the Tule Hills. The area is rural with little cultural disturbance, mainly roads and a 500-kV transmission line (Section 11.5.14.1). Construction of utility-scale solar facilities in the SEZ would substantially alter the natural scenic quality of the area. Other foreseeable actions near the proposed SEZ would cumulatively affect the visual resources in the area. Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area. There are currently two potential solar projects and one wind project with pending applications on public land lie within the 25-mi (40 km) geographic extent for visual impacts, all near I-15 (Figure 11.5.22.2-1). In addition, the proposed Toquop power plant would lie adjacent to the SEZ, while at least one proposed transmission project and several pipeline projects would pass through or near the proposed SEZ (Section 11.5.22.2). While the contribution to cumulative visual impacts of these foreseeable and potential projects would depend on the location of facilities that are actually built, it may be concluded that the general visual character of the landscape within this distance would be significantly altered by the presence of these developments. Because of the topography of the region, such developments, located in basin flats, would be visible at great distances from surrounding mountains, which include sensitive viewsheds, such as the Mormon Mountains WA. Given the proximity of some current proposals, it is possible that two or more facilities would be viewable from a single location. In addition, some facilities would be located near major roads and thus would be viewable by motorists, who would also be viewing transmission lines, towns, and other infrastructure, as well as the road system itself.

As additional facilities are added, several projects might become visible from one location, or in succession, as viewers move through the landscape, as by driving on local roads. In general, the new developments would not be expected to be consistent in terms of their appearance and, depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Considering the above, small to moderate cumulative visual impacts could occur within the geographic extent of effects from future solar, wind, and other existing and future developments.

11.5.22.4.14 Acoustic Environment

The areas around the proposed East Mormon Mountain SEZ are relatively quiet. The existing noise sources around the SEZ include infrequent road traffic, aircraft flyover, and cattle grazing, and possibly hunting. The construction of solar energy facilities could increase the noise levels periodically for up to 3 years per facility, and there would be increased noise during operation of solar facilities, notably from solar dish engine facilities and from parabolic trough or power tower facilities using TES. However, these noises would minimally affect nearby residences due to considerable separation distance.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZs are described in Section 11.5.22.2. Because the nearest residents are relatively far from the SEZ and from other foreseeable projects with respect to noise impacts, cumulative noise effects during the construction or operation of solar facilities are unlikely.

11.5.22.4.15 Paleontological Resources

The proposed East Mormon Mountain SEZ has low potential for the occurrence of significant fossil material in nearly 100% of its area, which contains mainly alluvial deposits (Section 11.5.16.1). While impacts on significant paleontological resources are unlikely to occur in the SEZ, a review of the geological deposits in the specific sites selected for future projects would be needed to determine whether a paleontological survey was warranted. Any paleontological resources encountered would be mitigated to the extent possible. No significant contributions to cumulative impacts on paleontological resources are expected.

11.5.22.4.16 Cultural Resources

The area around East Mormon Mountain is rich in cultural history, with settlements dating as far back as 12,000 years. The area covered by the proposed East Mormon Mountain SEZ has the potential to contain significant cultural resources. Seven surveys have been conducted within the SEZ boundaries, covering 0.9% of the SEZ, while 41 surveys have been conducted within the 5-mi (8-km) area of indirect effects, recording four sites and 45 sites, respectively (Section 11.5.17.1). Areas with high potential for containing archaeological sites include the South Fork and Toquop Wash areas. It is possible that the development of utility-scale solar energy projects in the SEZ would contribute to cumulative impacts on cultural resources in the region. Such contributions would be small and overall cumulative effects within the 25-mi (40-km) geographic extent of effects would also be small, given relatively little ongoing and foreseeable development within this distance, except for the proposed adjacent Toquop power plant (Section 11.5.22.2). While any future solar projects would disturb large areas, the specific sites selected for future projects would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Nevada SHPO and appropriate Native American governments, it is likely that most adverse effects on significant resources in the region could be mitigated to some degree. It is unlikely that any sites recorded in the SEZ would be of such individual significance that, if properly mitigated, development would cumulatively cause an irretrievable loss of information about a significant resource type, but this would depend on the results of the future surveys and evaluations.

11.5.22.4.17 Native American Concerns

To date, no specific concerns have been raised to the BLM regarding the proposed East Mormon Mountain SEZ. However, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments (Section 11.5.18.2). It is possible that the development of utility-scale solar energy projects in the proposed SEZ would contribute to cumulative impacts on resources important to Native Americans. Significant drawdown of groundwater supporting Tule Springs by solar facilities in the SEZ and by the proposed Toquop power plant could affect culturally important traditional resources. In addition, the Moapa River Valley 25 mi (40 km) to the southeast is a core area of Southern Paiute population and culture and is the location of several proposed solar projects within the geographic extent of visual impacts of the SEZ (Figure 11.5.22.2-1). Continued discussions with the area Tribes through government-to-government consultation are necessary to effectively consider and address the Tribes' concerns about solar energy development in the proposed East Mormon Mountain SEZ.

11.5.22.4.18 Socioeconomics

Solar energy development projects in the proposed East Mormon Mountain SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction, in combination with temporary workers involved in other new developments in the area, including other renewable energy development, would temporarily increase the number of workers in the area needing housing and services. The number of workers involved in the construction of solar projects in the peak construction year (including the transmission lines) could range from about 240 to 1,700 depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 440 (solar PV) to as high as 4,400 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-year or more solar development period.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-year duration, and could combine with those from other new developments in the area, including several foreseeable and potential solar and wind energy projects, several proposed transmission line and pipeline projects, and the proposed Toquop power plant project (Section 11.5.22.2). The number of workers needed at the SEZ solar facilities would be in the range of 16 to 310, with approximately 20 to 500 total jobs created in the region, assuming full build-out of the SEZ (Section 11.5.19.2.2). Population increases would contribute to general upward trends in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

11.5.22.4.19 Environmental Justice

Any impacts from solar development could have cumulative impacts on minority and low-income populations within 50 mi (80 km) of the proposed SEZ in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual impacts, noise, and exposure to fugitive dust. Actual impacts would depend on the geographic range of effects and on the location of low-income populations relative to solar and other proposed facilities. Overall, effects from facilities within the SEZ are expected to be small, while other foreseeable and potential actions could contribute additional small effects on minority and low-income populations. However, except for the proposed Toquop project, most foreseeable actions are more than 30 mi (48 km) from the proposed SEZ, and no minority or low-income populations are currently present within the 50-mi (80-km) ROI (Section 11.5.20.1). While future minority and low-income populations, if present, could experience small cumulative effects of some types, such as effects on visual resources or from fugitive dust from all actions within the geographic extent of effects, contributions from solar development in the proposed East Mormon Mountain SEZ would be small. If needed, mitigation measures could be employed to reduce the impacts on these populations in the vicinity of the SEZ.

11.5.22.4.20 Transportation

I-15 is the nearest major road and lies about 11 mi (18 km) southeast of the proposed East Mormon Mountain SEZ. The Las Vegas metropolitan area lies approximately 62 mi (100 km) to the southwest of the SEZ along I-15. The nearest airport with scheduled passenger service is the St. George Municipal Airport, 43 mi (69 km) to the northeast in St. George, Utah. The closest railroad access is in Moapa, about 25 mi (40 km) southwest of the SEZ. During construction of utility-scale solar energy facilities, there could be up to 1,000 workers commuting to the construction site at the SEZ, which could increase the AADT on these roads by 2,000 vehicle trips for each facility under construction. With a single solar facility assumed to be under construction at a given time, traffic on I-15 could experience minor slowdowns in the area near access to the SEZ (Section 11.5.21.2). This increase in highway traffic from construction workers could likewise have minor cumulative impacts on traffic flow in combination with existing traffic levels and increases from additional future developments in the area, including construction of the proposed Toquop power plant and facilities for the proposed Lincoln County Land Act Groundwater Development and Utility ROW project in the vicinity of the proposed SEZ, should project schedules overlap. Local road improvements may be necessary on portions of I-15 near access to the SEZ. Any impacts during construction activities would be temporary. The impacts can also be mitigated to some degree by staggered work schedules and ride-sharing programs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate the solar facilities and would have little contribution to cumulative impacts.

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11.5.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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11.6 GOLD POINT

11.6.1 Background and Summary of Impacts

11.6.1.1 General Information

The proposed Gold Point SEZ is located in Esmeralda County in southwestern Nevada (Figure 11.6.1.1-1). The SEZ has a total area of 4,810 acres (19 km^2). In 2008, the county population was 664, while adjacent Nye County to the east had a population of 44,175. There are no incorporated towns in close proximity to the SEZ. The town of Tonopah is approximately 50 mi (80 km) to the north, and the Las Vegas metropolitan area is approximately 180 mi (290 km) to the southeast of the SEZ.

The nearest major road access to the proposed Gold Point SEZ is State Route 774, which parallels the eastern edge of the SEZ; U.S. 95 runs north–south as it passes within 9 mi (14 km) to the east of the SEZ. The UP Railroad serves the region; the closest stop is in Thorne, 160 mi (257 km) northwest of the SEZ. The nearest public airport is Lida Junction Airport, a small BLM airport about 10 mi (16 km) from the SEZ. There are three additional airports in the vicinity, none of which have scheduled commercial passenger service. The nearest airport with scheduled passenger service is in Las Vegas, Nevada.

A 120-kV transmission line passes 22 mi (35 km) west of the SEZ. It is assumed that a new transmission line would be needed to provide access from the SEZ to the transmission grid (see Section 11.6.1.2).

Applications for ROWs that have been submitted to the BLM include one pending solar project, one pending authorization for wind site testing, two authorized projects for wind site testing, and one authorized geothermal project that would be located within 50 mi (80 km) of the Gold Point SEZ. These applications are discussed in Section 11.6.22.2.1.

The proposed Gold Point SEZ is in an undeveloped rural area. The SEZ is located in the Lida Valley, which lies between the Mount Jackson Ridge and Cuprite Hills to the north and Slate Ridge to the south. It is bounded on the west by the Palmetto Mountains and on the east by the Stonewell Mountains.

The proposed Gold Point SEZ and other relevant information are shown in Figure 11.6.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar energy development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Gold Point SEZ, other restrictions might be appropriate. The analyses in the following sections address the

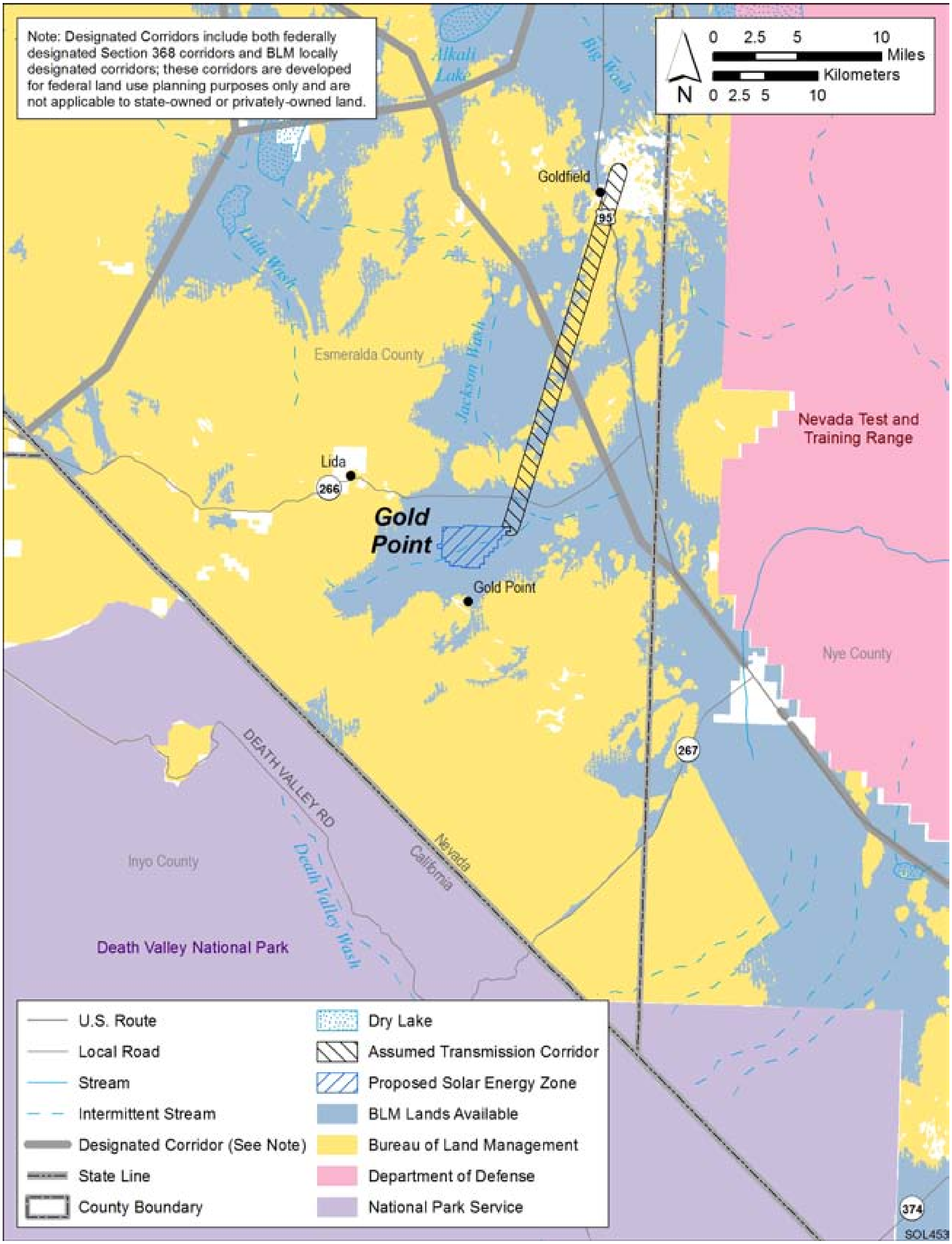

FIGURE 11.6.1.1-1 Proposed Gold Point SEZ

affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Gold Point SEZ encompassed 5,830 acres (24 km^2). Subsequent to the study area scoping period, the boundaries of the proposed Gold Point SEZ were altered somewhat to facilitate the BLM's administration of the SEZ area. Borders with irregularly shaped boundaries were adjusted to match the section boundaries of the Public Lands Survey System (PLSS) (BLM and USFS 2010c). The revised SEZ is approximately 1,020 acres (4 km^2) smaller than the original SEZ area as published in June 2009.

11.6.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the Gold Point SEZ is assumed to be 80% of the SEZ area over a period of 20 years, a maximum of 3,848 acres (16 km^2). These values are shown in Table 11.6.1.2-1, along with other development assumptions. Full development of the Gold Point SEZ would allow development of facilities with an estimated total of 428 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 770 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 120-kV line 22 mi (35 km) west of the SEZ. It is possible that a new transmission line could be constructed from the SEZ to this existing line, but the 120-kV capacity of that line would be inadequate for 428 to 770 MW of new capacity (note that a 500 kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, new transmission and/or upgrades of existing transmission lines (in addition to or instead of construction of a connection to the nearest existing line) might be required to bring electricity from the proposed Gold Point SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For purposes of as complete an analysis of impacts of development in the SEZ as possible, it was assumed that, at a minimum, a transmission line segment would be constructed from the proposed Gold Point SEZ to the nearest existing transmission line to connect the SEZ to the transmission grid. This assumption was made without additional information on whether the nearest existing transmission line would actually be available for connection of future solar

TABLE 11.6.1.2-1 Proposed Gold Point SEZ—Assumed Development Acreages, Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line and Road ROWs	Distance to Nearest Designated Corridor[e]
4,810 acres and 3,848 acres[a]	428 MW[b] and 770 MW[c]	State Route 774 0 mi	22 mi[d] and 120 kV	667 acres and 0 acres	6 mi

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] To convert mi to km, multiply by 1.609.

[e] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

facilities, and without assumptions about upgrades of the line. Establishing a connection to the line closest to the SEZ would involve the construction of about 22 mi (35 km) of new transmission line outside of the SEZ. The ROW for this transmission line would occupy approximately 667 acres (2.7 km^2) of land, assuming a 250-ft (76-m) wide ROW, a typical width for such a ROW. If a connecting transmission line were constructed to a different offsite grid location in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

Existing road access to the proposed Gold Point SEZ should be adequate to support construction and operation of solar facilities, because State Route 774 runs along the eastern border of the SEZ. Thus, no additional road construction outside of the SEZ is assumed to be required to support solar development, as summarized in Table 11.6.1.2-1.

11.6.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 11.6.2 through 11.6.21 for the proposed Gold Point SEZ are summarized in tabular form. Table 11.6.1.3-1 is a comprehensive list of impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 11.6.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

TABLE 11.6.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Gold Point SEZ and SEZ-Specific Design Features

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the proposed Gold Point SEZ could disturb up to 3,848 acres (15.6 km^2). Development of the SEZ for utility-scale solar energy production would establish an isolated industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	Light from solar facilities could adversely affect night sky viewing in some specially designated areas. New transmission lines could cause visual impacts on specially designated areas.	None. Transmission line construction should be routed and constructed in such a way as to minimize visual impacts on specially designated areas.
Rangeland Resources: Livestock Grazing	None.	None.
Rangeland Resources: Wild Horses and Burros	Wild horses and burros in the Gold Mountain HMA could incur indirect impacts from solar energy development. Wild horses and burros would incur direct and indirect impacts from construction of the assumed transmission line in the Goldfield HMA. Direct impacts would be small as only 0.07% of the HMA would be impacted by construction. Following construction, wild horses and burros would be able to make use of the rangelands within the transmission line ROW.	None.
Recreation	Recreational use would be eliminated from portions of the SEZ that would be developed for solar energy production; the loss of use, however, is anticipated to be minimal. There are no anticipated adverse effects on recreation use of specially designated areas within 25 mi (40 km) of the SEZ.	None.

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Military and Civilian Aviation	*Military*: The military has expressed serious concern over solar energy facilities being constructed within the SEZ. Nellis Air Force Base has indicated that solar technologies could interfere with flight operations on MTRs that cross the SEZ. The NTTR has indicated that structures higher than 50 ft (15 m) above ground level may present unacceptable electromagnetic compatibility concerns for the NTTR test mission.	None.
	Civilian: There would be no effect on civilian aviation.	None.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase. Impacts would include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation).	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.
Water Resources	Ground-disturbance activities (affecting 62% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills.	Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures.
	Construction activities may require up to 1,707 ac-ft (2.1 million m^3) of water during the peak construction year.	Land disturbance activities should minimize impacts to the unnamed intermittent stream, the playa area in the northeast corner, and ephemeral washes on site.
	Construction activities would generate as high as 74 ac-ft (91,300 m^3) of sanitary wastewater.	

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	Assuming full development of the SEZ, operations would use the following amounts of water: • For parabolic trough facilities (770-MW capacity), 550 to 1,166 ac-ft/yr (678,400 to 1.4 million m^3/yr) for dry-cooled systems; water requirements for wet-cooled systems are more than 10 times the perennial yield of the basin. • For power tower facilities (428-MW capacity), 305 to 647 ac-ft/yr (376,200 to 798,000 m^3/yr) for dry-cooled systems; water requirements for wet-cooled systems are more than 6 times the perennial yield of the basin. • For dish engine facilities (428-MW capacity), 219 ac-ft/yr (270,100 m^3/yr). • For PV facilities (428-MW capacity), 22 ac-ft/yr (27,100 m^3/yr). Assuming full development of the SEZ, operations would generate up to 11 ac-ft/yr (13,600 m^3/yr) of sanitary wastewater and up to 219 ac-ft/yr (270,100 m^3/yr) of blowdown water.	Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters. Groundwater supplies during the construction and operations phases would need to be secured through coordination of the NDWR in terms of obtaining groundwater rights with in the Lida Valley groundwater basin, and potentially from off-site sources and adjacent groundwater basins for the construction phase. Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection. Groundwater monitoring and production wells should be constructed in accordance with state standards. Water for potable uses would have to meet or be treated to meet water quality standards in accordance with the *Nevada Administrative Code*.

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Vegetation[b]	Up to 80% of the SEZ (3,848 acres [15.6 km^2]) would be cleared of vegetation; re-establishment of desert scrub communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Vegetation communities associated with playa habitats, greasewood flats, riparian habitats, desert dry washes, or other intermittently flooded areas within or downgradient from solar projects could be affected by ground-disturbing activities. The use of groundwater within the proposed Gold Point SEZ for technologies with high water requirements, such as wet-cooling systems, could disrupt the groundwater flow pattern and adversely affect habitats associated with springs in the vicinity of the SEZ.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of desert scrub, greasewood flat, and other affected habitats, and to minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. All riparian, dry wash, and playa communities within the SEZ and transmission line corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. Any Joshua tree or other *Yucca* species, cacti, or succulent plant species that cannot be avoided should be salvaged. A buffer area should be maintained around dry wash, riparian, and playa habitats to reduce the potential for impacts. Appropriate engineering controls should be used to minimize impacts on dry wash, playa, wetland, greasewood flat, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Vegetation *(Cont.)*		Groundwater withdrawals should be limited to reduce the potential for indirect impacts on habitats associated with springs. Potential impacts on springs should be determined through hydrological studies.
Wildlife: Amphibians and Reptiles[b]	Direct impacts on all representative amphibian and reptile species would be small (i.e., loss of 0.1% or less of potentially suitable habitats within the SEZ region). With the implementation of design features, indirect impacts would be expected to be negligible.	Development in wash and playa habitats should be avoided.
Wildlife: Birds[b]	Direct impacts on all representative bird species would be small (i.e., loss of 0.2% or less of potentially suitable habitats within the SEZ region). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act. Wash and playa habitats should be avoided.
Wildlife: Mammals[b]	Direct impacts on all representative mammal species would be small (i.e., loss of 0.1% or less of potentially suitable habitats within the SEZ region). Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These impacts are expected to be negligible with the implementation of design features.	The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. Wash and playa habitats should be avoided.

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Aquatic Biota[b]	There are no permanent water bodies, streams, or wetlands present within the area of direct or indirect effects of either the proposed Gold Point SEZ or the presumed new transmission line corridor. Intermittent and ephemeral streams are present in the area of direct and indirect effects, and ground disturbance could increase the transport of soil into these streams via waterborne and airborne pathways. In addition, contaminants such as fuels, lubricants, or pesticides/herbicides could enter intermittent streams near construction activities. However, these streams are not expected to contain aquatic habitat or biota and do not connect to perennial surface waters. Therefore, no impacts on aquatic habitat or biota are expected.	None.
Special Status Species[b]	Potentially suitable habitat for 21 special status species occurs in the affected area of the Gold Point SEZ. For most special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects.	Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible for some species, translocation of individuals from areas of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that uses one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Avoiding or minimizing disturbance to desert wash, playa, and sagebrush habitats could reduce or eliminate impacts on two special status species.

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Coordination with the USFWS and the NDOW should be conducted for the greater sage-grouse—a candidate species for listing under the ESA. Coordination would identify an appropriate survey protocol and mitigation requirements, which may include avoidance, minimization, translocation, or compensation. Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. These concentrations would decrease quickly with distance. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area (John Muir WA, California). In addition, construction emissions from the engine exhaust of heavy equipment and vehicles could affect AQRVs (e.g., visibility and acid deposition) at nearby federal Class I areas. *Operations*: Positive impact due to avoided emissions of air pollutants from combustion-related power generation: 2.0 to 3.6% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada (up to 1,902 tons/yr SO_2, 1,632 tons/yr NO_x, 0.011 ton/yr Hg, and 1,047,000 tons/yr CO_2).	None.

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Visual Resources	The SEZ is in an area of low scenic quality, but with few cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. Solar development could produce large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape. The SEZ is located 7.0 mi (13.5 km) from Queer Mountain WSA. Because of the elevated viewpoints in the WSA, moderate visual contrasts could be observed by WSA visitors. The SEZ is located 5.0 mi (8 km) from Magruder Mountain. Because of the close proximity and elevated viewpoints on Magruder Mountain, moderate visual contrasts could be observed by viewers on the mountain. Approximately 18 mi (29 km) of State Route 266 are within the SEZ viewshed. Because State Route 266 passes with 2 mi (3 km) of the SEZ, strong visual contrasts would be expected for nearby viewpoints on this highway. The community of Gold Point is located less than 2 mi (3 km) from the SEZ, although slight variations in topography and buildings could provide limited screening. Because of the close proximity of the SEZ to Gold Point, strong visual contrasts would be expected for viewpoints within the community of Gold Point.	None.

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction:* For construction of a solar facility located near the southern SEZ boundary, estimated noise levels at the nearest residences located about 2 mi (3 km) from the SEZ boundary would be about 34 dBA, which is below the typical daytime mean rural background level of 40 dBA. In addition, an estimated 40 dBA L_{dn} at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas. *Operations:* For operation of a parabolic trough or power tower facility located near the southern SEZ boundary, the predicted noise level would be about 36 dBA at the nearest residences, which is below the typical daytime mean rural background level of 40 dBA. If the operation were limited to daytime, 12 hours only, a noise level of about 41 dBA L_{dn} (i.e., minimal contribution from facility operation) would be estimated for the nearest residences, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. However, in the case of 6-hour TES, the estimated noise level at the nearest residences would be 46 dBA, which is well above the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 48 dBA L_{dn}, which is below the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level at the nearest residences would be about 43 dBA, which is somewhat higher than the typical daytime mean rural background level of 40 dBA. On the basis of 12-hour daytime operation, the estimated 43 dBA L_{dn} at these residences would be well below the EPA guideline of 55 dBA L_{dn} for residential areas.	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearby residences to the south of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers. Dish engine facilities within the Gold Point SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearby residences. Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at nearby residences.

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Paleontological Resources	Few, if any, impacts on significant paleontological resources are likely in the proposed Gold Point SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. The potential for impacts on significant paleontological resources in portions of the transmission line corridor is unknown. A paleontological survey may be needed prior to project approval.	The need for and nature of SEZ-specific design features would depend on the results of future paleontological investigations, especially along a potential new transmission corridor.
Cultural Resources	Direct impacts on significant cultural resources could occur in the proposed Gold Point SEZ; however, further investigation is needed. Sites related to historic mining in the region are possible. Visual impacts on the Gold Point Town Site are also likely. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP. Impacts on several sites are possible along the transmission line route, depending on the specific location of the line. Visual impacts along the transmission corridor are also possible, potentially affecting the Goldfield Historic District.	SEZ-specific design features would be determined through consultation with the Nevada SHPO and affected Tribes and would depend on the results of future cultural investigations. General visual mitigation measures may need to be employed to reduce visual impacts on the Gold Point Town Site near the SEZ and along the possible transmission line near the Goldfield Historic District.
Native American Concerns	While no comments specific to the proposed Gold Point SEZ have been received from Native American Tribes to date, as consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concern over potential visual and other effects of solar energy development within the SEZ on specific resources, including culturally important landscapes.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.

TABLE 11.6.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Gold Point SEZ	SEZ-Specific Design Features
Socioeconomics	*Construction:* A total 173 to 2,287 jobs would be added; ROI income would increase by \$10.5 million to \$138.9 million. *Operations:* A total of 10 to 224 annual jobs would be added; ROI income would increase by \$0.3 million to \$7.6 million. Construction of new transmission line: 79 jobs; \$3.7 million income in ROI.	None.
Environmental Justice	As defined in CEQ guidelines, no minority or low-income populations occur within the 50-mi (80-km) radius around the boundary of the SEZ; thus, there would be no disproportionately high and adverse human health or environmental effects on low-income or minority populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The increase in the volume of traffic on U.S. 95, State Route 266, and State Route 774 would represent an increase in traffic of about 100%, 1,000%, and 10,000%, respectively. Traffic on U.S. 95 could experience slowdowns, and local road improvements would be necessary on State Route 266 and on State Route 774.	None.

Abbreviations: AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; AQRV = air quality–related value; BLM = Bureau of Land Management; BMP = best management practice; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; dBA = A-weighted decibel; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; L_{dn} = day-night average sound level; MTR = military training route; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NNHP = Nevada Natural Heritage Program; NO_x = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; PEIS = programmatic environmental impact statement; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 μm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 μm or less; PSD = prevention of significant deterioration; PV = photovoltaic; ROI = region of influence; ROW = right-of-way; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; SRMA = Special Recreation Management Area; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; WA = Wilderness Area.

Footnotes continued on next page.

TABLE 11.6.1.3-1 (Cont.)

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Gold Point SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 11.6.10 through 11.6.12.

Only those design features specific to the proposed Gold Point SEZ are included in Sections 11.6.2 through 11.6.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

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11.6.2 Lands and Realty

11.6.2.1 Affected Environment

The proposed Gold Point SEZ is a small but well-blocked area of BLM-administered land that is isolated but accessible via U.S. 95 and connecting to State Routes 266 and 774. The latter highway is within 0.25 mi (0.4 km) of the eastern border of the SEZ. The SEZ is located about 180 mi (290 km) northwest from Las Vegas. The character of the land in the SEZ is undeveloped and rural with only a few dirt roads present within the area. There are no existing ROWs within the SEZ, but there is a designated 368b transmission corridor (of the Energy Policy Act of 2005) that passes about 6.5 mi (10 km) to the northeast of the area. There also is a proposed local corridor located just west of the 368b corridor.

As of February 2010, there were no ROW applications for solar energy facilities within the SEZ.

11.6.2.2 Impacts

11.6.2.2.1 Construction and Operations

Full development of the proposed Gold Point SEZ could disturb up to 3,848 acres (15.6 km^2) (Table 11.6.1.2-1). Development of the SEZ for utility-scale solar energy production would establish an industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and isolated, utility-scale solar energy development would be a new and highly discordant land use to the area.

Should the proposed area be identified as a solar energy zone in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights issued for solar energy development. Because the proposed SEZ is surrounded by BLM-administered lands, approval of solar energy development of the SEZ would not have any impact on the availability of land for future ROWs in the area.

11.6.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 120 kV transmission line runs 22 mi (35 km) northeast of the SEZ. It is assumed that a new transmission line segment would be constructed from the proposed Gold Point SEZ to the nearest existing transmission line to connect the SEZ to the transmission grid. Construction of the line would result in the disturbance of 667 acres (2.7 km^2) outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

State Route 774 is adjacent to the SEZ, and it is assumed that no new roads would be required to access the site.

Roads and transmission lines would be constructed within the SEZ as part of the development of the area.

11.6.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for some identified impacts. The exceptions would be that the development of the SEZ would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity and utility-scale solar energy development would be a new and discordant land use to the area.

11.6.3 Specially Designated Areas and Lands with Wilderness Characteristics

11.6.3.1 Affected Environment

There are 9 specially designated areas within 25 mi (40 km) of the proposed Gold Point SEZ that potentially could be affected by solar energy development within the SEZ, principally from impacts on scenic, recreation, and/or wilderness resources. The potential area of impact for the SEZ includes parts of Nevada and California. The specially designated areas that could be impacted from solar development within the SEZ include the following (see Figure 11.6.3.1-1):

- National Park
  - Death Valley

- National Conservation Area
  - California Desert

- Wilderness Areas
  - Death Valley
  - Piper Mountain
  - Sylvania Mountains

- Wilderness Study Areas
  - Pigeon Spring
  - Queer Mountain
  - Grapevine Mountains

- Special Recreation Management Area
  - Fish Lake Valley

Although they are within the 25-mi (40-km) radius of the visual analysis area, both the Piper Mountain and Sylvania Mountains WAs and the Grapevine Mountains WSA have no visibility of potential development within the SEZ; thus they are not considered further.

No lands near the SEZ and outside of designated WAs or WSAs have been identified by the BLM to be managed to protect wilderness characteristics.

11.6.3.2 Impacts

11.6.3.2.1 Construction and Operations

The primary potential impacts on specially designated areas generally are from visual impacts of solar energy development that could affect scenic, recreational, or wilderness characteristics of the areas. This visual impact is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing

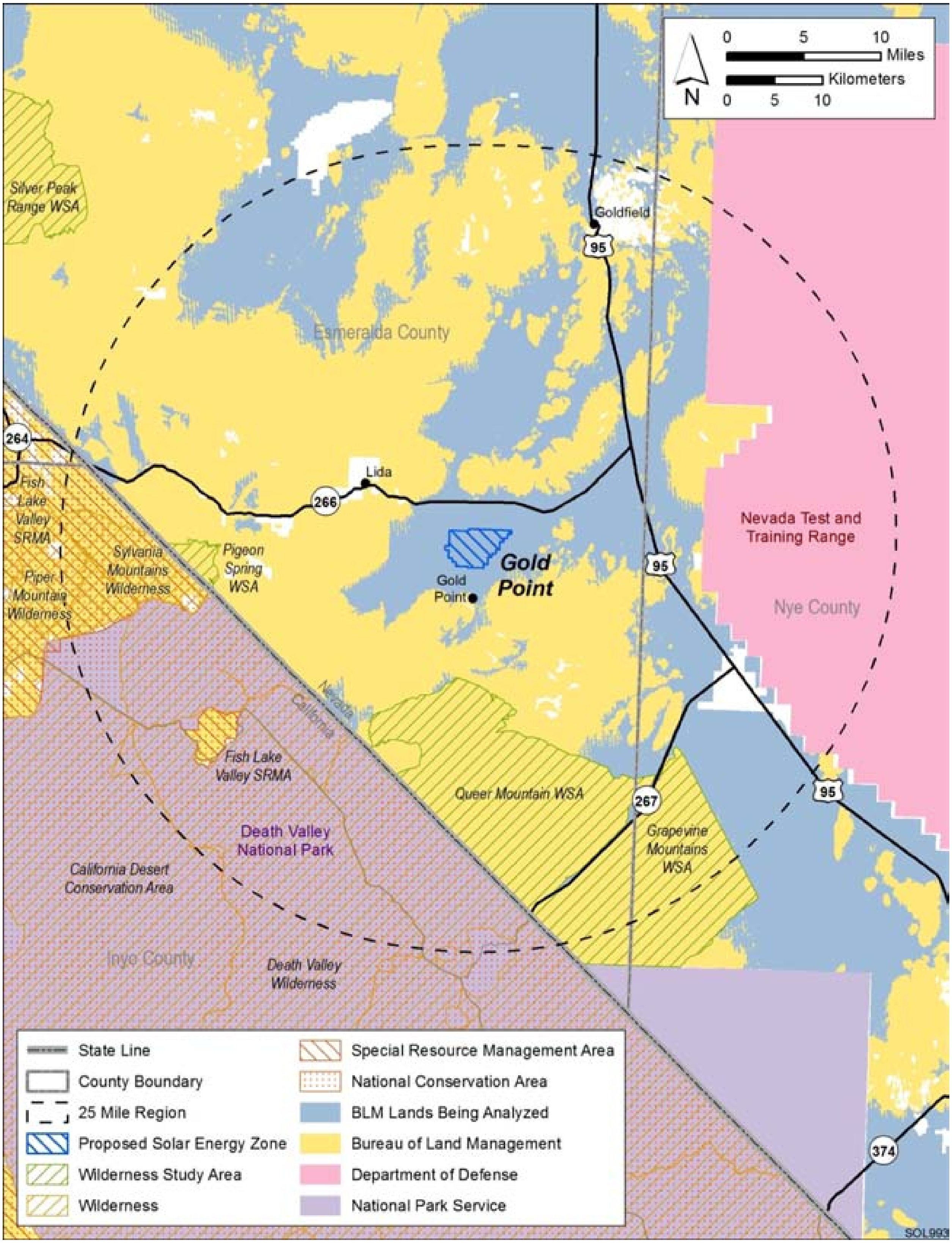

FIGURE 11.6.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Gold Point SEZ

the development. From viewshed analysis, it appears that solar development of the proposed Gold Point SEZ would not be a significant factor in the viewshed of any of these specially designated areas, as summarized in Table 11.6.3.2-1. Five of the specially designated areas would have no significant acreage with visibility of development within the SEZ closer than 15 mi (24 km). The data provided in the table assume the use of 650-ft (98.1-m) power tower solar energy technology, which because of the potential height of these facilities, could be visible from the largest amount of land of the technologies being considered in the PEIS. (See Section 11.6.14 for more detail on all viewshed analysis discussed in this section). Assessment of the visual impact of solar energy projects must be conducted on a site-specific and technology-specific basis to accurately identify impacts.

In general, the closer a viewer is to solar development, the greater the impact on an individual's perception. From a visual analysis perspective, the most sensitive viewing distances generally are from 0 to 5 mi (0 to 8 km). The viewing height above a solar energy development area, the size of the solar development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness or scenic experience within these areas

TABLE 11.6.3.2-1 Potentially Affected Specially Designated Areas within a 25-mi (40-km) Viewshed of the Proposed Gold Point SEZ[a]

		Feature Area[c]		
			Visible between	
Feature Type	Feature Name (Total Acreage)[b]	Visible within 5 mi	5 mi and 15 mi	15 mi and 25 mi
National Park	Death Valley (3,397,062 acres)	0 acres	67 acres (0%)	3,814 acres (0.11%)
National Conservation Area	California Desert (25,919,319 acres)	0 acres	67 acres (0%)	4,265 acres (0.02%)
WAs	Death Valley (3,074,256 acres)	0 acres	67 acres (0%)	3,774 acres (0.12%
WSAs	Pigeon Spring (3,651 acres)	0 acres	0 acres (0%)	8 acres (0.21%)
	Queer Mountain (85,294 acres)	0 acres	1,276 acres	1,276 acres (0.23%)
SRMA	Fish Lake Valley (196,811 acres)	0 acres	0 acres	460 (0.23%)

[a] Assuming power tower solar technology with a height of 650 ft (198.1 m).

[b] To convert acres to km^2, multiply by 0.004047. To convert mi to km, multiply by 1.609.

[c] Percentage of total feature acreage viewable.

could be expected to be more adversely affected than those simply traveling along a highway with another destination in mind.

The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas that were used to assess potential impacts on specially designated areas do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

California Desert Conservation Area (CDCA), Death Valley National Park, and Death Valley Wilderness Area.

These areas are all located in California, and the state line is about 12.5 mi (20 km) southwest of the SEZ. The three areas overlap one another in this area; the WA is within the National Park, which is within the CDCA.

Solar facilities within the SEZ could be visible from the summits and northeast-facing slopes of higher peaks in the area surrounding Last Chance Mountain in the northern portion of Death Valley NP, at a distance of about 16 to 18 mi (26 to 29 km) from the SEZ. This area with visibility encompasses about 4,000 acres (16 km^2); however, visibility in about one-third of the area would be restricted only to taller solar facility components, such as transmission towers and power towers. Some viewpoints would have clear, but long-distance, views of the SEZ, but the SEZ would occupy only a very small part of the horizontal field of view, and the vertical viewing angle would be very low, despite the elevated viewpoints. Furthermore, most of the area has scattered vegetation, and some views of the SEZ could therefore be subject to screening. Three additional small areas with visibility of the SEZ exist at distances from 14 to 20 mi (23 to 30 km) from the SEZ. The largest of these areas is less than 200 acres (0.8 km^2) in size, and in these smaller areas, visibility would be limited to the upper portions of tall power towers in the SEZ. Visual contrast levels caused by solar facilities within the SEZ for viewpoints within all of the areas described would not be expected to exceed very weak levels. For that reason, it is anticipated that there would be no adverse impacts on wilderness, scenic, or recreational resources within these three specially designated areas.

Because of the lack of development in the immediate region of the SEZ, the night sky is very dark. The NPS has identified the concern that solar facility development in the region adjacent to Death Valley NP could adversely affect the quality of the night sky environment as viewed from the park. The amount of light that could emanate from this relatively small SEZ is not known, but it could adversely affect night sky viewing from limited portions of the National Park and the adjoining wilderness and other specially designated areas.

Queer Mountain WSA

The boundary of this WSA is directly south of the SEZ at a distance of 7 mi (11 km) at the closest point of approach. At a distance of about 10 mi (16 km) from the SEZ, solar facilities in the SEZ could be visible from about 1,400 acres (5.7 km^2) within the WSA on summits and north-facing slopes of Gold Mountain and some ridges to the west of Gold Mountain in the northern portion o f the area. From the highest peaks and ridges in those portions of the WSA that have views of the SEZ, the ridges of Slate Ridge screen portions of the SEZ from view; however, from some viewpoints most of the SEZ would be visible, and the SEZ would occupy a moderate amount of the horizontal field of view. The vertical angle of view is low, but high enough that the tops of collector/reflector arrays within the SEZ would likely be visible. From these very high-elevation viewpoints, visual contrast levels from solar facilities could potentially reach moderate levels; for lower-elevation viewpoints, very weak or weak levels of visual contrast would be expected. Because of these levels of contrast and the distance from the SEZ, it is anticipated that there would be no adverse impact on wilderness characteristics in the WSA.

Pigeon Spring WSA

This WSA is 15 mi (24 km) west of the SEZ. Because of topographic screening, only a very small area within the WSA about 16 mi (26 km) from the westernmost boundary of the SEZ would have any visibility of development in the SEZ. Because of the long distance view and very low contrast levels from solar energy facilities, it is anticipated that there would be no impact on wilderness characteristics within the WSA.

Fish Lake Valley SRMA

The BLM-administered Fish Lake Valley SRMA is located within the CDCA and is surrounded by Death Valley NP and Death Valley WA and is composed of two areas that are about 6 mi (10 km) apart. The nearest boundary of the southern, smaller area of the SRMA is located about 17 mi (27 km) southwest of the SEZ and is surrounded by designated wilderness within Death Valley NP. This portion of the SRMA is not designated as wilderness.

The nearest boundary of the larger northern portion of the SRMA is west of the SEZ about 16 mi (26 km). This portion of the SRMA contains the Sylvania Mountains and Piper Mountain WAs, the White Mountains WSA, and some undesignated public lands. Although almost all of the Sylvania Mountains, a portion of the Piper Mountain WAs, and some public lands are within the 25-mi (40-km) visual analysis area surrounding the SEZ this portion of the SRMA has no areas with views of the SEZ; thus there would be no impact from solar energy development.

Within the smaller portion of the SRMA, there is very limited visibility of the SEZ from less than 500 acres (2 km^2) of the northeast-facing slopes of a few of the higher peaks in the area, at an approximate distance of 18 to 19 mi (29 to 31 km) from the SEZ. Land surface within the SEZ would not be visible from this area, but the upper portions of power towers and transmission towers located in the far northern portion of the SEZ might just be visible over intervening mountains. It is unlikely that the solar facilities would be seen by casual viewers, and even if they were, expected visual contrast levels would be minimal. It is anticipated that there would be no impact on recreational use in this portion of the SRMA from development within the SEZ.

11.6.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

See Section 11.6.2.2.2 for the assumptions regarding the construction of new transmission facilities. Depending on their location and visibility, new transmission facilities could potentially cause additional visual impacts on the specially designated areas listed above. However, because of the limited amount of area with visibility of the transmission line route and the distance to the route, it is not anticipated that the impacts would be significant.

There would be no impacts outside of the SEZ to provide for road access to the area.

11.6.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for some potential impacts.

A proposed design feature specific to the Gold Point SEZ includes:

- Transmission line construction should be routed and constructed in such a way as to minimize visual impacts on specially designated areas.

11.6.4 Rangeland Resources

11.6.4.1 Livestock Grazing

Rangeland resources managed by the BLM on BLM-administered lands include livestock grazing and habitat for wild horses and burros. These resources and possible impacts on them from solar development within the proposed Gold Point SEZ are discussed in Sections 11.6.4.1 and 11.6.4.2.

11.6.4.1.1 Affected Environment

One grazing allotment overlaps the proposed SEZ—the large Magruder Mountain allotment. The allotment contains 667,139 acres (2,700 km^2) of public and private lands and has an active grazing authorization of 6,300 AUMs (BLM 2009c). A total of 4,810 acres (19 km^2), or 0.7%, of the allotment is within the SEZ.

11.6.4.1.2 Impacts

Construction and Operations

Should utility-scale solar development occur in the Gold Point SEZ, grazing would be excluded from the areas developed, as provided for in the BLM grazing regulations (43 CFR Part 4100). The regulations provide for reimbursement of permittees for their portion of the value for any range improvements in the area removed from the grazing allotment. The impact of this change in the grazing permits would depend on several factors, including (1) how much of an allotment the permittee might lose to development, (2) how important the specific land lost is to the permittee's overall operation, and (3) the amount of actual forage production that would be lost by the permittee.

Since less than 1% of the Magruder Mountain allotment overlaps the SEZ, the loss of this small amount of area is anticipated to have no impact on grazing use because the loss of use from the SEZ likely could be absorbed elsewhere in the allotment.

Transmission Facilities and Other Off-Site Infrastructure

Connecting the SEZ to the regional power grid would require the construction of about 22 mi (35 km) of new transmission line and would disturb about 667 acres (2.7 km^2) allocated in the Magruder Mountain allotment. This additional loss of land also would not be significant for the operation of the allotment.

There would be no impacts outside of the SEZ to provide for road access to the area. See Section 11.6.1.2 regarding development assumptions for the SEZ.

11.6.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required to protect livestock grazing. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate protection for livestock grazing.

11.6.4.2 Wild Horses and Burros

11.6.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nearly 100 wild horse and burro herd management areas (HMAs) occur within Nevada (BLM 2009d). Ten HMAs in Nevada are located wholly or partially within the 50-mi (80-km) SEZ region for the proposed Gold Point SEZ, while two HMAs in California also occur partially or wholly within the SEZ region (BLM 2010) (Figure 11.6.4.2-1). None of the HMAs occur within the SEZ. Portions of the Palmetto and Gold Mountain HMAs occur within the indirect impact area of the SEZ. They are located 2.2 and 2.9 mi (3.5 and 4.7 km), respectively, from the SEZ. In FY 2009, no wild horses or burros occurred in the Palmetto HMA. Six wild horses and one wild burro occurred in the Gold Mountain HMA in FY 2009; the appropriate management levels were no wild horses and 78 wild burros (BLM 2010a). The Goldfield HMA occurs within the assumed transmission line corridor for the proposed Gold Point SEZ (Figure 11.6.4.2-1). In FY 2009, the Goldfield HMA contained a population of 8 wild horses and 20 wild burros and had an appropriate management level of no wild horses and 37 wild burros (BLM 2010a).

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to the proposed Gold Point SEZ is the Monitor Territory, located about 51 mi (82 km) north of the Gold Point SEZ (Figure 11.6.4.2-1).

11.6.4.2.2 Impacts

Because the proposed Gold Point SEZ is about 2.2 mi (3.5 km) or more from any wild horse and burro HMA managed by the BLM and about 51 mi (82 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly affect wild horses and burros that are managed by these agencies. Indirect impacts on wild horses and burros within the Gold Mountain HMA could result from fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts would be negligible with the implementation of design features.

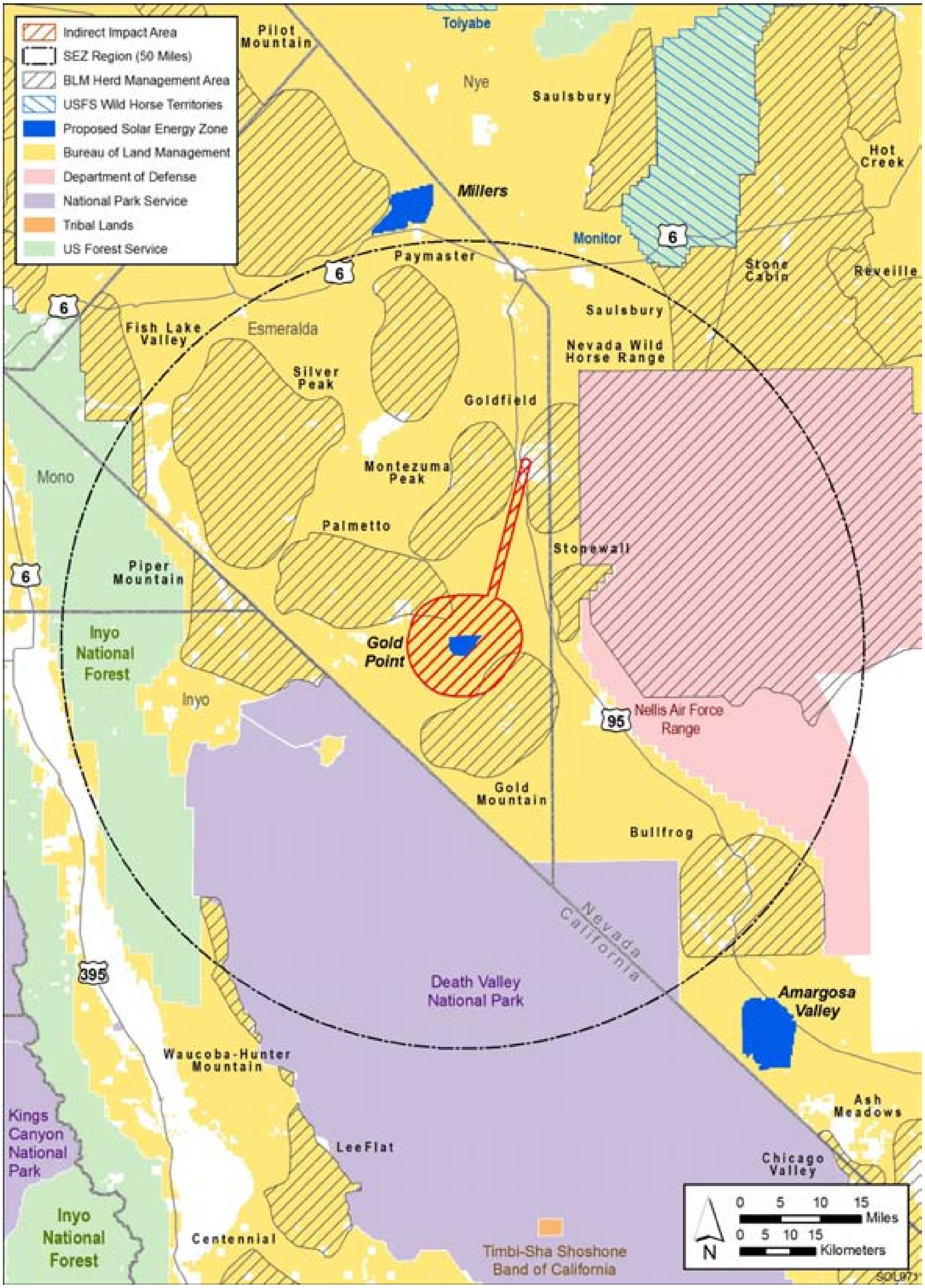

FIGURE 11.6.4.2-1 Wild Horse and Burro Herd Management Areas and Territories within the Analysis Area for the Proposed Gold Point SEZ (Sources: BLM 2009d, 2010a; USFS 2007)

About 904 acres (3.7 km^2) of the assumed transmission line corridor for the Gold Point SEZ occurs within the 62,367-acre (252.4-km^2) Goldfield HMA (Figure 11.6.4.2-1). Construction of the transmission line would result in a direct impact on 43 acres (0.2 km^2), or about 0.07%, of the HMA. This would result in a small temporary direct impact on the wild horses and burros within the HMA and would not have an overall adverse impact on the management of the animals within the Goldfield HMA. Following construction, wild horses and burros would be able to use the rangelands within the transmission line ROW. Indirect impacts, as discussed above, could also be incurred by the wild horses and burros within the SEZ. These impacts would be negligible with the implementation of programmatic design features.

11.6.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features for solar development within the proposed Gold Point SEZ would be necessary to protect or minimize direct impacts on wild horses and burros. Indirect impacts should be reduced to negligible levels by implementing programmatic design features and engineering controls that reduce noise lighting, spills, and fugitive dust.

11.6.5 Recreation

11.6.5.1 Affected Environment

The site of the proposed Gold Point SEZ is an isolated area with no natural features that invite recreational use. The area is flat but gently sloping to the northeast, with much gravel pavement and uniform low-growing vegetation consisting primarily of shadscale, greasewood, and winterfat, with some Indian ricegrass. The overall appearance of the site is uniform and somewhat monotonous. There are a few scattered dirt trails that provide access into the area. The area is classified as open to vehicle use (BLM 1997). Although there are no recreation figures for the area, it is believed that the area receives no significant recreational use.

11.6.5.2 Impacts

Construction and Operations

Any recreational use would be eliminated from portions of the SEZ developed for solar energy production, and existing recreational users would be displaced. The area is not a major recreation destination, and the loss of recreational opportunities would not be significant. If open OHV routes within the SEZ were identified during project-specific analyses, these routes would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).The SEZ is relatively small and there are good roads around the north and east sides of the SEZ; thus solar development within the SEZ would not cause the public to be hindered from accessing other public lands in the area.

Transmission Facilities and Other Off-Site Infrastructure

The construction of about 22 mi (35 km) of new transmission line and would disturb about 667 acres (2.7 km^2) northeast of the SEZ. This additional land disturbance would not be anticipated to have a significant impact on recreation use.

There would be no impacts outside of the SEZ caused by road construction to provide road access to the area.

11.6.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features to protect recreational use in the area are required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for recreation resources.

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11.6.6 Military and Civilian Aviation

11.6.6.1 Affected Environment

The proposed Gold Point SEZ is located under numerous MTRs, one of which can be used down to 100 ft (30 m) AGL. The area is also located between two MOAs. The area is located within a zone identified in BLM land records as a DoD Consultation Area.

The nearest public airport is the Lida Junction Airport, a small BLM airport about 10 mi (16 km) from the SEZ at the junction of State Route 266 and U.S. 95. The airport has a single dirt runway and has no regularly scheduled use.

11.6.6.2 Impacts

The military has expressed serious concern over solar energy facilities being constructed within the Gold Point SEZ. It is especially concerned over the potential use of power tower facilities. Nellis Air Force Base has indicated that it has concerns for its use of the MTRs because of potential overflight restrictions above a solar energy facility caused by the height of solar facilities, possible restrictions on hydrocarbon or residue from fuel burn by aircraft, possible glare from reflective surfaces, and any potential restrictions on supersonic operations over solar facilities. The NTTR has indicated that solar technologies requiring structures higher than 50 ft (15 m) AGL may present unacceptable electromagnetic compatibility concerns for its test mission at NTTR. The NTTR maintains that a pristine testing environment is required for the unique national security missions conducted on the NTTR. In the military's opinion, the potential electromagnetic interference impacts from solar facilities on testing activities at the NTTR, coupled with potential training route obstructions created by taller structures, make it likely that solar facilities exceeding 50 ft (50 m) could significantly affect military operations.

The Air Force has stated that the NTTR complex is unique in the world in its ability to provide realistic training of air crews. In addition to the effect of individual solar energy facilities, there is a more general concern over the potential for cumulative effects from multiple solar energy projects around the NTTR to eventually have a serious adverse effect on the training environment of the NTTR.

The Lida Junction Airport is located far enough away from the proposed SEZ that there would be no effect on airport operations. Any solar or related facilities in excess of 199 ft (61 m) would require an FAA evaluation of flight hazards and could require hazard marking lights.

11.6.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features to protect military or civilian aviation use in the area are required. The programmatic design features described in Appendix A, Section A.2.2, would require early coordination with the DoD to identify and mitigate, if possible, potential impacts on the use of MTRs.

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11.6.7 Geologic Setting and Soil Resources

11.6.7.1 Affected Environment

11.6.7.1.1 Geologic Setting

Regional Setting

The proposed Gold Point SEZ is located in the southern part of Lida Valley, a closed intermontane basin within the Basin and Range physiographic province in southern Nevada. The southern part of the valley lies between the Mount Jackson Ridge and Cuprite Hills to the north and Slate Ridge to the south. It is bounded on the west by the Palmetto Mountains and on the east by the Stonewell Mountains (Figure 11.6.7.1-1).

Basin fill consists of Quaternary and Tertiary alluvial fan and playa deposits of variable thickness and induration. Recent gravity surveys in the southern part of Lida Valley indicate that basin-fill sediments are up to 570 ft (175 m) thick near Stonewall Pass, just west of I-95, increasing northward to greater than 1,640 ft (500 m) near the alkali flat (Hasbrouck 2010a,b).

Exposed sediments within and adjacent to the proposed SEZ consist mainly of modern alluvial, eolian, and playa deposits (Figure 11.6.7.1-2). Exposures in the surrounding mountains are predominantly Jurassic- and Cretaceous-age felsic intrusive rocks (diorite and granite), especially along Slate Ridge south and southwest of the SEZ. Paleozoic and Precambrian metamorphic rocks are exposed in the Palmetto Mountains and along Slate Ridge.

Topography

The southern part of Lida Valley (south of Mount Jackson Ridge) is a northeast-trending basin, about 20-mi (32-km) long and 7-mi (11-km) wide. Elevations along the valley axis range from about 5,300 ft (1,615 m) near the southwest end and along the valley sides to about 4,700 ft (1,430 m) at the northeastern end of the valley (Figure 11.6.7.1-1). Moderately sloping alluvial fan deposits occur along the mountain fronts, especially to the northwest (Palmetto Mountains) and northeast (Stonewall Mountains). The valley is drained by the Jackson Wash, an ephemeral stream that flows from Jackson Flat (through a breech in Mount Jackson Ridge) to an alkali flat at the valley's northeastern end and then on to the south toward Sarcobatus Flat. The alkali flat (also called the Lida Valley playa) is being explored as a source of lithium placer deposits (First Liberty Power 2010).

The proposed Gold Point SEZ is located in the southern part of Lida Valley. Its terrain gently slopes to the northeast. Elevations range from about 5,040 ft (1,535 m) along the southwestern boundary to about 4,840 ft (1,475 m) at its northeastern corner (Figure 11.6.7.1-3). Jackson Wash flows to the northeast through the center of the site.

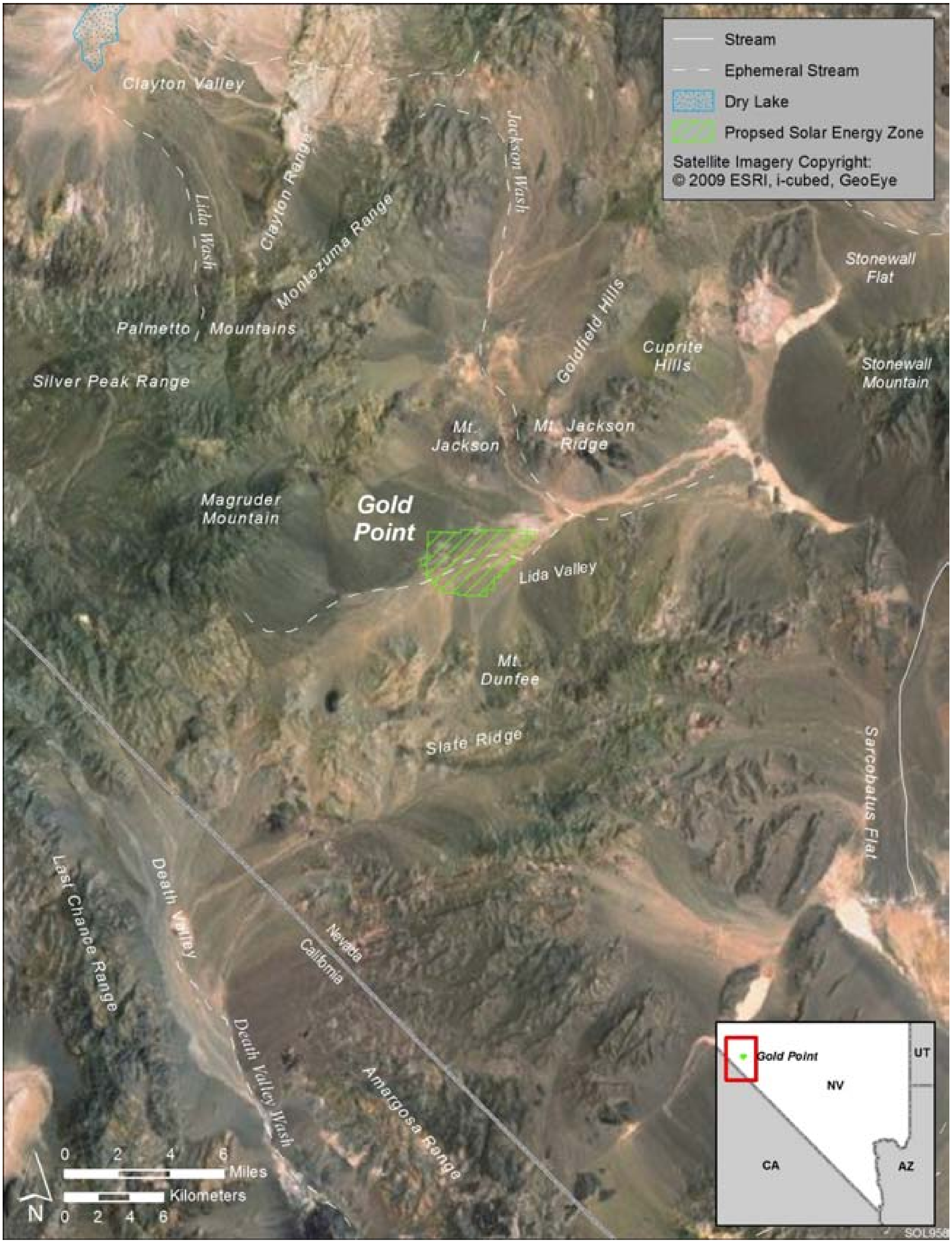

FIGURE 11.6.7.1-1 Physiographic Features of the Lida Valley Region

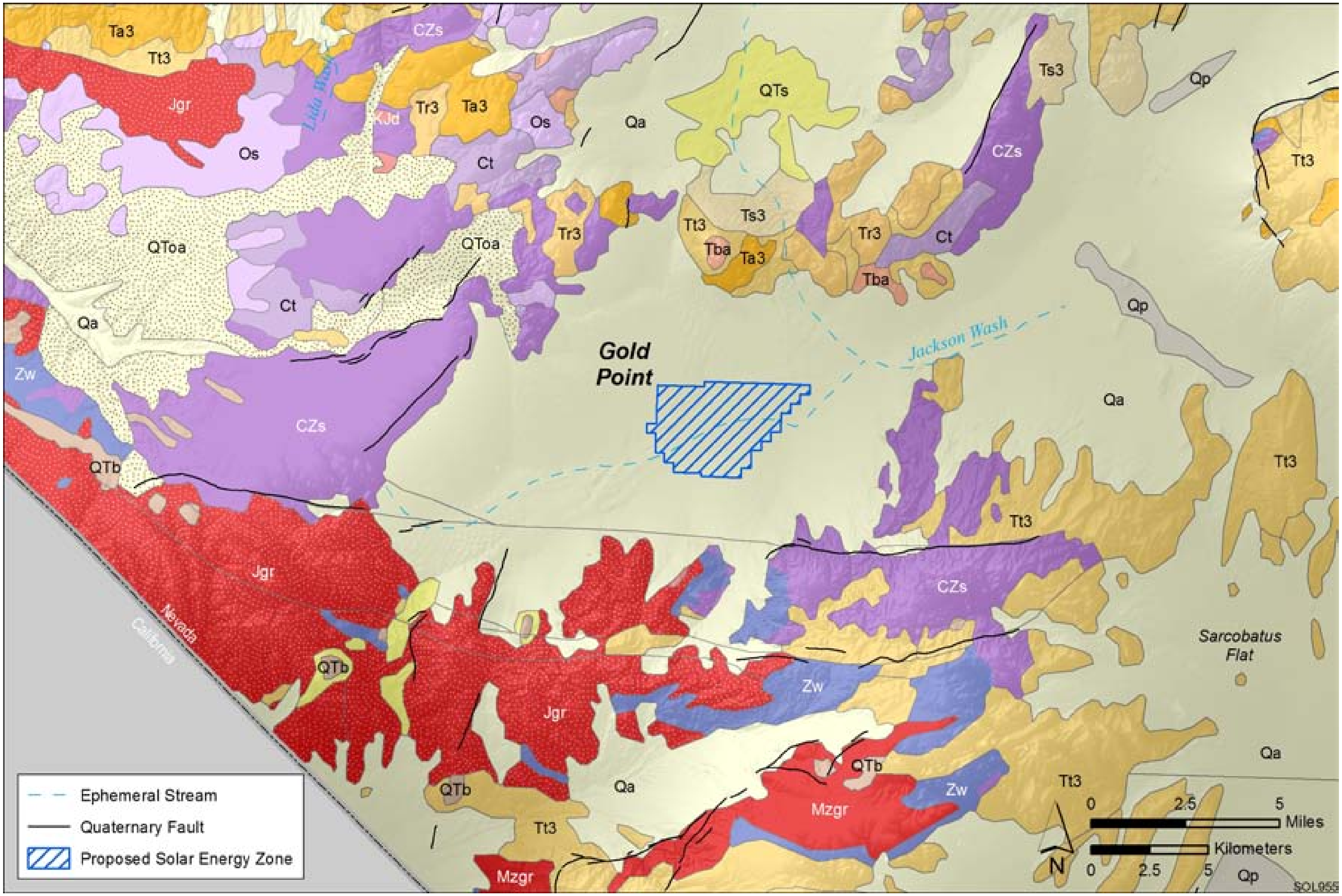

FIGURE 11.6.7.1-2 Geologic Map of the Lida Valley Region (Ludington et al. 2007; Stewart and Carlson 1978)

Cenozoic (Quaternary, Tertiary)

- Qa Alluvial deposits; locally includes beach and sand dune deposits
- Qp Playa, marsh and alluvial-flat deposits, locally eroded
- QToa Older alluvial deposits
- QTb Basalt flows
- QTs Sedimentary rocks, mostly lake deposits
- Tt3 Welded and nonwelded silicic ash-flow tuffs
- Tr3 Rhyolitic flows and shallow instrusive rocks
- Ta3 Andesite and related rocks of intermediate composition
- Ts3 Tuffaceous sedimentary rocks, locally includes minor amounts of tuff
- Tba Andesite and basalt flows

Mesozoic

- Mzgr Granitic rocks (inconclusively dated)
- KJd Diorite (Jurassic - Cretaceous)
- Jgr Granitic rocks, mostly quartz monzonite and granodiorite

Paleozoic

- Os Shale, chert and minor quartzite, greenstone, and limestone
- Ct Shale and thin-bedded or laminated limestone and chert
- CZs Phyllitic siltstone, quartzite and lesser amounts of limestone and dolomite

Precambrian

- Zw Wyman Formation (phyllite and phyllitic siltstone and minor amounts of limestone, dolomite and sandstone

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FIGURE 11.6.7.1-2 (Cont.)

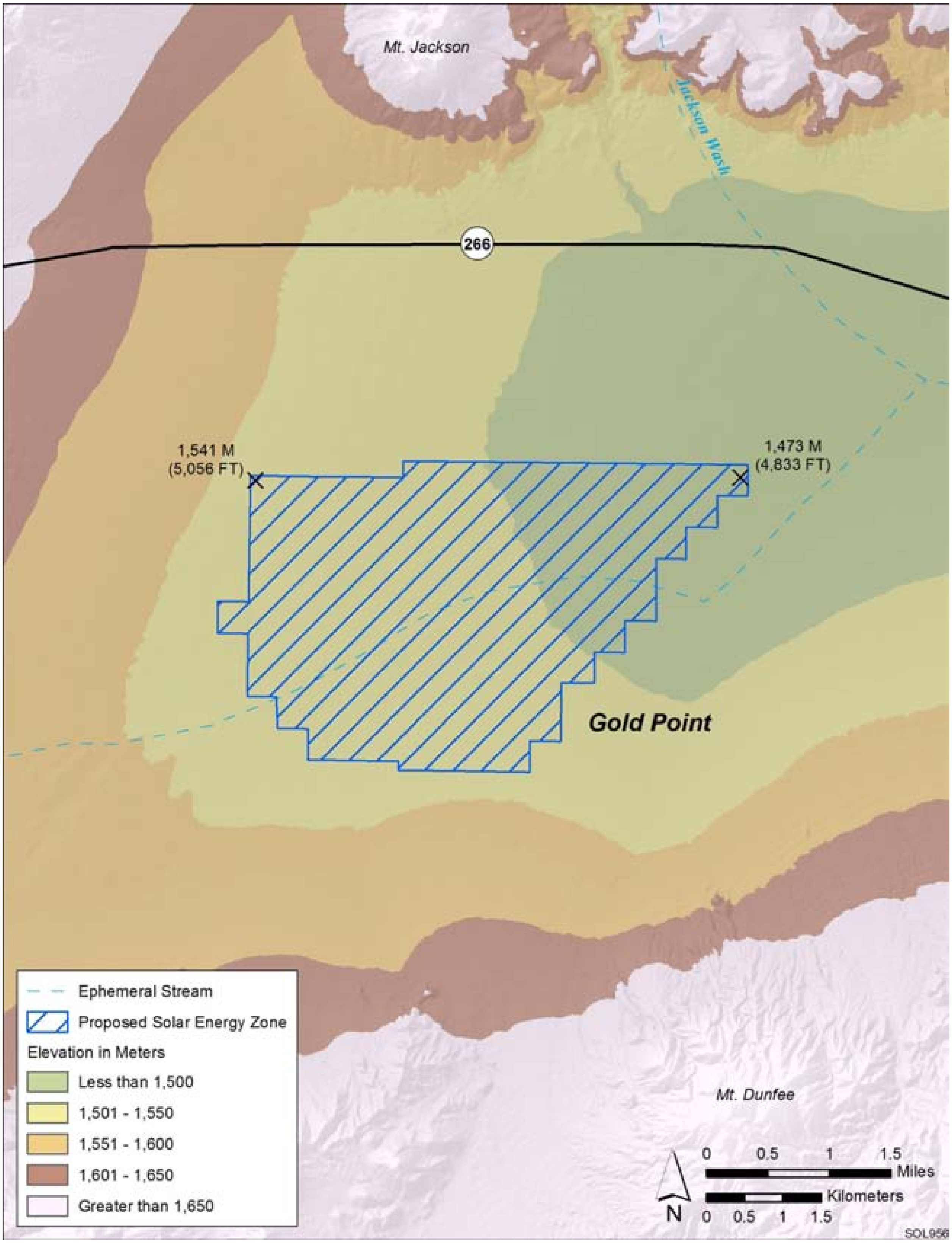

FIGURE 11.6.7.1-3 General Terrain of the Proposed Gold Point SEZ

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Section 5.7.3. The following sections provide a preliminary assessment of these hazards at the proposed Gold Point SEZ. Solar project developers may need to conduct a geotechnical investigation to identify and assess geologic hazards locally to better identify facility design criteria and site-specific mitigation measures to minimize their risk.

Seismicity. Lida Valley is located within the Walker Lane Belt, a northwest-trending seismic region along the Nevada–California border that accommodates (right-lateral shear) strain from movement between the Pacific and North American plates. Although there are no faults within or immediately adjacent to the Gold Point SEZ, several Quaternary faults and fault systems occur along the margins of Lida Valley. These include the Gold Mountain and Slate Ridge faults to the south, Wild Rose Spring and Lida faults to the west, and Stonewall Flat and Stonewell Mountain faults to the northeast. The most recently active faults in the region are within the northwest-striking Fish Lake Valley fault zone (less than 15,000 years old), located in California, parallel to the California–Nevada state line (Figure 11.6.7.1-4).

From June 1, 2000, to May 31, 2010, 107 earthquakes were recorded within a 61-mi (100-km) radius of the proposed Gold Point SEZ (USGS 2010a). The largest earthquake during that period occurred on August 2, 2001. It was located about 26 mi (43 km) southwest of the SEZ in the Eureka Valley (California) and registered a Richter scale magnitude[1] (ML) of 4.3 (Figure 11.6.7.1-4). During this period, 45 (42%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0; none were greater than 4.3 (USGS 2010a).

Liquefaction. The proposed Gold Point SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.15 and 0.20 g. Shaking associated with this level of acceleration is generally perceived as moderate; however, the potential damage to structures is light (USGS 2008). Given the deep water table (from 300 to 400 ft [91 to 122 m] below the surface [USGS 2010c]) and the low intensity of ground shaking estimated for Lida Valley, the potential for liquefaction in sediments within and around the SEZ is also likely to be low.

Volcanic Hazards. Lida Valley is located about 60 mi (90 km) to the west-northwest of the southwestern Nevada volcanic field, which consists of volcanic rocks (tuffs and lavas) of the Timber Mountain-Oasis Valley caldera complex and Silent Canyon and Black Mountain calderas. The area has been studied extensively because of its proximity to the Nevada Test Site

[1] Richter scale magnitude (ML) was the original magnitude defined by Richter and Gutenberg for local earthquakes in 1935. It was based on the maximum amplitude recorded on a Wood-Anderson torsion seismograph but is currently calculated for earthquakes with magnitudes ranging from 2 to 6, using modern instruments with adjustments (USGS 2010b).

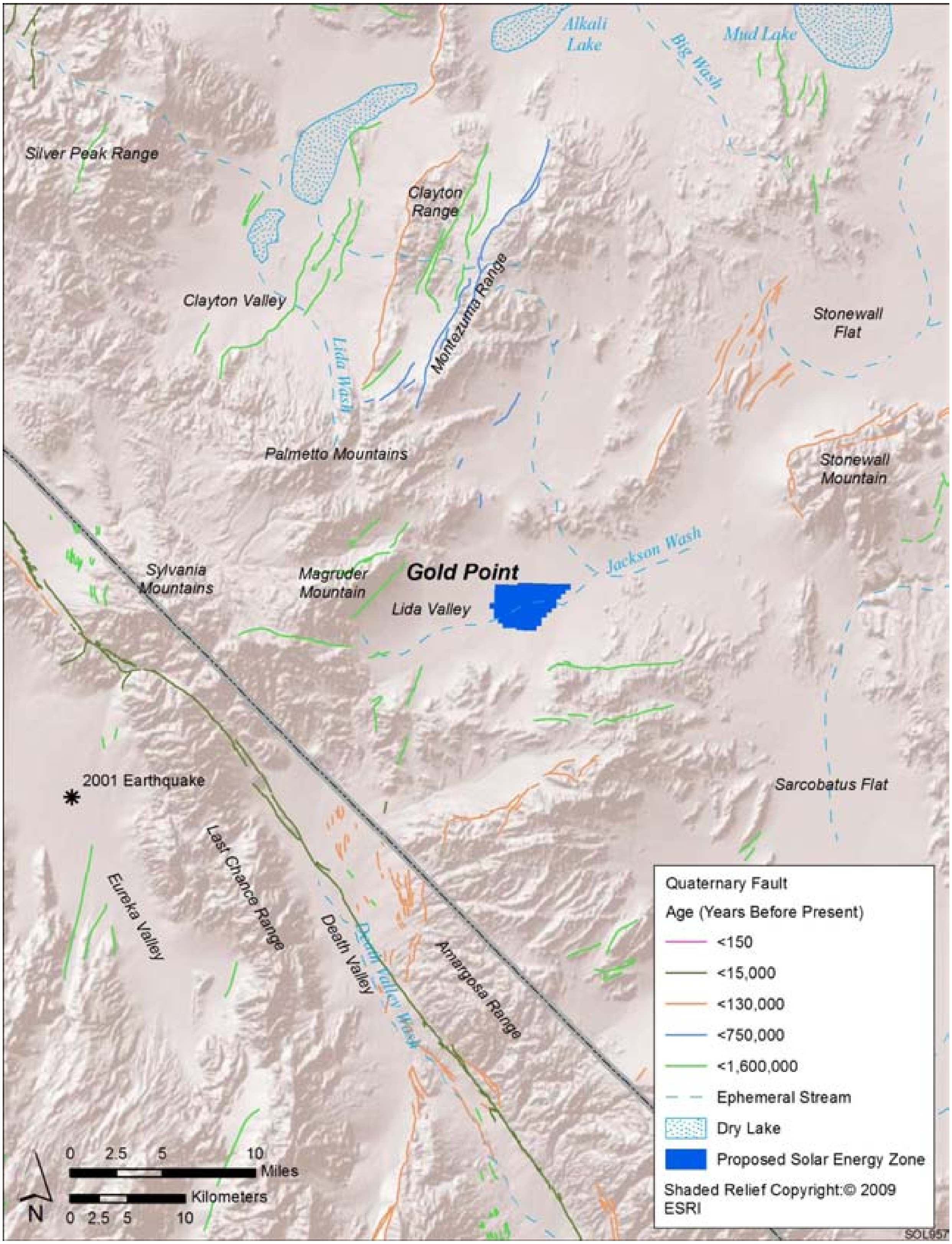

FIGURE 11.6.7.1-4 Quaternary Faults in the Lida Valley Region (USGS and NBMG 2010; USGS 2010a)

and Yucca Mountain repository. Two types of fields are present in the region: (1) large-volume, long-lived fields with a range of basalt types associated with more silicic volcanic rocks produced by melting of the lower crust, and (2) small-volume fields formed by scattered basaltic scoria cones during brief cycles of activity, called rift basalts because of their association with extensional structural features. The basalts of the region typically belong to the second group; examples include the basalts of Silent Canyon and Sleeping Butte (Byers et al. 1989; Crowe et al. 1983).

The oldest basalts in the region were erupted during the waning stages of silicic volcanism in the southern Great Basin in the Late Miocene and are associated with silicic volcanic centers like Dome Mountain (the first group). Rates of basaltic volcanic activity in the region have been relatively constant but generally low. Basaltic eruptions closest to the proposed Gold Point SEZ occurred from 1.7 million to 700,000 years ago, creating the cinder cones within Crater Flat (Stuckless and O'Leary 2007). The most recent episode of basaltic eruptions occurred at the Lathrop Wells Cone complex about 80,000 years ago (about 8 mi [13 km] east of the SEZ) (Stuckless and O'Leary 2007). There has been no silicic volcanism in the region in the past 5 million years. Current silicic volcanic activity occurs entirely along the margins of the Great Basin (Crowe et al. 1983).

Crowe et al. (1983) determined that the annual probability of a volcanic event for the region is very low (3.3×10^{-10} to 4.7×10^{-8}), similar to the probability of 1.7×10^{-8} calculated for the proposed Yucca Mountain repository (Cline et al. 2005). The volcanic risk in the region is associated only with basaltic eruptions; the risk of silicic volcanism is negligible. Perry (2002) cites geologic data that could indicate an increase in the recurrence rate (and thus the probability of disruption). These data include hypothesized episodes of an anomalously high strain rate, the hypothesized presence of a regional mantle hot spot, and new aeromagnetic data that suggest that previously unrecognized volcanoes may be buried in the alluvial-filled basins in the region.

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to facilities on the relatively flat terrain of valley floors such as Lida Valley, if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

No land subsidence monitoring has taken place in Lida Valley to date; however, Katzenstein and Bell (2005) report ground subsidence of 1 to 1.5 in. (2.5 to 3.5 cm) related to groundwater withdrawal in the Amargosa Valley, about 60 mi (100 km) southeast of the Gold Point SEZ, which has caused compaction in the underlying aquifer. Subsidence is not generally a serious hazard if it occurs as a broad depression over a large region (except in flood-prone areas sensitive to changes in elevation). The major problems associated with subsidence occur as a result of differential vertical subsidence, horizontal displacement, and earth fissures (Burbey 2002).

Other Hazards. Other potential hazards at the proposed Gold Point SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Disturbance of soil crusts and desert pavement on soil surfaces may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those found in Lida Valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) will depend on the specific morphology of the fan (National Research Council 1996). Section 11.6.9.1.1 provides further discussion of flood risks within the Gold Point SEZ.

11.6.7.1.2 Soil Resources

Soils within the Gold Point SEZ are predominantly sandy loams, gravelly sandy loams, and gravelly loams of the Keefa-Itme, Stonell-Wardenet-Izo, and Papoose-Roic associations, which together cover about 84% of the site (Figure 11.6.7.1-5). Soil map units within the SEZ are described in Table 11.6.7.1-1. These gently to steeply sloping soils are derived from mixed alluvium and the residuum and colluvium of tuffaceous sedimentary rocks. They are predominantly very deep (with the exception of Roic series soils, which occur above a shallow hardpan layer) and well drained. Most of the soils on the site have a low to moderate surface runoff potential and moderate to moderately rapid permeability. The natural soil surface is suitable for roads, with a slight to moderate erosion hazard when used as roads or trails. The water erosion potential is low to moderate for all soils at the site. The susceptibility to wind erosion is moderate for most soils, with as much as 86 tons (78 metric tons) of soil eroded by wind per acre (0.004 km^2,) each year (NRCS 2010). Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

None of the soils within the Gold Point SEZ are rated as hydric.[2] Flooding is not likely for soils at the site, occurring with a frequency of less than once in 500 years. None of the soils are classified as prime or unique farmland (NRCS 2010).

11.6.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy facilities in varying degrees and are described in more detail for the four phases of development in Section 5.7 1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2).

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2 A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding (NRCS 2010).

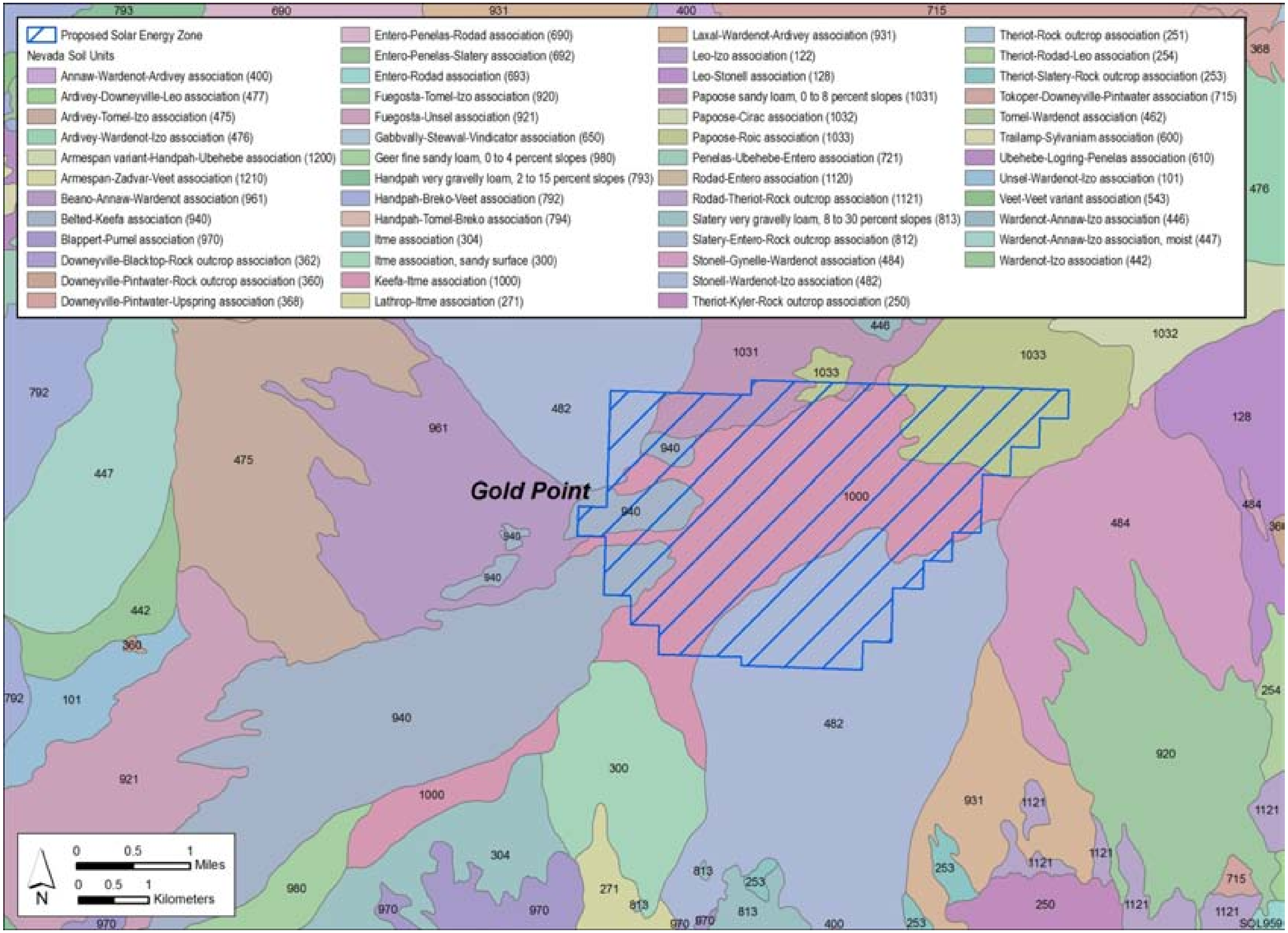

FIGURE 11.6.7.1-5 Soil Map for the Proposed Gold Point SEZ (NRCS 2008)

TABLE 11.6.7.1-1 Summary of Soil Map Units within the Proposed Gold Point SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area[c] (% of SEZ)
1000	Keefa-Itme association	Low (0.20)	Moderate (WEG 3)[d]	Consists of about 70% Keefa sandy loam and 20% Itme gravelly loamy sand. Gently sloping soils on fan skirts, inset fans, and lake plains. Parent material consists of mixed alluvium (including from granitic rocks). Very deep and well drained, with moderate surface runoff potential and moderately rapid permeability. Available water capacity is low. Moderate rutting hazard. Used mainly as rangeland; unsuitable for cultivation.	2,405 (50)
482	Stonell-Wardenot-Izo association	Low (0.05)	Moderate (WEG 5)	Consists of about 35% Stonell very gravelly sandy loam, 30% Wardenot very gravelly sandy loam, and 20% Izo very gravelly sand. Gently sloping soils on fan remnants, inset fans, and drainage ways. Parent material is mixed alluvium. Very deep and excessively drained, with low surface runoff potential (high infiltration rate) and moderately rapid permeability. Available water capacity is low to very low. Slight rutting hazard. Used mainly as rangeland and wildlife habitat; unsuitable for cultivation.	1,077 (22)
1033	Papoose-Roic association	Moderate (0.37)	Moderate (WEG 3)	Consists of about 50% Papoose sandy loam and 45% Roic very gravelly loam. Gently to steeply sloping soils on lake terraces, hills, and pediments. Parent material is mixed alluvium and residuum and colluvium from tuffaceous sedimentary rocks. Very deep (Papoose soils) and very shallow (Roic soils over shallow paralithic bedrock) and well drained, with moderate surface runoff potential and moderate permeability. Available water capacity is low to very low. Moderate rutting hazard. Used mainly as rangeland or wildlife habitat; small areas may be irrigated and used for cropland (alfalfa and small grains).	577 (12)

TABLE 11.6.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area (% of SEZ)
940	Belted-Keefa association	Low (0.10)	Moderate (WEG 3)	Consists of about 70% Belted gravelly loamy sand and 20% Keefa sandy loam. Gently to steeply sloping soils on beach terraces and fan skirts. Parent material consists of mixed alluvium. Very deep (Keefa soils) and very shallow (Belted soils over shallow duripan) and well drained, with high surface runoff potential (very slow infiltration rate) and moderate permeability. Available water capacity is low to very low. Moderate rutting hazard. Used mainly as rangeland, forest; unsuitable for cultivation.	451 (9)
1031	Papoose sandy loam (0 to 8% slopes)	Moderate (0.37)	Moderate (WEG 3)	Gently sloping soils on lake terraces. Parent material consists of mixed alluvium from tuffs, basalt, and andesite with small amounts of limestone and quartzite. Very deep and well drained, with moderate surface runoff potential and moderately slow permeability. Available water capacity is low. Moderate rutting hazard. Used mainly as rangeland or wildlife habitat; small areas may be irrigated and used for cropland (alfalfa and small grains).	299 (6)

[a] Water erosion potential rates based on soil erosion factor K (whole rock), which indicates the susceptibility of soil to sheet and rill erosion by water. Values range from 0.02 to 0.69 and are provided in parentheses under the general rating; a higher value indicates a higher susceptibility to erosion. Estimates based on the percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8 low (see footnote c for further explanation).

[c] To convert acres to km^2, multiply by 0.004047.

[d] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEG 3, 86 tons (78 metric tons) per acre (0.004 km^2) per year and WEG 5, 56 tons (51 metric tons) per acre (0.004 km^2) per year.

Source: NRCS (2010).

The magnitude of impacts would also depend on the types of components built for a given facility since installation of some components would involve greater disturbance and would take place over a longer timeframe.

11.6.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Gold Point SEZ. Implementing the programmatic design features described under both Soils and Air Quality in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for soil impacts during all project phases.

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11.6.8 Minerals (Fluids, Solids, and Geothermal Resources)

11.6.8.1 Affected Environment

As of September 21, 2010, there were no mining claims located in the proposed Gold Point SEZ. The western half of the SEZ, however, was previously blanketed by both lode and placer claims that have been closed (BLM and USFS 2010a). The public land within the SEZ was closed to locatable mineral entry in June 2009 pending the outcome of this PEIS. There are no active oil and gas leases in the area, nor has the area been previously leased (BLM and USFS 2010b). The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals and for disposal of salable minerals. There is no active or historical geothermal leasing or development in or near the SEZ (BLM and USFS 2010b).

11.6.8.2 Impacts

If the area were identified as a solar energy zone, it would continue to be closed to all incompatible forms of mineral development. Since the SEZ does not contain existing mining claims, it was also assumed that there would be no future loss of locatable mineral production.

For the purpose of this analysis, it was assumed that future development of oil and gas resources, should any be found, would still be possible, since such development could occur with directional drilling from outside the SEZ. Also, since the SEZ has no history of development of geothermal resources, it is not anticipated that solar development would adversely affect the development of geothermal resources.

The production of common minerals, such as sand and gravel and mineral materials used for road construction or other purposes, might take place in areas not directly developed for solar energy production.

11.6.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation to protect mineral resources.

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11.6.9 Water Resources

11.6.9.1 Affected Environment

The proposed Gold Point SEZ is located within the Central Nevada Desert subbasin of the Great Basin hydrologic region (USGS 2010a) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed SEZ is located in the southern portion of Lida Valley, which is connected to the northern portion through narrow passes along Mount Jackson and Mount Jackson Ridge. Because a shallow surface divide separates Lida Valley and Stonewall Flat basins, Lida Valley drains south and east toward the Sarcobatus Flat area (Figure 11.6.9.1-1). Surface elevations in the proposed SEZ range from 4,831 to 5,059 ft (1,472 to 1,542 m), with a general southwest to northeast drainage pattern. Elevations in the surrounding mountains range from about 5,700 ft (1,737 m) in Slate Ridge to the south and Mount Jackson Ridge to the north, to about 9,000 ft (2,743 m) in Magruder Mountain and the Palmetto Mountains to the northwest. The climate in this region of Nevada is characterized by low humidity and precipitation, with mild winters and hot summers (Planert and Williams 1995; WRCC 2010a). The average annual precipitation ranges from 3 to 6 in. (8 to 15 cm), and the average annual snowfall ranges from 6 to 18 in. (15 to 46 cm) at the Sarcobatus and Goldfield weather stations, respectively (WRCC 2010b,c). Very little phreatic vegetation is present in the Lida Valley, so evapotranspiration is estimated to be negligible (Rush 1968), while the arid climate leads to high evaporation rates, with pan evaporations rates estimated to be about 97 in./yr (246 cm/yr) (Cowherd et al. 1988; WRCC 2010d).

11.6.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

No perennial surface water features are present in the proposed Gold Point SEZ. An unnamed intermittent stream crosses the SEZ site in a northeasterly direction and converges with Jackson Wash about 1.5 mi (2.4 km) east of the site. Jackson Wash is an intermittent stream that originates in the Montezuma Range in the northern portion of Lida Valley and enters the southern Lida Valley through the pass between Mount Jackson and Mount Jackson Ridge. It drains to the east and north toward a series of dry lakes located near the boundary of Lida Valley and Stonewall Flat about 8 mi (13 km) northeast of the site. Several ephemeral washes also drain toward the northeast across the proposed SEZ and converge to a small playa area in the northeast corner of the site (Figure 11.6.9.1-1).

A few, small lacustrine wetland areas near the boundary of Lida Valley and Stonewall Flat basin cover between about 40 and 780 acres (0.2 and 3 km^2) according to the NWI (USFWS 2009). These dry lake wetland areas have sparse vegetation with water levels mostly below the land surface for most of the year. Surface water drainage out of Lida Valley enters a large playa region in the Sarcobatus basin about 18 mi (29 km) southeast of the proposed SEZ. The playa regions in the Sarcobatus basin also coincide with the presence of lacustrine wetland areas that cover between 755 and 1,875 acres (3 and 8 km^2). Additional information regarding wetlands within the region of the proposed SEZ is presented in Section 11.6.10.1.

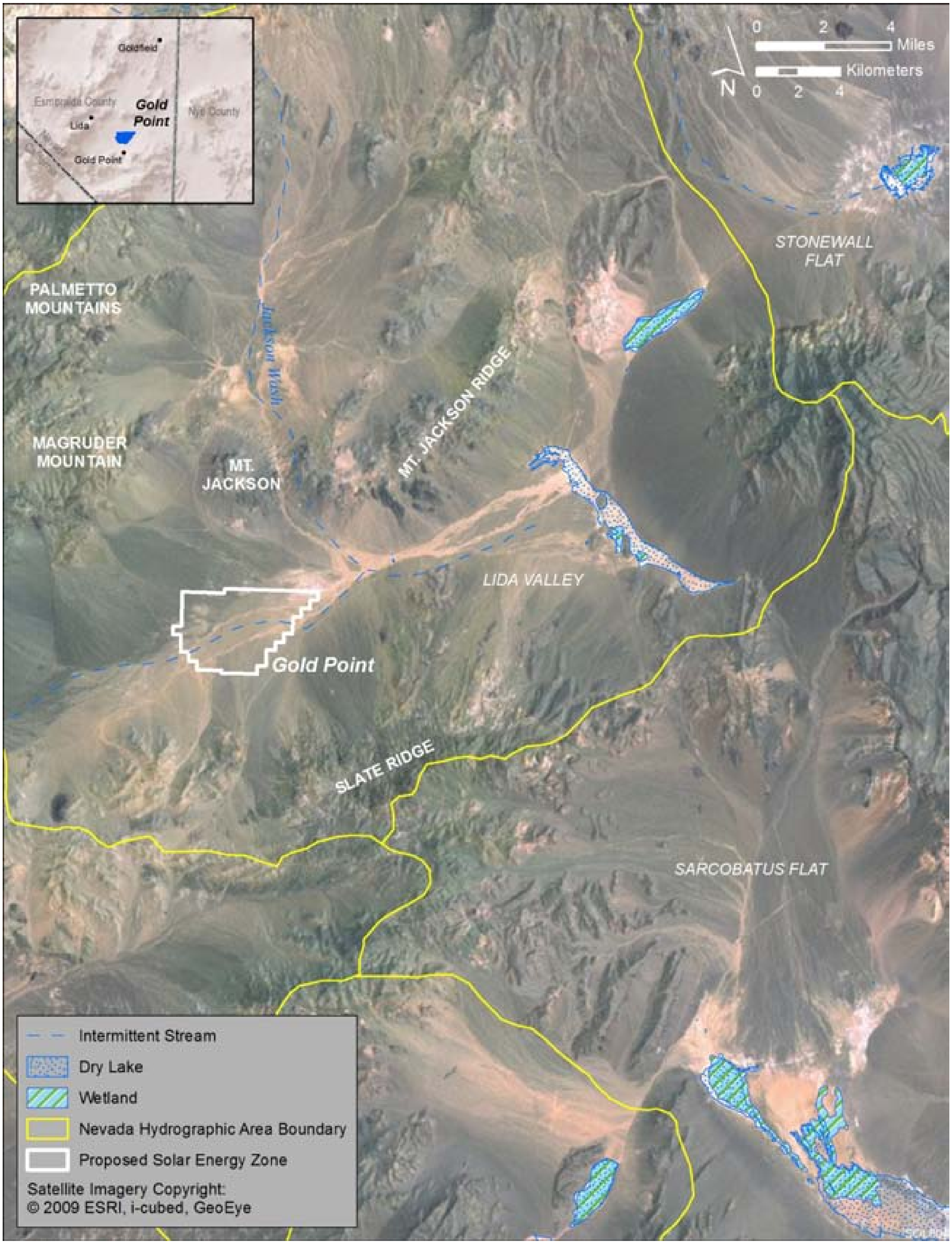

FIGURE 11.6.9.1-1 Surface Water Features near the Proposed Gold Point SEZ

Flood hazards have not been identified in Esmeralda County but have been mapped for Nye County, located 9 mi (14 km) east of the proposed Gold Point SEZ. In Nye County, Jackson Wash and the playa area it drains to are identified as being within a 100-year floodplain (Zone A) (FEMA 2009). It is likely that this 100-year floodplain region continues upstream along the riparian areas of Jackson Wash, which could potentially include portions of the proposed SEZ. Erosion and sedimentation are potentially concerns along the intermittent streams and ephemeral washes in the vicinity of the proposed SEZ. Additionally, temporary flooding may occur near the playa region in the northeast corner of the site during large rainfall events.

11.6.9.1.2 Groundwater

The proposed Gold Point SEZ is a part of the Lida Valley groundwater basin, which covers an area of 342,400 acres (1,386 km^2) (NDWR 2010a). The Lida Valley groundwater basin is located on the northwestern edge of the Death Valley Regional Groundwater Flow System (described in Section 11.1.9.1.2); however, it is not located over any of the regional-scale carbonate-rock aquifers associated with the carbonate rock province that covers approximately one-third of Nevada (Harrill and Prudic 1998, Faunt et al. 2004). The general hydrogeologic structure of the Lida Valley groundwater basin is that of a basin-fill aquifer containing three units: consolidated rocks, older alluvium, and younger alluvium. The consolidated rocks of the surrounding mountains and bedrock (underlying the basin-fill alluvium) consist primarily of volcanic rocks and intrusive structures, as well as some carbonate and sedimentary rocks (Rush 1968). The older and younger alluvium units of the basin-fill are composed of sand, gravel, and cobbles with interbedded silts and clays of late Tertiary and Quaternary age (Belcher et al. 2001). The thickness of the basin-fill in the Lida Valley is typically greater than 500 ft (152 m) but not more than 2,460 ft (750 m) (Faunt et al. 2004).

Historically, there has been limited groundwater development in the Lida Valley groundwater basin. In the early 1900s, groundwater from springs located in the Palmetto Mountains were pumped to supply water for mining near the town of Goldfield, 20 mi (32 km) north of the proposed SEZ; however, many of the springs in the surrounding mountains of the Lida Valley were dry or discharged less than 10 ac-ft/yr (12,300 m^3/yr) by the 1960s (Rush 1968). The primary source of available groundwater in the Lida Valley is within the basin-fill alluvium aquifers. Groundwater recharge in the Lida Valley groundwater basin is largely driven by precipitation and subsurface inflow from the Stonewall Flat region. Depending on the methods of calculation used, estimates of groundwater recharge range from 500 ac-ft/yr (616,700 m^3/yr) by precipitation and 200 ac-ft/yr (246,700 m^3/yr) by subsurface inflow (NDWR 1971), to a total recharge ranging from 50 to 420 ac-ft/yr (61,700 to 518,000 m^3/yr) (Flint et al. 2004). Groundwater discharge is driven primarily by subsurface outflow to the Sarcobatus Flat basin and has estimated as 700 ac-ft/yr (863,400 m^3/yr) (NDWR 1971). Groundwater discharge by evapotranspiration is assumed to be negligible in the Lida Valley groundwater basin, and groundwater pumping was less than 30 ac-ft/yr (37,000 m^3/yr) in 1966 (Rush 1968).

Depth to groundwater is typically about 300 to 400 ft (91 to 122 m) below the ground surface in the Lida Valley groundwater basin, and the general groundwater flow pattern is from southwest to northeast in the vicinity of the proposed Gold Point SEZ, with an approximate slope of 0.7% in groundwater surface elevations (well numbers 372138117274001 and 373003117110101) (USGS 2010d). Groundwater flows to the northeast past the proposed SEZ, where it then converges with subsurface inflow from the Stonewall Flat basin, about 8 mi (13 km) northeast (in the vicinity of the dry lakes mentioned in Section 11.6.9.1.1), and then discharges to the south to the Sarcobatus Flat basin (Rush 1968; NDWR 1971; Faunt et al. 2004). Groundwater in the Lida Valley groundwater basin has high TDS concentrations typically greater than 500 mg/L, with sulfate concentrations greater than 250 mg/L (Rush 1968). The TDS concentrations typically increase as groundwater flows out of the Lida Valley groundwater basin an into the Sarcobatus Flat basin, where TDS concentrations are on the order of 1,000 mg/L (well number 371647117015201) (Rush 1968; USGS 2010d).

11.6.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Esmeralda County were 46,786 million ac-ft/yr (57.7 million m^3/yr), of which 9% came from surface waters and 91% came from groundwater. The largest water use categories for groundwater were irrigation and mining at 28,235 and 14,202 ac-ft/yr (34.8 million and 17.5 million m^3/yr), respectively. The remaining groundwater withdrawals were for domestic use and livestock watering (Kenny et al. 2009). The majority of the groundwater use in Esmeralda County occurs north and west of the proposed Gold Point SEZ in the Fish Lake Valley groundwater basin (NDWR 2010b); as groundwater withdrawals in the Lida Valley groundwater basin were only 30 ac-ft/yr (37,000 m^3/yr) in 1966 (Rush 1968).

All waters in Nevada are the property of the public and are subject to the laws described in Nevada Revised Statutes, Chapters 532 through 538 (available at: http://leg.state.nv.us/nrs). The NDWR, led by the State Engineer, is the agency responsible for managing both the surface water and groundwater resources. This responsibility includes overseeing water rights applications, appropriations, and interbasin transfers (NDWR 2010c). The two primary principles underlying water rights in Nevada are the prior appropriations doctrine and the concept of beneficial use. A water right establishes an appropriation amount and date such that more senior water rights have priority over newer water rights. Additionally, water rights are treated as both real and personal property, such that water rights can be transferred without affecting the land ownership (NDWR 2010c). Water rights applications (new or transfer of existing) are approved if the water is available to be appropriated, if existing water rights will not be affected, and if the proposed use is not deemed to be harmful to the public interest. If these conditions are satisfied according to the State Engineer, a proof of beneficial use of the approved water must be provided within a certain time period, and following that a certificate of appropriation is issued (BLM 2001).

The Lida Valley groundwater basin in not a designated groundwater; thus, there are no specified beneficial uses set by the NDWR (NDWR 1974). The perennial yield of the Lida Valley groundwater basin is set at 350 ac-ft/yr (431,700 m^3/yr), and current water rights total 76 ac-ft/yr (93,700 m^3/yr). This water is being used for mining, stock water, and municipal supply (NDWR 2010a). Solar energy developers would have to submit applications for new groundwater withdrawals or transfer of existing water rights to the NDWR according to the process described previously.

11.6.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, as well as off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water-wetland-groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by the excessive withdrawal from aquifers).

11.6.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy facilities and are described in more detail for the four phases of development in Section 5.9.1. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. Land disturbance activities should be minimized in the vicinity of the unnamed intermittent stream and the several ephemeral washes draining across the site. During large storm events, these intermittent streams have the potential to flood and cause sedimentation and erosion issues. Additionally, alterations to these intermittent and ephemeral stream features could have adverse impacts on sedimentation and erosion to the downstream playa region in the northeast corner of the proposed SEZ, as well as off-site in Jackson Wash.

11.6.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Gold Point SEZ include the following:

- On the basis of a total area of 4,810 acres (19 km^2), it is assumed that one solar project would be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;
- The maximum land disturbance for an individual solar facility during the peak construction year is 3,000 acres (12 km^2);
- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, results in the potential to disturb of up to 62% of the total SEZ area during the peak construction year; and
- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those for dry-cooling systems (see Section 5.9.2.1).

Site Characterization

During site characterization, water would be used mainly for controlling fugitive dust and the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for controlling fugitive dust and the workforce potable water supply. Because there are no significant surface water bodies on the proposed Gold Point SEZ, the water requirements for construction activities could be met by either trucking water to the site or by using on-site groundwater resources.

Water requirements for dust suppression and potable water supply during construction, shown in Table 11.6.9.2-1, could be as high as 1,707 ac-ft (2.1 million m^3) for the peak construction year. The assumptions underlying these estimates for each solar energy technology are described in Appendix M. The total water use estimates for the peak construction year are on the order of 3 to 5 times greater than the perennial yield of the Lida Valley groundwater basin. Thus, at least a portion of the water supply would have to come from an off-site source or be transferred from an adjacent basin (if unappropriated groundwater is available in adjacent basins), which would have to be negotiated with the NDWR. The effects of groundwater withdrawals on groundwater surface elevations in the Lida Valley would have to be assessed during the site characterization phase. In addition, the generation of up to 74 ac-ft (91,300 m^3) of sanitary wastewater during the peak construction year would have to be treated either on-site or sent to an off-site facility.

TABLE 11.6.9.2-1 Estimated Water Requirements, by Technology, during the Peak Construction Year for the Proposed Gold Point SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	1,108	1,662	1,662	1,662
Potable supply for workforce (ac-ft)	74	45	19	9
Total water use requirements (ac-ft)	1,182	1,707	1,681	1,671
Wastewater generated				
Sanitary wastewater (ac-ft)	74	45	19	9

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Appendix M.

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 97 in./yr (246 cm/yr) (Cowherd et al. 1988; WRCC 2010d).

[c] To convert ac-ft to m^3, multiply by 1,234.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 11.6.9.2-2). Water needs for cooling would be a function of the type of cooling used (dry, hybrid, wet). Further refinements to water requirements for cooling would result from the percentage of time that the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 11.6.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as great as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 21 to 385 ac-ft/yr (25,900 to 474,900 m^3/yr) and the workforce potable water supply from 1 to 11 ac-ft/yr (1,234 to 13,600 m^3/yr). The maximum total water usage during normal operation at full build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 11,555 ac-ft/yr (14.3 million m^3/yr). Water usage for dry-cooling systems would be as high as 1,166 ac-ft/yr (1.4 million m^3/yr), approximately a factor of 10 times less that the wet-cooling option. Non-cooled technologies, dish engine and PV systems, require substantially less water at full build-out capacity at 219 ac-ft/yr (270,100 million m^3/yr) for dish engine and 22 ac-ft/yr (27,100 million m^3/yr) for PV (Table 11.6.9.2-2). Operations would produce up to 11 ac-ft/yr (13,600 m^3/yr) of sanitary wastewater. In addition, for wet-cooled technologies, 121 to 219 ac-ft/yr (149,300 to 270,100 million m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

TABLE 11.6.9.2-2 Estimated Water Requirements, by Technology, during Operations at the Proposed Gold Point SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	770	428	428	428
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	385	214	214	21
Potable supply for workforce (ac-ft/yr)	11	5	5	1
Dry cooling (ac-ft/yr)[e]	154–770	86–428	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	3,463–11,159	1,924–6,200	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	219	22
Dry-cooled technologies (ac-ft/yr)	550–1,166	305–647	NA	NA
Wet-cooled technologies (ac-ft/yr)	3,859–11,555	2,143–6,419	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	219	121	NA	NA
Sanitary wastewater (ac-ft/yr)	11	5	5	1

[a] Land area for parabolic trough was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

[b] Water needs are linearly related to power. Water usage for any other size project can be estimated by using multipliers provided in Table M.9-2 (Appendix M).

[c] Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

[d] To convert ac-ft to m^3, multiply by 1,234.

[e] Dry-cooling value assumes 0.2 to 1.0 ac-ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac-ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009).

[f] NA = not applicable.

[g] Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

Groundwater is the primary water resource available for solar energy development at the proposed Gold Point SEZ, and the NDWR has set the perennial yield for the Lida Valley groundwater basin at 350 ac-ft/yr (431,700 m^3/yr). Estimated water needs for technologies using wet cooling are at least a factor of 10 greater than the perennial yield (total available water) of the basin, so wet cooling is not feasible at the proposed Gold Point SEZ. Technologies using dry cooling have water use estimates on the order of the perennial yield to about 3 times the perennial yield. It is doubtful that a full build-out scenario using dry-cooling technologies could be supported with the available groundwater supplies. However, water conservation measures and operational aspects (e.g. 30% operating time) could lower the water use requirements of dry-cooling technologies. Full build-out operations of dish engine and PV technologies could be supported by groundwater resources in the Lida Valley groundwater basin and would not require the transfer of any existing groundwater rights.

The water quality of groundwater sources would have to be assessed during the site characterization phase. Water used for the workforce potable water supply would have to meet or be treated to comply with water quality standards described in the Nevada Administrative Code (445A.453-445A.455).

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site would be reclaimed to its preconstruction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and may also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less than during the construction phase. Because quantities of water needed during the decommissioning/ reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

11.6.9.2.3 Off-Site Impacts: Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. The extent of the impacts on water resources is proportional to the amount and location of land disturbance needed to connect the proposed SEZ to major roads and existing transmission lines. The proposed Gold Point SEZ is located adjacent to existing roads and 22 mi (35 km) from existing transmission lines, as described in Section 11.6.1.2. Impacts to water resources from the construction of transmission lines are expected to be negligible with the implementation of programmatic design features described in Appendix A, Section A.2.2.

11.6.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy at the proposed Gold Point SEZ are related to land disturbance effects to the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation issues, as well as alter groundwater recharge and discharge processes. The unnamed intermittent stream and ephemeral washes within the proposed SEZ, along with the playa area in the northeast corner, may be in a 100-year floodplain as they drain toward Jackson Wash, which has been identified as being within a 100-year floodplain in the neighboring Nye County, located 9 mi (14 km) east of the site. The 100-year floodplain would be identified during the site characterization phase, and solar energy development should be excluded from areas of the proposed SEZ within the 100-year floodplain.

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling used (wet, dry, or hybrid). Groundwater is the primary water resource available to solar energy facilities in the proposed Gold Point SEZ. Water requirements during the construction phase are greater than the perennial yield of the Lida Valley groundwater basin for all technologies. Given the limited temporal extent of construction activities, off-site water sources (including water transfers from adjacent basins) would need to be considered to meet peak year construction water use requirements. During the operations phase, the water use requirements for technologies using wet cooling are at least a factor of 10 greater than the perennial yield for the Lida Valley groundwater basin, so wet cooling would not be feasible for the full build-out scenario. Water use estimates for dry cooling are on the same order of magnitude as the perennial yield of the Lida Valley groundwater basin or greater, so water conservation measures would need to be implemented to reduce water needs. Dish engine and PV technologies have full build-out water use requirements that can be supported by unallocated water rights in the Lida Valley groundwater basin, so these technologies are the preferred solar technologies for potential development at the proposed Gold Point SEZ based on water use requirements.

11.6.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require the programmatic design features given in Appendix A, Section A.2.2, to be implemented, thus mitigating some impacts on water resources. Design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Design features specific to the proposed Gold Point SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures;

- Land disturbance activities should minimize impacts to the unnamed intermittent stream, the playa area in the northeast corner, and ephemeral washes on site;

- Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters;

- Groundwater supplies during the construction and operations phases would need to be secured through coordination of the NDWR in terms of obtaining groundwater rights with in the Lida Valley groundwater basin, and potentially from off-site sources and adjacent groundwater basins for the construction phase;

- Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection (NDEP 2010);

- Groundwater monitoring and production wells should be constructed in accordance with state standards (NDWR 2006); and

- Water for potable uses would have to meet or be treated to meet water quality standards in accordance with the *Nevada Administrative Code* (445A.453–445A.455).

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11.6.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Gold Point SEZ. The affected area considered in this assessment includes the areas of direct and indirect effects. The area of direct effects is defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and includes the SEZ and a 250-ft (76-m) wide portion of an assumed transmission line corridor. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed transmission line corridor, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects.

Indirect effects considered in the assessment include effects from surface runoff, dust, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

11.6.10.1 Affected Environment

The proposed Gold Point SEZ is located primarily within the Tonopah Basin Level IV ecoregion, which primarily supports sparse shadscale (*Atriplex confertifolia*) communities on broad valleys, hills, bajadas, and alluvial fans (Bryce et al. 2003). Additional commonly occurring shrubs in this ecoregion include bud sagebrush (*Picrothamnus desertorum*), spiny hopsage (*Grayia spinosa*), seepweed (*Suaeda* sp.), fourwing saltbush (*Atriplex canescens*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedra nevadensis*), littleleaf horsebrush (*Tetradymia glabrata*), Douglas rabbitbrush (*Chrysothamnus viscidiflorus*), and winterfat (*Krascheninnikovia lanata*), which, along with shadscale, often co-dominate in highly diverse mosaics. Warm season grasses, such as Indian rice grass (*Achnatherum hymenoides*) and galleta grass (*Pleuraphis jamesii*), occur in the understory. Stands of inland saltgrass (*Distichlis spicata*) and alkali sacaton (*Sporobolus airoides*) also occur. Bailey greasewood (*Sarcobatus baileyi*) and Shockley wolfberry (*Lycium* sp.) are widespread and often co-dominate on lower alluvial slopes in this ecoregion. Black greasewood (*Sarcobatus vermiculatus*) occurs in saline bottoms. Springs and sporadic precipitation in foothills provide surface water sources.

The area surrounding the SEZ consists of a mosaic of the Tonopah Basin and the Tonopah Sagebrush Foothills Level IV ecoregion. This ecoregion supports black sagebrush (*Artemisia nova*) and Mojave species such as blackbrush (*Coleogyne ramosissima*), Joshua tree (*Yucca brevifolia*), and cholla (*Cylindropuntia* sp.) on rocky substrates. The Tonopah Basin and Tonopah Sagebrush Foothills ecoregions lie within the Central Basin and Range Level III ecoregion, described in Appendix , I, and are part of the Great Basin desertscrub biome. Annual precipitation in the vicinity of the SEZ is low, averaging about 6.1 in. (15.4 cm) at Goldfield, Nevada (see Section 11.6.13).

Land cover types described and mapped under the SWReGAP (USGS 2005a) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Gold Point SEZ are shown in Figure 11.6.10.1-1. Table 11.6.10.1-1 lists the surface area of each cover type within the potentially affected area.

Inter-Mountain Basins Mixed Salt Desert Scrub is the predominant cover type within the proposed Gold Point SEZ. Additional cover types within the SEZ are given in Table 11.6.10.1-1. During an August 2009 visit to the site, shadscale, greasewood, fourwing saltbush, winterfat, spiny horsebrush (*Tetradymia* sp.), and Indian ricegrass were the dominant species observed in the desert scrub communities throughout most of the SEZ. Joshua tree (*Yucca brevifolia*) was sparse in the northwest area of the SEZ and absent elsewhere. Joshua tree density increased south and southeast of the SEZ, within the area of indirect effects. Cacti observed on the SEZ included beavertail (*Opuntia basilaris*). Sensitive habitats on the SEZ include riparian, desert dry wash, and playa habitats. The area has a history of livestock grazing, and the plant communities on the SEZ have likely been affected by grazing.

The indirect effects area, including the area within 5 mi (8 km) around the SEZ and transmission line corridor, includes 16 cover types, which are listed in Table 11.6.10.1-1. The predominant cover type in the indirect effects area is Inter-Mountain Basins Mixed Salt Desert Scrub.

There are no wetlands mapped by the NWI within the SEZ or indirect effects area (USFWS 2009). NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009). Small areas identified as Inter-Mountain Basins Playa occur in the northeastern portion of the SEZ, along with scattered areas of greasewood flat. An unnamed intermittent stream crosses the SEZ from west to east and supports small areas of riparian plant communities. Numerous desert dry washes occur within the SEZ. The dry washes typically do not support wetland or riparian habitats, but many support communities of shrubs, including rabbitbrush (*Chrysothamnus/Ericameria* sp.). The dry washes, greasewood flats, and playas typically contain water for short periods during or following precipitation events. The entire SEZ is within the watershed of Jackson Wash, which supports riparian communities downstream of the SEZ. Springs occur in the vicinity of the SEZ, primarily to the west; however, discharge from these springs is generally low (see Section 11.6.9).

The State of Nevada maintains an official list of weed species that are designated noxious species. Table 11.6.10.1-2 provides a summary of the noxious weed species regulated in Nevada that are known to occur in Esmeralda County (USDA 2010, Creech et al. 2010), which includes the proposed Gold Point SEZ. Russian thistle (*Salsola* sp.), a non-native species observed to occur within much of the SEZ in August 2009, is not included in this table.

The NDA classifies noxious weeds into one of three categories (NDA 2010):

- "Category A: Weeds not found or limited in distribution throughout the state; actively excluded from the state and actively eradicated wherever found; actively eradicated from nursery stock dealer premises; control required by the state in all infestations."

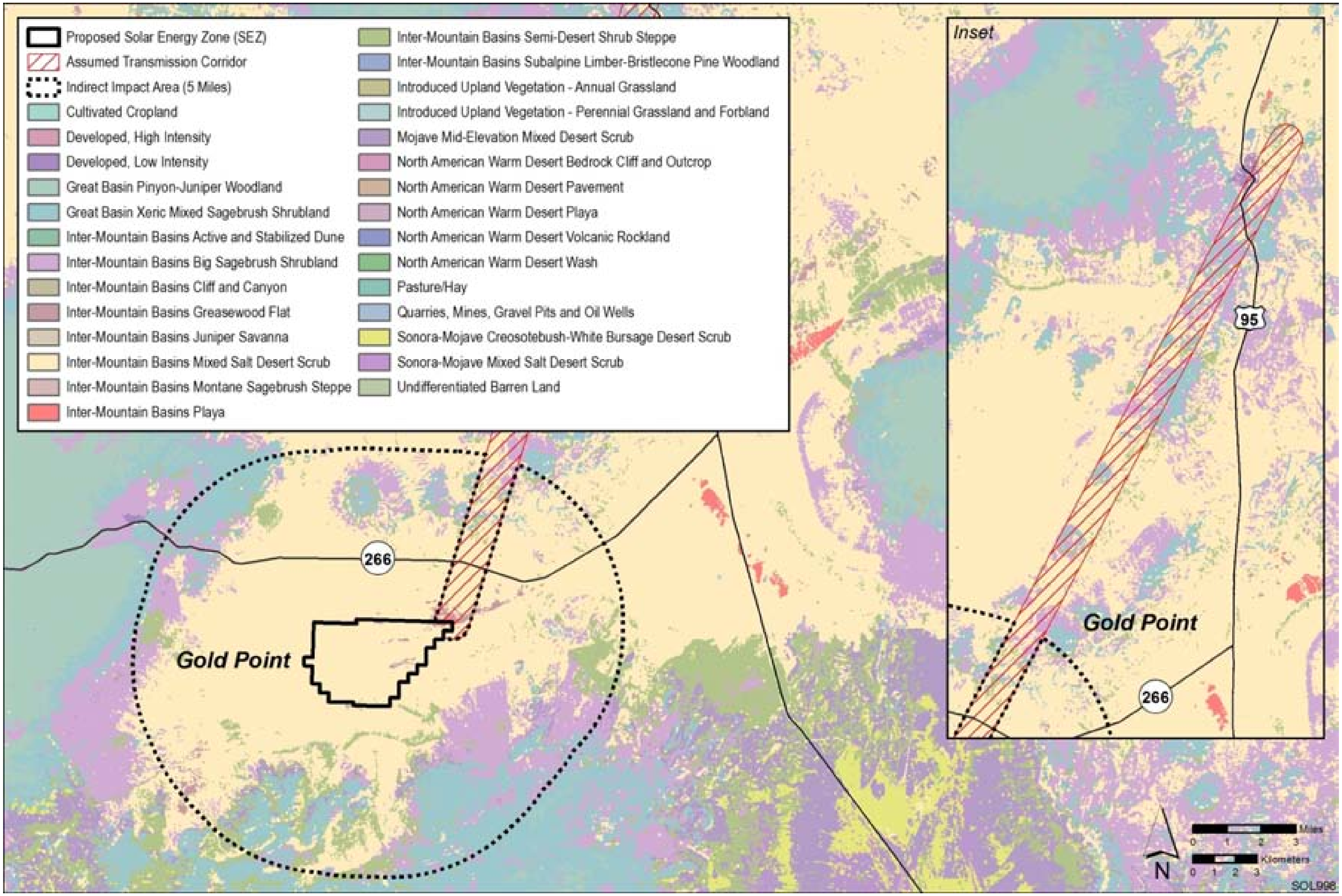

FIGURE 11.6.10.1-1 Land Cover Types within the Proposed Gold Point SEZ (Source: USGS 2004)

1

TABLE 11.6.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Gold Point SEZ and Potential Impacts

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Transmission Line (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Mixed Salt Desert Scrub: Generally consists of open shrublands that include at least one species of *Atriplex*, along with other shrubs. Perennial grasses dominate a sparse to moderately dense herbaceous layer.	4,641 acres[g] (0.5%, 0.6%)	397 acres (<0.1%)	60,242 acres (3.5%)	Small
Inter-Mountain Basins Greasewood Flat: Dominated or codominated by greasewood (*Sarcobatus vermiculatus*) and generally occurring in areas with saline soils, a shallow water table, and intermittent flooding, although remaining dry for most growing seasons. This community type generally occurs near drainages or around playas. These areas may include, or may be codominated by, other shrubs, and may include a graminoid herbaceous layer.	106 acres (0.6%, 1.1%)	8 acres (<0.1%)	582 acres (1.1%)	Small
Inter-Mountain Basins Playa: Playa habitats are intermittently flooded and generally barren or sparsely vegetated. Depressions may contain small patches of grass, and sparse shrubs may occur around playa margins.	29 acres (0.1%, 0.1%)	2 acres (<0.1%)	46 acres (0.1%)	Small
Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	23 acres (<0.1%, <0.1%)	32 acres (<0.1%)	8,122 acres (2.5%)	Small
Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	2 acres (<0.1%, <0.1%)	140 acres (<0.1%)	14,299 acres (3.5%)	Small

TABLE 11.6.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ (Direct Effects)[c]	Transmission Line (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Great Basin Xeric Mixed Sagebrush Shrubland: Generally occurs on level plains, slopes, and ridges. The dominant shrub species are black sagebrush (*Artemisia nova*) or, at higher elevations, little sagebrush (*Artemisia arbuscula*), and co-dominants may be Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) or yellow rabbitbrush (*Chrysothamnus viscidiflorus*). Other shrub species may also be present as well as sparse perennial bunchgrasses.	0 acres	76 acres (<0.1%)	12,739 acres (2.9%)	Small
Developed, Open Space – Low Intensity: Includes housing, parks, golf courses, and other areas planted in developed settings. Impervious surfaces compose up to 49 percent of the total land cover.	0 acres	4 acres (0.1%)	90 acres (1.9%)	Small
Barren Lands, Nonspecific: Includes a variety of barren areas, generally with less than 15% cover of vegetation.	0 acres	3 acres (0.1%)	57 acres (1.6%)	Small
Inter-Mountain Basins Cliff and Canyon: Includes barren and sparsely vegetated (generally <10% plant cover) steep cliff faces, narrow canyons, small rock outcrops, and scree and talus slopes. Composed of widely scattered coniferous trees and a variety of shrubs.	0 acres	2 acres (<0.1%)	357 acres (1.3%)	Small
Developed, Medium-High Intensity: Includes housing and commercial/industrial development. Impervious surfaces compose 50 to 100% of the total land cover.	0 acres	1 acre (0.2%)	9 acres (2.9%)	Small
Great Basin Pinyon-Juniper Woodland: Occurs on low-elevation slopes and ridges. Singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), or both are the dominant species, generally associating with curl-leaf mountain mahogany (*Cercocarpus ledifolius*). Understory species include shrubs and grasses.	0 acres	<1 acre (<0.1%)	79 acres (<0.1%)	Small

TABLE 11.6.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Transmission Line (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Big Sagebrush Steppe: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), big sagebrush (*Artemisia tridentata xericensis*), threetip sagebrush (*Artemisia tripartita tripartita*), or antelope bitterbrush (*Purshia tridentata*), or a combination of these species. Other shrubs may be present. Perennial grasses are often abundant. The distribution of shrubs may be patchy, with grassland predominating.	0 acres	<1 acre (<0.1%)	6 acres (1.8%)	Small
Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs, forbs, and grasses and may include *Yucca* spp.	0 acres	<1 acre (<0.1%)	1,303 acres (0.4%)	Small
Introduced Upland Vegetation – Annual and Perennial Grassland: Dominated by non-native annual and perennial grass species.	0 acres	<1 acre (<0.1%)	45 acres (0.6%)	Small
Inter-Mountain Basins Semi-Desert Grassland: Consists of perennial bunchgrasses as dominants or co-dominants. Scattered shrubs or dwarf shrubs may also be present.	0 acres	<1 acre (<0.1%)	15 acres (0.3%)	Small

TABLE 11.6.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Transmission Line (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Sonora-Mojave Creosotebush-White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	0 acres	0 acres	80 acres (<0.1%)	Small

[a] Land cover descriptions are from USGS (2005a). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from USGS (2004).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region. The SEZ region intersects portions of Nevada and California.

[d] For transmission development, direct effects were estimated within a 22-mi (35-km) long, 250-ft (76-m) wide transmission ROW from the SEZ to the nearest existing line. Direct impacts within this area were determined from the proportion of the cover type within the 1-mi (1.6-km) wide transmission corridor. Impacts are for the area of the cover type within the assumed ROW, and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed transmission line corridor, where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from projects. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the area of indirect effects and the percentage that area represents of all occurrences of that cover type within the SEZ region. The area of indirect effects occurs only in Nevada.

[f] Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

[g] To convert acres to km^2, multiply by 0.004047.

TABLE 11.6.10.1-2 Designated Noxious Weeds of Nevada Occurring in Esmeralda County

Common Name	Scientific Name	Category
Hoary cress/Whitetop[a]	*Cardaria* spp.	C
Johnsongrass[a]	*Sorghum halepense*	C
Musk thistle[b]	*Carduus nutans*	B
Perennial pepperweed[a]	*Lepidium latifolium*	C
Poison hemlock[a]	*Conium maculatum*	C
Puncture vine	*Tribulus terrestris*	C
Russian knapweed[a]	*Acroptilon repens*	B
Saltcedar[a,b]	*Tamarix* spp.	C
Scotch thistle[a]	*Onopordium acanthium*	B
Yellow toadflax[a]	*Linaria vulgaris*	A

[a] Creech et al. (2010).

[b] USDA (2010).

Source: NDA (2010).

- "Category B: Weeds established in scattered populations in some counties of the state; actively excluded where possible, actively eradicated from nursery stock dealer premises; control required by the state in areas where populations are not well established or previously unknown to occur."

- "Category C: Weeds currently established and generally widespread in many counties of the state; actively eradicated from nursery stock dealer premises; abatement at the discretion of the state quarantine officer."

11.6.10.2 Impacts

The construction of solar energy facilities within the proposed Gold Point SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (3,848 acres [15.6 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (e.g., caused by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and to reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation within the SEZ, are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.6.10.2.3, below, identifies design features of particular relevance to the proposed Gold Point SEZ.

11.6.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (≤1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); moderate if it could affect an intermediate proportion (>1 but ≤10%) of a cover type; and large if it could affect greater than 10% of a cover type.

Solar facility construction and operation in the proposed Gold Point SEZ would primarily affect communities of the Inter-Mountain Basins Mixed Salt Desert Scrub cover type. Additional cover types that would be affected within the SEZ include Inter-Mountain Basins Greasewood Flat, Inter-Mountain Basins Playa, Inter-Mountain Basins Semi-Desert Shrub Steppe, and Inter-Mountain Basins Big Sagebrush Shrubland. Additional cover types that would be affected only by the assumed transmission line include Great Basin Xeric Mixed Sagebrush Shrubland, Developed, Open Space—Low Intensity, Barren Lands, Nonspecific, Inter-Mountain Basins Cliff and Canyon, Developed, Medium-High Intensity, Great Basin Pinyon-Juniper Woodland, Inter-Mountain Basins Big Sagebrush Steppe, Mojave Mid-Elevation Mixed Desert Scrub, Introduced Upland Vegetation—Annual and Perennial Grassland, Inter-Mountain Basins Semi-Desert Grassland, and Sonora-Mojave Creosotebush-White Bursage Desert Scrub. Introduced Upland Vegetation—Annual and Perennial Grassland, Developed, Open Space—Low Intensity, and Developed, Medium-High Intensity cover types would likely have relatively minor populations of native species. Table 11.6.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed Gold Point SEZ. While these cover types are relatively common in the SEZ region, several cover types within the transmission line corridor are relatively uncommon, representing less than 1% of the land area within the SEZ region: Inter-Mountain Basins Cliff and Canyon (0.5%), Inter-Mountain Basins Semi-Desert Grassland (0.09%), Barren Lands, Non-specific (0.07%), and Inter-Mountain Basins Big Sagebrush Steppe (0.006%). The construction, operation, and decommissioning of solar projects within the proposed Gold Point SEZ would result in small impacts on all cover types in the affected area. Playa, riparian, and desert dry wash are important sensitive habitats in the SEZ and corridor.

Because of the arid conditions, reestablishment of desert scrub communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region and likely occur on the SEZ. Damage to these crusts, by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the area of indirect affects identified in Table 11.6.10.1-1.

Communities associated with riparian habitats, playa habitats, greasewood flats communities, desert dry wash habitats, or other periodically flooded areas within solar projects or the transmission line corridor could be directly affected by ground-disturbing activities. Similar habitats downgradient from ground-disturbing activities could be indirectly affected. Surface drainage in the northern portion of the SEZ is directed toward playa habitats. The entire SEZ is within the watershed of Jackson Wash, which supports riparian communities downstream of the SEZ. Site-clearing and -grading could disrupt surface water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation; could potentially alter plant communities within riparian or playa habitats or along Jackson Wash, including occurrences outside of the SEZ; and could affect community function. Increases in surface runoff from a solar energy project site or transmission line could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Alteration of surface drainage patterns or hydrology could also adversely affect downstream desert dry wash communities. Vegetation within these communities could be lost by erosion or desiccation.

Although the use of groundwater within the Gold Point SEZ for technologies with high water requirements, such as wet-cooling systems, may be unlikely, groundwater withdrawals for such systems could reduce groundwater elevations. Communities that depend on accessible groundwater, such as those associated with springs in the Lida Valley groundwater basin, or in other hydrologically connected basins, could become degraded or lost as a result of lowered groundwater levels. The potential for impacts on springs would need to be evaluated by project-specific hydrological studies.

11.6.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

On February 8, 1999, the President signed E.O. 13112, "Invasive Species," which directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Despite required design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Gold Point SEZ, such that weeds could be transported into areas that were previously relatively weed-free, which could result in reduced restoration success and possible widespread habitat degradation. Species designated as noxious weeds in Nevada and known to occur in Esmeralda County are listed in Table 11.6.10.1-2. Less than 1 acre (<0.004 km^2) of Introduced Upland Vegetation—Annual and Perennial Grassland occurs within the direct effects area of the assumed transmission line and approximately 45 acres (0.2 km^2) occurs in the indirect effects area of the SEZ.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Existing roads, transmission lines, and recreational OHV use within the affected area of the Gold Point SEZ would also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species. Disturbed areas may contribute to the establishment of noxious weeds and invasive species. Approximately 1 acre (0.004 km^2) of Developed, Medium-High Intensity occurs within the direct effects area of the assumed transmission line and 9 acres (0.04 km^2) in the area of indirect effects; 4 acres (0.02 km^2) of Developed, Open Space—Low Intensity occurs within the direct effects area of the assumed transmission line and 90 acres (0.4 km^2) in the area of indirect effects.

11.6.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While specific practices are best established when project details are considered, some SEZ-specific design features can be identified at this time, as follows.

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of desert scrub, greasewood flat, and other affected habitats, and to minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- All riparian, dry wash, and playa communities within the SEZ and transmission line corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. Any Joshua tree or other *Yucca* species, cacti, or succulent plant species that cannot be avoided should be salvaged. A buffer area should be maintained around dry wash, riparian, and playa habitats to reduce the potential for impacts.

- Appropriate engineering controls should be used to minimize impacts on dry wash, playa, wetland, greasewood flat, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on habitats associated with springs. Potential impacts on springs should be determined through hydrological studies.

If these SEZ-specific design features are implemented in addition to other programmatic design features, it is anticipated that a high potential for impacts from invasive species and potential impacts on dry washes, playas, riparian habitats, wetlands, and springs would be reduced to a minimal potential for impact.

11.6.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Gold Point SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from the SWReGAP (USGS 2007). Land cover types suitable for each species were determined from the SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 250-ft (76-m) wide portion of an assumed 22-mi (35.4-km) long transmission line corridor. The maximum developed area within the SEZ would be 3,848 acres (15.6 km^2).

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within a 1.0-mi (1.6-km) wide transmission line corridor where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the areas of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills). An additional area of indirect effects was considered for 17 mi (27.4 km) of the transmission line corridor that would extend beyond the 5-mi (8-km) area of indirect effects for the SEZ. The potential degree of indirect effects would decrease with increasing distance from the SEZ. The area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. These areas of direct and indirect effects are defined and the impact assessment approach is described in Appendix M.

Dominant land cover habitats in the affected area are sagebrush shrubland and desert scrub (see Section 11.6.10). An unnamed wash traverses the SEZ, and converges with Jackson Wash, about 1.5 mi (2.4 km) east of the proposed Gold Point SEZ (Figure 11.6.9.1-1). Several ephemeral washes converge to a small playa area in the northeast corner of the SEZ.

11.6.11.1 Amphibians and Reptiles

11.6.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Gold Point SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008) and the SWReGAP (USGS 2007). Land cover types suitable for each species were determined from the SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Based on species distributions within the area of the SEZ and habitat preferences of the amphibian species, the Great Plains toad (*Bufo cognatus*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). Both toad species would most likely occur in or near the wash and playa habitats within the SEZ.

More than 25 reptile species occur within the area that encompasses the proposed Gold Point SEZ (USGS 2007; Stebbins 2003). The desert tortoise (*Gopherus agassizii*) is a federal and state listed threatened species. This species is discussed in Section 11.6.12. Lizard species expected to occur within the SEZ include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*). Snake species expected to occur within the SEZ are the coachwhip (*Masticophis flagellum*), common kingsnake (*Lampropeltis getula*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), long-nosed snake (*Rhinocheilus lecontei*), and nightsnake (*Hypsiglena torquata*). The Mojave rattlesnake (*Crotalus scutulatus*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 11.6.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Gold Point SEZ. Special status amphibian and reptile species are addressed in Section 11.6.12.

11.6.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.6.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed Gold Point SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area as presented in Section 11.6.11.1.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 11.6.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on amphibians

TABLE 11.6.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Gold Point SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] — Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Amphibians					
Great Plains toad (*Bufo cognatus*)	Prefers desert, grassland, and agricultural habitats. Breeds in shallow temporary pools, quiet areas of streams, marshes, irrigation ditches, and flooded fields. In cold winter months, it burrows underground and becomes inactive. About 1,165,800 acres[h] of potentially suitable habitat occurs within the SEZ region.	129 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) during construction and operations	10,101 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	40 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 805 acres in area of indirect effects	Small overall impact. Avoid playa and wash habitats.
Red-spotted toad (*Bufo punctatus*)	Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos; desert streams and oases; open grassland; scrubland oaks; and dry woodlands. About 3,104,100 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	62,556 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	397 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 7,988 acres in area of indirect effects	Small overall impact. Other than avoidance of wash and playa habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Lizards					
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edges of dunes. Burrows in soil during periods of inactivity. About 4,700,900 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,366 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	655 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,179 acres in area of indirect effects	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

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TABLE 11.6.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] — Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Great Basin collared lizard (*Crotaphytus bicinctores*)	Usually inhabits alluvia, lava flows, mountain slopes, canyons, buttes, rock outcrops, washes, and rocky plains. Limiting factors are presence of large boulders and open/sparse vegetation. About 3,794700 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	83,658 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	508 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 10,221 acres in area of indirect effect	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 3,740,500 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	89,458 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	613 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 12,340 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Western fence lizard (*Sceloporus occidentalis*)	Disturbed areas, roadsides, gravel beds, rock quarries, lava flows, outcrops, talus slopes, shrublands, riparian areas, and coniferous woodlands. About 4,792,900 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	96,741 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	648 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,038 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Western whiptail (*Aspidoscelis tigris*)	Primarily occurs in sparsely vegetated desert and shrubland habitats. During cold winter months, it often occupies underground burrows created by rodents or other lizards. About 3,818,200 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	84,083 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	514 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 10,342 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Zebra-tailed lizard (*Callisaurus draconoides*)	Open, warm-desert habitats, especially dry washes and canyons with fine gravel and sand. About 3,228,400 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	75,157 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	473 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 9,517 acres in area of indirect effects	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Snakes					
Coachwhip (*Masticophis flagellum*)	Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 2,940,100 acres of potentially suitable habitat occurs within the SEZ region.	131 acres of potentially suitable habitat lost (0.004% of available potentially suitable habitat) during construction and operations	36,272 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	259 acres of potentially suitable habitat lost (0.009% of available potentially suitable habitat) and 5,211 acres in area of indirect effects	Small overall impact.

TABLE 11.6.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Common kingsnake (*Lampropeltis getula*)	Coniferous forests, woodlands, swampland, coastal marshes, river bottoms, farmlands, prairies, chaparral, and deserts. Uses rock outcrops and rodent burrows for cover. About 4,581,300 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	85,515 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	518 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 10,422 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Glossy snake (*Arizona elegans*)	Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 1,604,100 acres of potentially suitable habitat occurs within the SEZ region.	54 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) during construction and operations	22,562 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	174 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 3,501 acres in area of indirect effects	Small overall impact.
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 2,739,600 acres of potentially suitable habitat occurs in the SEZ region.	31 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) during construction and operations	28,660 acres of potentially suitable habitat (1.0% of available potentially suitable habitat)	223 acres of potentially suitable habitat lost (0.008% of available potentially suitable habitat) and 4,487 acres in area of indirect effect	Small overall impact.

TABLE 11.6.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	
Snakes (Cont.)					
Groundsnake (*Sonora semiannulata*)	Arid and semiarid regions with rocky to sandy soils. River bottoms, desert flats, sand hummocks, and rocky hillsides. About 2,748,300 acres of potentially suitable habitat occurs within the SEZ region.	25 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) during construction and operations	36,642 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	249 acres of potentially suitable habitat lost (0.009% of available potentially suitable habitat) and 5,010 acres in area of indirect effects	Small overall impact. Avoid greasewood flat habitat.
Mojave rattlesnake (*Crotalus scutulatus*)	Mostly upland desert and lower mountain slopes. Barren desert, grassland, open juniper woodland, and scrubland; especially common in areas of scattered scrubby growth such as creosote and mesquite. About 5,435,700 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.07% of available potentially suitable habitat) during construction and operations	99,023 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	666 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,400 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Nightsnake (*Hypsiglena torquata*)	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, it seeks refuge underground, in crevices, or under rocks. About 3,460,800 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	69,785 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	434 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 8,732 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

Footnotes on next page.

TABLE 11.6.11.1-1 (Cont.)

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area.

[c] Direct effects within the SEZ would consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 3,848 acres (15.6 km^2) would be developed in the SEZ.

[d] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide transmission line corridor (less the assumed area of direct effects) that extends beyond the 5-mi (8-km) area adjacent to the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 3,848 acres (15.6 km^2) of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

[e] For transmission line development, direct effects were estimated within a 22-mi (35-km) long, 250-ft (76-m) wide ROW for an assumed new transmission line connecting to the nearest existing line. Indirect effects were estimated within a 1-mi (1.6-km) wide transmission corridor to the existing transmission line, less the assumed area of direct effects. Additional indirect effects for the transmission line considered only the 17-mi (27-km) long portion that extends outside of the 5-mi (8-km) area of indirect effects for the SEZ

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

and reptiles summarized in Table 11.6.11.1-1, direct impacts on amphibian and reptile species would be small, as 0.1% or less of potentially suitable habitats identified for the species in the SEZ region would be lost. Larger areas of potentially suitable habitats for most amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 2.4% of available habitat for the long-nosed leopard lizard). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.6.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that depend on habitat types that can be avoided (e.g., washes and playas). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features are best established when considering specific project details, one design feature can be identified at this time:

- Development in wash, playa, and cliff and canyon habitats should be avoided.

If this SEZ-specific design feature is implemented in addition to the programmatic design features, impacts on amphibian and reptile species could be reduced. However, as potentially suitable habitats for a number of the representative amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.6.11.2 Birds

11.6.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Gold Point SEZ. The list of bird species potentially present in the SEZ area was determined from the

Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008) and the SWReGAP (USGS 2007). Land cover types suitable for each species were determined from the SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Five bird species that could occur on or in the affected area of the SEZ are considered focal species in the *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), ladder-backed woodpecker (*Picoides scalaris*), and Le Conte's thrasher (*Toxostoma lecontei*). Habitats for most of these species are described in Table 11.6.11.2-1. Because of its special species status, the burrowing owl is discussed in Section 11.6.12.

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state study area. However, within the proposed Gold Point SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Playa and wash habitats within the SEZ may attract shorebird species, but Deep Springs Lake, Cottonwood and Crooked creeks, and larger washes and dry lakes within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) is the shorebird species most likely to occur within the SEZ.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state study area. Species expected to occur within the proposed Gold Point SEZ include the ash-throated flycatcher, Bewick's wren (*Thryomanes bewickii*), Brewer's sparrow (*Spizella breweri*), cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker, Le Conte's thrasher, lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), northern mockingbird (*Mimus polyglottos*), rock wren (*Salpinctes obsoletus*), sage sparrow (*Amphispiza belli*), Say's phoebe (*Sayornis saya*), and western kingbird (*Tyrannus verticalis*) (CDFG 2008; NDCNR 2002; USGS 2007).

TABLE 11.6.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Gold Point SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Shorebirds					
Killdeer (*Charadrius vociferus*)	Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 129,200 acres[h] of potentially suitable habitat occurs within the SEZ region.	29 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) during construction and operations	145 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	7 acres of potentially suitable habitat lost (0.005% of available potentially suitable habitat) and 141 acres in area of indirect effects	Small overall impact. Avoid playa and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Neotropical Migrants					
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 4,365,800 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	90,225 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	621 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 12,495 acres in area of indirect effects	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] — Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Bewick's wren (*Thryomanes bewickii*)	Generally associated with dense, brushy habitats. Permanent resident of lowland deserts and pinyon-juniper forests of southern Utah. Breeding occurs in brushy areas of open woodlands and other open habitats. Cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 3,047,900 acres of potentially suitable habitat occurs within the SEZ region.	160 acres of potentially suitable habitat lost (0.005% of available potentially suitable habitat) during construction and operations	36,303 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	261 acres of potentially suitable habitat lost (0.009% of available potentially suitable habitat) and 5,251 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Brewer's sparrow (*Spizella breweri*)	Considered a shrub-steppe obligate. Occupies open desert scrub and cropland habitats. However, may also occur in high desert scrub (greasewood) habitats, particularly where adjacent to shrub-steppe habitats. Nests are usually located in patches of sagebrush that are taller and denser, with more bare ground and less herbaceous cover, than the surrounding habitat. Also breeds in large sagebrush openings in pinyon-juniper or coniferous forest habitats. About 3,801,700 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	89,479 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	613 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 12,334 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semi-arid habitats. Nests in open areas on a bare site. About 4,474,800 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	88,928 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	621 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 12,495 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or man-made structures. Forages in sparse, open terrain. About 4,755,500 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,891 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	661 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,299 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,772,900 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	89,983 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	620 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 12,474 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats, other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 4,198,900 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	98,444 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	658 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 13,239 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Ladder-backed woodpecker (Picoides scalaris)	Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 3,179,500 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	62,853 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	400 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 8,048 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 2,537,800 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	62,418 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	397 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 7,988 acres in area of indirect effects	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 4,288,300 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	89,458 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	613 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 12,334 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 4,732,500 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,831 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	660 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,279 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Northern mockingbird (*Mimus polyglottos*)	Parkland, cultivated lands, second-growth habitats, desert scrub, and riparian areas. Forages on ground in short, grassy to nearly barren substrates. About 5,167,800 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.07% of available potentially suitable habitat) during construction and operations	98,921 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	663 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,340 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Rock wren (*Salpinctes obsoletus*)	Arid and semiarid habitats. Breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices, and the nest entrance is paved with small rocks and stones. About 5,235,000 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.07% of available potentially suitable habitat) during construction and operations	98,969 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	665 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,380 acres in area of indirect effects	Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Sage sparrow (*Amphispiza belli*)	Prefers shrubland, grassland, and desert habitats. The nest, constructed of twigs and grasses, is located either low in a shrub or on the ground. About 4,005,800 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	97,364 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	656 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 13,199 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 2,558,900 acres of potentially suitable habitat occurs within the SEZ region.	108 acres of potentially suitable habitat lost (0.004% of available potentially suitable habitat) during construction and operations	29,455 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	231 acres of potentially suitable habitat lost (0.009% of available potentially suitable habitat) and 4,648 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Western kingbird (*Tyrannus verticalis*)	Occurs in a variety of habitats including riparian forests and woodlands, savannas, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. Migrates to Central America or the southeastern United States for the winter. About 4,046,000 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	98,064 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	653 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 13,138 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Birds of Prey					
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 4,756,900 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,766 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	661 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,299 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,800,100 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,667 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	656 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,199 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Great horned owl (*Bubo virginianus*)	Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 5,070,200 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	99,023 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	666 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,400 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Long-eared owl (*Asio otus*)	Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush-bursage flats, desert scrub, grasslands, and agricultural fields). About 4,611,800 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,391 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	653 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,138 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures, urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 3,192,100 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	85,251 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	576 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 11,589 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 3,517,900 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	62,853 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	400 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 8,048 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Upland Game Birds					
Chukar (*Alectoris chukar*)	Steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Distribution often follows that of cheatgrass. Sources of water are required during hot, dry periods, with most birds found within 0.25 mi (0.4 km) of water during the brooding period. About 4,585,400 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	97,747 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	646 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 12,998 acres in area of indirect effects	Small overall impact. Other than avoidance of wash and playa habitats, no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Upland Game Birds					
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 2,781,700 acres of potentially suitable habitat occurs within the SEZ region.	131 acres of potentially suitable habitat lost (0.005% of available potentially suitable habitat) during construction and operations	37,496 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	259 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 5,211 acres in area of indirect effects	Small overall impact. Avoid wash and playa habitats.
Mourning dove (*Zenaida macrroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,379,500 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	85,865 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	584 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 11,750 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area.

[c] Direct effects within the SEZ would consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 3,848 acres (15.6 km^2) of direct effects within the SEZ was assumed.

Footnotes continued on next page.

TABLE 11.6.11.2-1 (Cont.)

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[d] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide transmission line corridor (less the assumed area of direct effects) that extends beyond the 5-mi (8-km) area adjacent to the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 3,848 acres (15.6 km^2) of direct effects was also added to the area of indirect effects. Indirect effects include those from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

[e] For transmission line development, direct effects were estimated within a 22-mi (35-km) long, 250-ft (76-m) wide ROW for an assumed new transmission line connecting to the nearest existing line. Indirect effects were estimated within a 1-mi (1.6-km) wide transmission corridor to the existing transmission line, less the assumed area of direct effects. Additional indirect effects for the transmission line only considered the 17-mi (27-km) long portion that extends outside of the 5 mi (8 km) area of indirect effects for the SEZ

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

Birds of Prey

Section 4.10.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state study area. Twenty-seven bird of prey species have been reported from Iron County (Utah Ornithological Society 2007). Raptor species that could occur within the proposed Gold Point SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*) (CDFG 2008; NDCNR 2002; USGS 2007). Several special status birds of prey species are discussed in Section 11.6.12.

Upland Game Birds

Section 4.10.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state study area. Upland game species that could occur within the proposed Gold Point SEZ include the chukar (*Alectoris chukar*), Gambel's quail (*Callipepla gambelii*), and mourning dove (*Zenaida macroura*) (CDFG 2008; NDCNR 2002; USGS 2007).

Table 11.6.11.2-1 provides habitat information for representative bird species that could occur within the proposed Gold Point SEZ. Special status bird species are discussed in Section 11.6.12.

11.6.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.6.11.2.3, below, identifies design features of particular relevance to the proposed Gold Point SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area, as presented in Section 11.6.11.2.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 11.6.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), and from disturbance, injury, or mortality to individual birds. Table 11.6.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed Gold Point SEZ. Direct impacts on all representative bird species would be small, as only 0.2% or less of potentially suitable habitats for the bird species would be lost (Table 11.6.11.2-1). Larger areas of potentially suitable habitat for bird species occur within the area of potential indirect effects (e.g., up to 2.7% of potentially suitable habitat for the red-tailed hawk). Other impacts on birds could result from collision with vehicles and buildings, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.6.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds, especially for those species that depend on habitat types that can be avoided (e.g., wash and playa habitats). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important to reducing impacts on birds are best established when project details are considered, some design features can be identified at this time:

- The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed.

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act.

- Wash and playa habitats should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on bird species could be reduced. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.6.11.3 Mammals

11.6.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Gold Point SEZ. The list of mammal species potentially present in the SEZ area was determined from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008) and the SWReGAP (USGS 2007). Land cover types suitable for each species were determined from the SWReGAP (USGS 2004, 2005a, 2007). Appendix M contains additional information on the approach used.

More than 55 species of mammals have ranges that encompass the area of the proposed Gold Point SEZ (NDCNR 2002; USGS 2007); however, suitable habitats for a number of these species are limited or nonexistent within the SEZ (USGS 2007). Similar to the overview of mammals provided for the six-state study area (Section 4.10.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share similar habitats.

Big Game

The big game species that could occur within the area of the proposed Gold Point SEZ include cougar (*Puma concolor*), elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), Nelson's bighorn sheep (*Ovis canadensis nelsoni*), and pronghorn (*Antilocapra americana*) (CDFG 2008; NDCNR 2002; USGS 2007). Because of its special species status, Nelson's bighorn sheep is addressed in Section 11.6.12. Based on land cover, potentially suitable habitat for the cougar and mule deer occur throughout the SEZ; whereas, limited suitable habitat for elk and pronghorn occurs within the SEZ (Table 11.6.11.3-1). Figures 11.6.11.3-1 and 11.6.11.3-2 show the location of the SEZ relative to the mapped ranges of mule deer and pronghorn, respectively.

Other Mammals

A number of furbearers and small game mammal species occur within the area of the proposed Gold Point SEZ. Species that could occur within the area of the SEZ include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and red fox (*Vulpes vulpes*) (CDFG 2008; NDCNR 2002; USGS 2007).

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TABLE 11.6.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Gold Point SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Big Game					
Cougar *(Puma concolor)*	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 5,040,400 acres[h] of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,059 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	648 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,038 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Elk *Cervis canadensis)*	Semi-open forest, mountain meadows, foothills, plains, valleys, and alpine tundra. Uses open spaces such as alpine pastures, marshy meadows, river flats, brushy clean cuts, forest edges, and semidesert areas. About 1,242,200 acres of potentially suitable habitat occurs in the SEZ region.	2 acres of potentially suitable habitat lost (<0.0002% of available potentially suitable habitat) during construction and operations	27,044 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	216 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 4,346 acres in area of indirect effects	Small overall impact.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Big Game (Cont.)					
Mule deer *(Odocoileus hemionus)*	Most habitats, including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provides abundant browse and cover. About 4,182,100 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	98,401 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	658 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 13,239 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Pronghorn *(Antilocapra americana)*	Grasslands and semidesert shrublands on rolling topography that affords good visibility. Most abundant in shortgrass or midgrass prairies and least common in xeric habitats. About 1,582,200 acres of potentially suitable habitat occurs in the SEZ region.	131 acres of potentially suitable habitat lost (0.008% of available potentially suitable habitat) during construction and operations	35,757 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	256 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 5,151 acres in area of indirect effects	Small overall impact.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers					
American badger *(Taxidea taxus)*	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 4,698,400 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,882 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	658 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,239 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Black-tailed jackrabbit *(Lepus californicus)*	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 5,121,100 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,969 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	665 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,380 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Bobcat *(Lynx rufus)*	Most habitats except subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 2,922,300 acres of potentially suitable habitat occurs in the SEZ region.	160 acres of potentially suitable habitat lost (0.005% of available potentially suitable habitat) during construction and operations	37,360 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	263 acres of potentially suitable habitat lost (0.009% of available potentially suitable habitat) and 5,292 acres in area of indirect effects	Small overall impact.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Coyote *(Canis latrans)*	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 5,406,700 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.07% of available potentially suitable habitat) during construction and operations	99,023 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	666 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,400 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Desert cottontail *(Sylvilagus audubonii)*	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 4,302,400 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	110,264 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	94 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 1,884 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Gray fox *(Urocyon cinereoargenteus)*	Deserts, open forests and brush. Prefer wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 3,572,000 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	70,473 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	442 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 8,893 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Kit fox *(Vulpes macrotis)*	Desert and semidesert areas with relatively open vegetative cover and soft soils. Seeks shelter in underground burrows. About 4,227,900 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	97,683 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	648 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 13,038 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Red fox *(Vulpes vulpes)*	Most common in open woodlands, pasturelands, riparian areas, and agricultural lands. About 2,610,500 acres of potentially suitable habitat occurs in the SEZ region.	54 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) during construction and operations	35,736 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	253 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 5,090 acres in area of indirect effects	Small overall impact.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	
Nongame (small) Mammals					
Big brown bat *(Eptesicus fuscus)*	Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 3,535,300 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	70,572 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	447 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 8,994 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Botta's pocket gopher *(Thomomys bottae)*	Variety of habitats, including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 3,382,300 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	84,339 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	579 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 11,649 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Brazilian free-tailed bat *(Tadarida brasiliensis)*	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 4,307,900 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	84,574 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	587 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 11,810 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Cactus mouse *(Peromyscus eremicus)*	Variety of areas, including desert scrub, semidesert chaparral, desert wash, semidesert grassland, and cliff and canyon habitats. About 1,780,400 acres of potentially suitable habitat occurs in the SEZ region.	129 acres of potentially suitable habitat lost (0.007% of available potentially suitable habitat) during construction and operations	10,537 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	43 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 865 acres in area of indirect effects	Small overall impact. Avoid wash habitat.
California myotis *(Myotis californicus)*	Desertscrub, semidesert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 3,780,400 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	84,339 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	579 acres of potentially suitable habitat lost (0.015% of available potentially suitable habitat) and 11,649 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Canyon mouse *(Peromyscus crinitus)*	Associated with rocky substrates in a variety of habitats including desert scrub, sagebrush shrublands, woodlands, cliffs and canyons, and volcanic rock and cinder lands. Source of free water not required. About 2,124,200 acres of potentially suitable habitat occurs in the SEZ region.	2 acres of potentially suitable habitat lost (<0.0001% of available potentially suitable habitat) during construction and operations	28,421 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	216 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 4,346 acres in area of indirect effects	Small overall impact.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	
Nongame (small) Mammals (Cont.)					
Deer mouse *(Peromyscus maniculatus)*	Tundra; alpine and subalpine grasslands; plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran desert scrub habitats. About 4,976,700 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,741 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	656 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,199 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Desert shrew *(Notiosorex crawfordi)*	Usually in arid areas with adequate cover such as semiarid grasslands, shortgrass plains, desert scrub, chaparral slopes, shortgrass plains, oak savannas and woodlands, and alluvial fans. About 3,479,900 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	71,340 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	440 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 8,853 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Desert woodrat *(Neotoma lepida)*	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 5,231,800 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.07% of available potentially suitable habitat) during construction and operations	98,747 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	656 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 13,199 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Hoary bat *(Lasiurus cinereus)*	Chaparral, shortgrass plains, scrub-grassland, desertscrub, forests and woodlands. Usually roosts in trees, also in caves, rock crevices, and houses. About 1,799,700 acres of potentially suitable habitat occurs in the SEZ region.	158 acres of potentially suitable habitat lost (0.009% of available potentially suitable habitat) during construction and operations	9,379 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	50 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 1,006 acres in area of indirect effects	Small overall impact.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Little pocket mouse *(Perognathus longimembris)*	Mostly sandy and gravelly soils, but also stony soils and rarely rocky sites. About 2,314,300 acres of potentially suitable habitat occurs in the SEZ region.	25 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) during construction and operations	36,543 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	248 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 4,990 acres in area of indirect effects	Small overall impact.
Long-legged myotis *(Myotis volans)*	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees are used for daytime roosting and winter hibernation. Forages in open areas, such as forest clearings. About 3,605,000 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	70,925 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	449 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 9,034 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Merriam's kangaroo rat *(Dipodomys merriami)*	Plains grasslands, scrub-grasslands, desertscrub, shortgrass plains, oak and juniper savannas, mesquite dunes, and creosote flats. About 4,206,900 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	98,387 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	655 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 13,179 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Northern grasshopper mouse *(Onychomys leucogaster)*	Occurs in grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 2,793,700 acres of potentially suitable habitat occurs within the SEZ region.	25 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) during construction and operations	36,637 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	248 acres of potentially suitable habitat lost (0.009% of available potentially suitable habitat) and 4,990 acres in area of indirect effects	Small overall impact.
Silver-haired bat *(Lasionycteris noctivagans)*	Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savanna and desertscrub habitats. Roosts under bark, in hollow trees, caves and mines. Forages over clearings and open water. About 4,252,200 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.09% of available potentially suitable habitat) during construction and operations	84,170 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	579 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 11,649 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Southern grasshopper mouse *(Onychomys torridus)*	Low, arid, shrub and semiscrub vegetation of deserts. About 2,882,400 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	70,577 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	430 acres of potentially suitable habitat lost (0.015% of available potentially suitable habitat) and 8,652 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Western pipistrelle *(Parastrellus esperus)*	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 3,726,700 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	84,495 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	587 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 11,810 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
White-tailed antelope squirrel *(Ammospermophilus leucurus)*	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends nights and other periods of inactivity in underground burrows. About 3,735,000 acres of potentially suitable habitat occurs within the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	84,085 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	516 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 10,382 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.6.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Yuma myotis *(Myotis yumanensis)*	Riparian areas, grasslands, semidesert shrubland, mountain brush, woodlands, and deserts. Occurs where there is open water, regardless of the habitat. Roosts in caves, mines, cliffs, crevices, buildings, and swallow nests. About 3,762,800 acres of potentially suitable habitat occurs in the SEZ region.	3,848 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	83,651 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	571 acres of potentially suitable habitat lost (0.015% of available potentially suitable habitat) and 11,489 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 3,848 acres (15.6 km^2) of direct effects within the SEZ was assumed.

[c] Direct effects within the SEZ would consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide transmission line corridor (less the assumed area of direct effects) that extends beyond the 5-mi (8-km) area adjacent to the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 3,848 acres (15.6 km^2) of direct effects was also added to the area of indirect effects. Indirect effects include those from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

[e] For transmission line development, direct effects were estimated within a 22-mi (35-km) long, 250-ft (76-m) wide ROW for an assumed new transmission line connecting to the nearest existing line. Indirect effects were estimated within a 1-mi (1.6-km) wide transmission corridor to the existing transmission line, less the assumed area of direct effects. Additional indirect effects for the transmission line only considered the 17-mi (27-km) long portion that extends outside of the 5 mi (8 km) area of indirect effects for the SEZ

Footnotes continued on next page.

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TABLE 11.6.11.3-1 (Cont.)

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[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) small: $\leq$1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) moderate: >1 but $\leq$10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) large: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

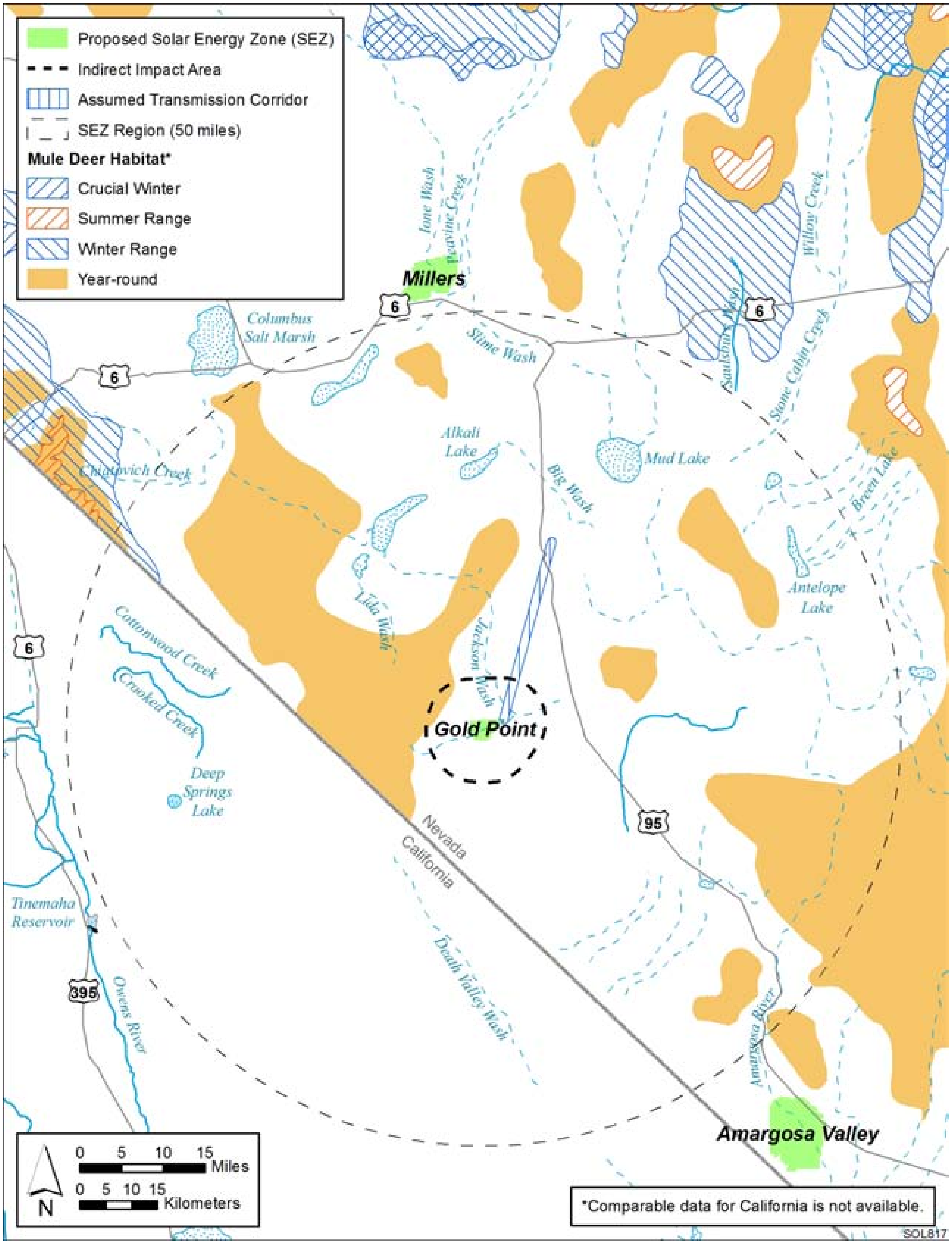

FIGURE 11.6.11.3-1 Location of the Proposed Gold Point SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)

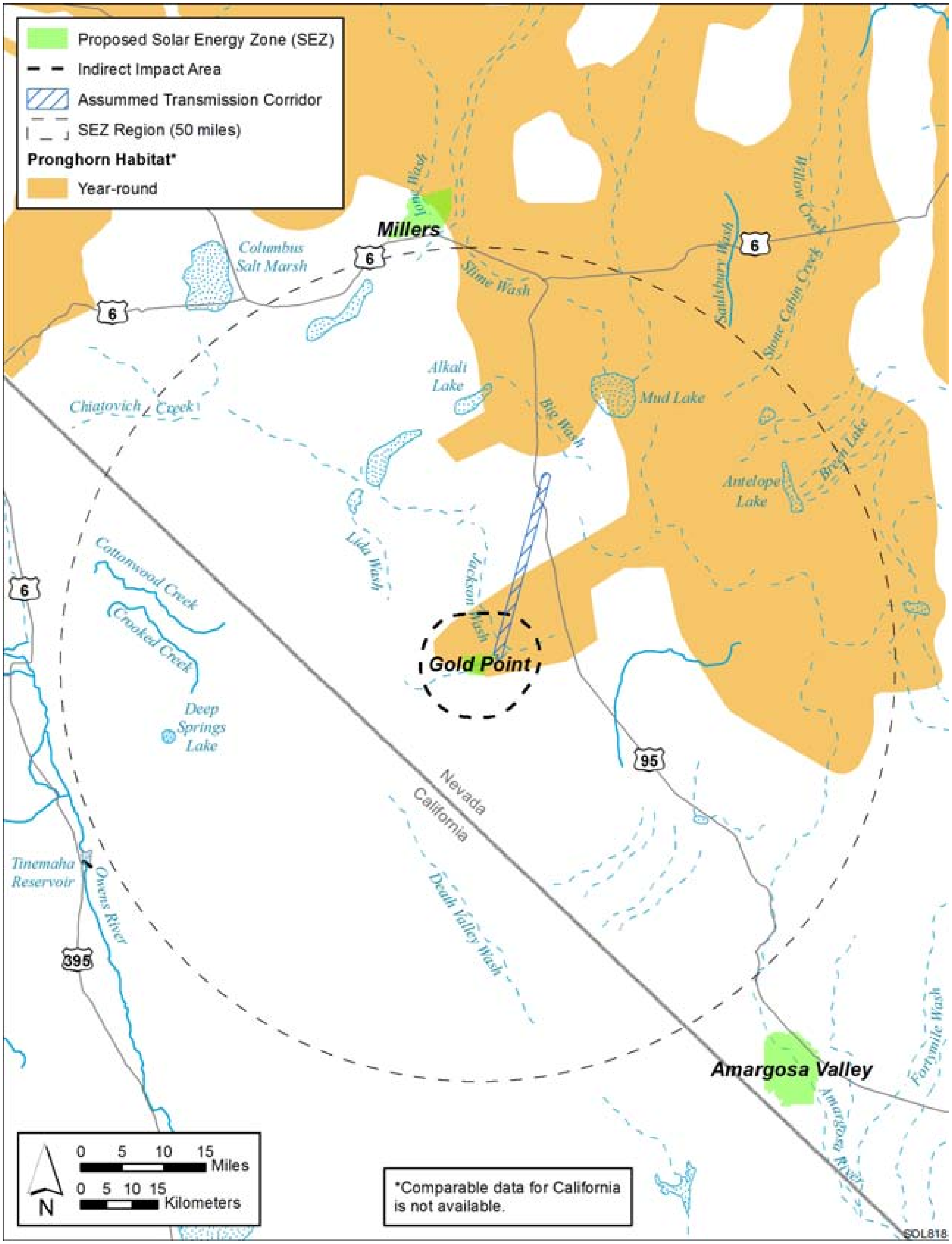

FIGURE 11.6.11.3-2 Location of the Proposed Gold Point SEZ Relative to the Mapped Range of Pronghorn (Source: NDOW 2010)

The nongame (small) mammals include bats, rodents, and shrews. Representative species for which potentially suitable habitat occurs within the proposed Gold Point SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), canyon mouse (*P. crinitis*), deer mouse (*P. maniculatus*), desert kangaroo rat (*Dipodomys deserti*), desert shrew (*Notiosorex crawfordi*), little pocket mouse (*Perognathus longimembris*), Merriam's pocket mouse (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), southern grasshopper mouse (*O. torridus*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (CDFG 2008; NDCNR 2002; USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), long-legged myotis (*M. volans*), silver-haired bat (*Lasionycteris noctivagans*), and western pipistrelle (*Parastrellus hesperus*) (CDFG 2008; NDCNR 2002; USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited or absent within the SEZ. Several other special status bat species that could occur within the SEZ area are addressed in Section 11.6.12.

Table 11.6.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Gold Point SEZ. Special status mammal species are discussed in Section 11.6.12.

11.6.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.6.11.3.3, below, identifies design features of particular relevance to mammals for the proposed Gold Point SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 11.6.11.3.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 11.6.11.3.3). Table 11.6.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed Gold Point SEZ.

Cougar

Up to 3,848 acres (15.6 km^2) of potentially suitable cougar habitat could be lost by solar energy development within the proposed Gold Point SEZ and another 648 acres (2.6 km^2) by transmission line construction. This represents about 0.09% of potentially suitable cougar habitat within the SEZ region. More than 98,000 acres (396 km^2) of potentially suitable cougar habitat occurs within the area of indirect effects. Overall, impacts on cougar from solar energy development in the SEZ would be small.

Elk

Only 2 acres (0.008 km^2) of potentially suitable elk habitat could be lost by solar energy development within the proposed Gold Point SEZ and another 216 acres (0.9 km^2) by transmission line construction. This represents about 0.02% of potentially suitable elk habitat within the SEZ region. More than 27,000 acres (109 km^2) of potentially suitable elk habitat occurs within the area of indirect effects. No mapped elk range occurs near the SEZ (NDOW 2010). Overall, impacts on elk from solar energy development in the SEZ would be small.

Mule Deer

Based on land cover analyses, up to 3,848 acres (15.6 km^2) of potentially suitable mule deer habitat could be lost by solar energy development within the proposed Gold Point SEZ and another 658 acres (2.7 km^2) by transmission line construction. This represents about 0.1% of potentially suitable mule deer habitat within the SEZ region. More than 98,000 acres (396 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effects. Based on mapped range, the closest year-round mule deer habitat is about 4.0 mi (6.4 km) from the SEZ (Figure 11.6.11.3-1). About 4,560 acres (18.5 km^2) of year-round mule deer habitat occurs within the area of indirect effects. This is about 0.6% of the year-round mule deer habitat within the SEZ region. The closest summer range, winter range, and crucial winter ranges are over 40 mi (64 km) from the SEZ (Figure 11.6.11.3-1). Thus, no direct or indirect effects on these mule deer ranges would occur. Overall, impacts on mule deer from solar energy development in the SEZ would be small.

Pronghorn

Based on land cover analyses, about 130 acres (0.5 km^2) of potentially suitable pronghorn habitat could be lost by solar energy development within the proposed Gold Point SEZ and another 256 acres (1.0 km^2) by transmission line construction. This represents about 0.03% of potentially suitable pronghorn habitat within the SEZ region. Fewer than 35,800 acres (145 km^2) of potentially suitable pronghorn habitat occurs within the area of indirect effects. Based on mapped range, year-round pronghorn habitat occurs within the SEZ (Figure 11.6.11.3-2). Over 4,430 acres (17.9 km^2) of year-round habitat occurs within the SEZ; therefore, up to 3,848 acres (15.6 km^2) could be lost by solar energy development within the SEZ and about 300 acres (1.2 km^2) could be lost by construction of the proposed transmission line. These losses would total about 0.3% of the year-round pronghorn range within the SEZ region. About 45,630 acres (185 km^2) of year-round pronghorn habitat occurs within the area of indirect effects. This is about 3.9% of the year-round pronghorn habitat within the SEZ region. Overall, impacts on pronghorn from solar energy development in the SEZ would be small.

Other Mammals

Direct impacts on small game, furbearers, and nongame (small) mammal species would be small, as about 0.01 to 0.1% of potential habitats identified for the representative species would be lost by solar energy development within the SEZ and associated transmission line construction (Table 11.6.11.3-1). Larger areas of potentially suitable habitat for these species occur within the area of potential indirect effects (i.e., ranging from 0.5% for the hoary bat to 2.5% for the desert cottontail and Botta's pocket gopher).

Summary of Impacts on Mammals

Overall, direct impacts on mammal species would be small for all species, as only 0.1% or less of potentially suitable habitats for the representative mammal species would be lost (Table 11.6.11.3-1). Larger areas of potentially suitable habitat for mammal species occur within the area of potential indirect effects (e.g., up to 2.5% for the desert cottontail and Botta's pocket gopher). Other impacts on mammals could result from collision with vehicles and facilities (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) would be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.6.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important for reducing impacts on mammals are best established when considering specific project details, design features that can be identified at this time are:

- The fencing around the solar energy development should not block the free movement of mammals, particularly big game species.

- Wash and playa habitats should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on mammals could be reduced. However, potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ; therefore, species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.6.11.4 Aquatic Biota

11.6.11.4.1 Affected Environment

The proposed Gold Point SEZ is in a desert valley where surface waters are typically limited to ephemeral and intermittent washes that contain water only for short periods during or following precipitation. No perennial streams or water bodies are present in the proposed Gold Point SEZ or within the area of direct effects associated with the proposed new transmission line corridor. Approximately 3 mi (5 km) of an unnamed intermittent stream runs through the center of the SEZ and flows into the intermittent Jackson Wash. Several ephemeral streams also cross the SEZ, flowing to the northeast and terminating in dry lakes. In addition, the presumed new transmission line (250 ft [76 m] wide) would cross the intermittent Jackson Wash. The intermittent and ephemeral streams within the area of direct effects flow primarily in response to rainfall and typically do not support wetland or riparian habitats or flow into perennial surface waters. Although not considered aquatic habitat, such nonpermanent surface waters may contain invertebrates that are either aquatic opportunists (i.e., species that occupy both temporary and permanent waters) or specialists adapted to living in temporary aquatic environments (Graham 2001). On the basis of information from ephemeral pools in the American Southwest, ostracods (seed shrimp) and small planktonic crustaceans (e.g., copepods or cladocerans) may be present, and larger branchiopod crustaceans such as fairy shrimp could occur (Graham 2001). Various types of insects that have aquatic larval stages, such as dragonflies and a variety of midges and other fly larvae, may also occur depending on the duration of standing water, the distance to permanent water features, and the abundance of other invertebrates for prey (Graham 2001). The NWI mapping does not indicate any wetlands within the Gold Point SEZ (USFWS 2009).

No perennial streams or water bodies are present within the area of indirect effects associated with the proposed Gold Point SEZ or the presumed new transmission line corridor. There are 8 mi (13 km) of the intermittent Jackson Wash and 8 mi (13 km) of an unnamed intermittent stream present within the area of indirect effects associated with the SEZ. In addition, the 1-mi (2-km) area of indirect effects associated with the proposed new transmission line corridor crosses over Jackson Wash. Washes within the area of indirect effects are typically dry and do not flow into any perennial surface waters. There are also several ephemeral streams within the area of indirect effects. Although typically dry, such ephemeral and intermittent habitat may contain opportunistic crustaceans and aquatic insect larvae. The National Wetlands Inventory mapping does not indicate any wetlands within the area of indirect effects associated with the Gold Point SEZ (USFWS 2009).

Outside of the indirect effects area, but within 50 mi (80 km) of the proposed Gold Point SEZ, are approximately 70 mi (113 km) of perennial streams and 449 mi (723 km) of intermittent streams, 44,389 acres (180 km^2) of dry lakes and 1,255 acres (5 km^2) of intermittent lakes. The nearest permanent surface water is more than 14 mi (22 km) from the SEZ. Intermittent streams are the only surface water feature in the area of direct and indirect effects, and their area represents approximately 0.7 % of the total amount of intermittent stream present in the 50-mi (80-km) SEZ region.

11.6.11.4.2 Impacts

Because surface water habitats are a unique feature in the arid landscape in the vicinity of the proposed Gold Point SEZ, the maintenance and protection of such habitats may be important to the survival of aquatic and terrestrial organisms. The types of impacts that aquatic habitats and biota could incur from the development of utility-scale solar energy facilities are described in detail in Section 5.10.3. Aquatic habitats present on or near the locations selected for construction of solar energy facilities could be affected in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality.

There are no permanent water bodies, streams, or wetlands within the area of direct or indirect effects associated with the proposed Gold Point SEZ or the presumed new transmission line corridors, and consequently there would be no direct impacts on aquatic habitat from solar energy development. There are intermittent and ephemeral streams in the area of direct and indirect effects associated with the SEZ and presumed new transmission line corridor, and ground disturbance associated with solar development could increase the transport of soil into these streams via water- and airborne pathways. However, intermittent and ephemeral streams in the area of direct and indirect effects are typically dry and are not expected to support aquatic habitat or communities, nor do they flow into perennial surface waters. It is unlikely that significant airborne dust associated with ground disturbance within the SEZ would reach aquatic habitat, given the large distance from the SEZ to the nearest stream (14 mi [22 km]). However, fugitive dust could be minimized using the appropriate dust suppression measures as needed.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater are utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). There are no surface water habitats on the proposed Gold Point SEZ that could be used to supply water needs. Water demands during normal operations would most likely be met by withdrawing groundwater from wells constructed on-site, and given the subsurface connection between regional groundwater and basins outside the SEZ (see Section 11.6.9.1.2), there is the potential that groundwater withdrawals could reduce surface water levels in streams and wetlands outside of the proposed SEZ. Additional details on the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

As described in Section 5.10.3, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning/reclamation of a solar energy facility. Construction activities occurring near intermittent streams in the Gold Point SEZ and in the proposed new transmission line corridor could introduce contaminants into intermittent streams. However, these features are not expected to contain aquatic habitat or biota and do not connect to any perennial surface waters. The introduction of contaminants could be further minimized by avoiding construction near streams.

11.6.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are identified at this time. If programmatic design features described in Appendix A, Section A.2.2, are implemented as needed and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the proposed Gold Point SEZ would be negligible.

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11.6.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Gold Point SEZ. Special status species include the following types of species[3]:

- Species listed as threatened or endangered under the ESA;

- Species that are proposed for listing, are under review, or are candidates for listing under the ESA;

- Species that are listed by the BLM as sensitive;

- Species that are listed by the State of Nevada4; and

- Species that have been ranked by the State of Nevada as S1 or S2 or species of concern by the State of Nevada or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the Gold Point SEZ center (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the NDOW NNHP (Miskow 2009; NDCNR 2004, 2009a,b), CNDDB (CDFG 2010), the SWReGAP (USGS 2004, 2005a, 2007), the CAReGAP (Davis et al. 1998; USGS 2010e), and the USFWS ECOS (USFWS 2010). Information reviewed consisted of county-level occurrences as determined from Nature Serve, element occurrences provided by the CDFG and NNHP, as well as modeled land cover types and predicted suitable habitats for the species within the 50 mi (80 km) region as determined from CAReGAP and SWReGAP. The 50-mi (80-km) SEZ region intersects Esmeralda and Nye Counties, Nevada, as well as Inyo and Mono Counties, California. However, the SEZ and affected area occurs only in Esmeralda County, Nevada. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

11.6.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the Gold Point SEZ, the area of direct effects included the SEZ and the areas within the transmission

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[3] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008b). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[4] State-listed species for the state of Nevada are those protected under NRS 501.110 (animals) or NRS **527 (plants).**

corridor where ground-disturbing activities are assumed to occur. No new access roads are expected to be needed to serve development on the SEZ because of the proximity of existing infrastructure (refer to Section 11.6.1.2 for development assumptions). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and the portion of the transmission corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ and transmission construction area, but did not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary land cover habitat type within the affected area is intermountain basin mixed desert scrub (see Section 11.6.10). Potentially unique habitats in the affected area in which special status species may reside include rocky cliffs and outcrops, desert washes, playas, and woodland habitats. There are no permanent or perennial surface water features on the SEZ or within the area of indirect effects. However, various intermittent streams (washes) and playas occur on the SEZ and throughout the area of indirect effects. In particular, Jackson Wash occurs northeast of the SEZ within the transmission corridor, and an unnamed tributary to Jackson Wash occurs on the SEZ (Figure 11.6.12.1-1).

All special status species that are known to occur within the Gold Point SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats, in Appendix J. Of these species, 21 could be affected by solar energy development on the SEZ based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 11.6.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped SWReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 m) away from the SEZ.

Based on NNHP records, there are no special status species known to occur within the affected area of the Gold Point SEZ (Table 11.6.12.1-1). There are no groundwater-dependent species in the vicinity of the SEZ based upon NNHP records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Gold Point SEZ region (Section 11.6.9).

11.6.12.1.1 Species Listed under the Endangered Species Act That Could Occur in the Affected Area

In scoping comments on the proposed Gold Point SEZ (Stout 2009), the USFWS did not express concern for impacts of project development within the SEZ on any species listed as

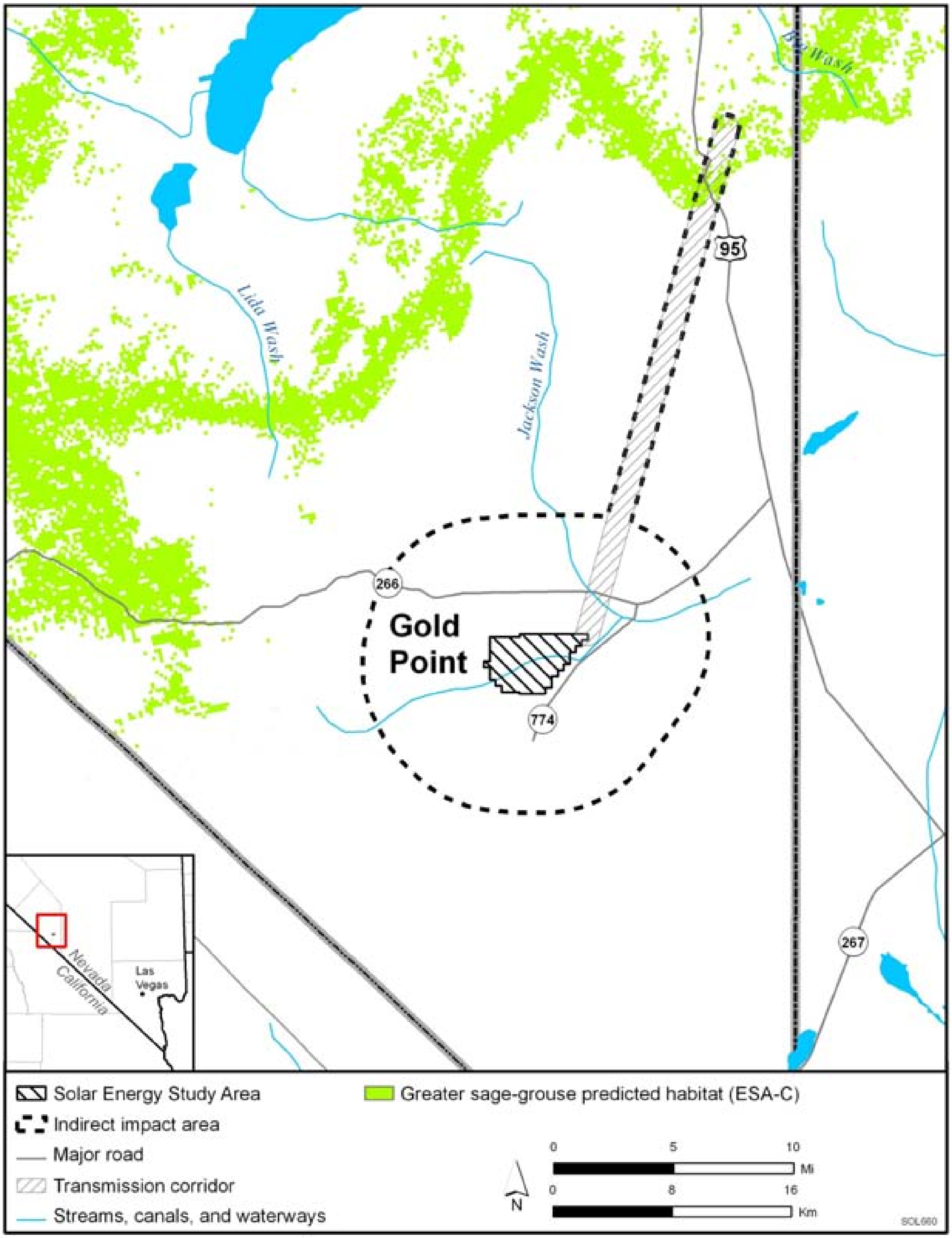

FIGURE 11.6.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA, Candidates for Listing under the ESA, or Species under Review for ESA Listing in the Affected Area of the Proposed Gold Point SEZ (Sources: Miskow 2009; USGS 2007)

TABLE 11.6.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Gold Point SEZ

				Maximum Area of Potential Habitat Affected[c]			
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants							
Bullfrog Hills sweetpea	*Lathyrus hitchcockianus*	NV-S2	Open, dry to slightly moist gravels of rocky drainage bottoms in canyons and on upper alluvial slopes, often at bases of boulders or canyon walls and climbing up through shrubs, in areas of volcanic tuff or carbonate rocks in the mixed-shrub, sagebrush, and pinyon-juniper zones. Elevation ranges between 4,000 and 7,000 ft.[i] Nearest recorded occurrence is 35 mi[j] southeast of the SEZ. About 512,600 acres[k] of potentially suitable habitat occurs in the SEZ region.	3,850 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	90,300 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance or minimization of disturbance to occupied habitats in the area of direct effects; translocation of individuals from area of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.
Clokey paintbrush	*Castilleja martinii* var. *clokeyi*	FWS-SC	Pinyon-juniper woodland at elevations between 6,500 and 9,500 ft. Nearest recorded occurrence is 15 mi east of the SEZ. About 513,700 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	80 acres of potentially suitable habitat (<0.1% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.6.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Transmission Line (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Eastwood milkweed	*Asclepias eastwoodiana*	BLM-S; FWS-SC; NV-S2	Endemic to Nevada in Esmeralda, Lander, Lincoln, and Nye Counties in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, or shale outcrops, generally barren and lacking competition. Frequently occurs in small washes or other moisture-accumulating microsites at elevations between 4,700 and 7,100 ft. Nearest recorded occurrence is 30 mi northeast of the SEZ. About 37,900 acres of potentially suitable habitat occurs in the SEZ region.	An unquantified amount of potentially suitable desert wash habitat occurs on the SEZ.[l]	An unquantified amount of potentially suitable desert wash habitat occurs in the transmission corridor.[l]	420 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	Small to large overall impact. Avoiding or minimizing disturbance to desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the Bullfrog Hills sweetpea for a list of other potential mitigation measures.
Holmgren lupine	*Lupinus holmgrenianus*	BLM-S; NV-S2	Inhabits dry desert slopes, washes, and valleys on volcanic substrates, in association with sagebrush and pinyon-juniper woodland. Elevation ranges between 4,600 and 8,200 ft. Nearest recorded occurrence is 9 mi west of the SEZ. About 119,700 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	10 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	27,300 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to sagebrush habitats in the area of direct effects could reduce impacts. See the Bullfrog Hills sweetpea for a list of other potential mitigations.

TABLE 11.6.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Panamint Mountains bedstraw	*Galium hilendiae* ssp. *carneum*	NV-S1	Rocky or gravelly substrates of rocky slopes or open flats within Mojave desert scrub and pinyon-juniper woodlands at elevations between 4,000 and 11,200 ft. Nearest recorded occurrence is 30 mi southeast of the SEZ. About 962,400 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	160 acres of potentially suitable habitat (<0.1% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Squalid milkvetch	*Astragalus serenoi* var. *sordescens*	NV-S2	Endemic to Nevada on dry, open, gravelly, or sandy soils along gentle slopes of alluvial fans or light-colored clay hills, within mixed-shrub, sagebrush, and lower pinyon-juniper communities at elevations between 5,000 and 6,800 ft. Nearest recorded occurrence is 35 mi north of the SEZ. About 2,815,250 acres of potentially suitable habitat occurs in the SEZ region.	3,850 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	90,000 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. See the Bullfrog Hills sweetpea for a list of potential mitigations.

TABLE 11.6.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Transmission Line (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Tonopah pincushion cactus	*Sclerocactus nyensis*	BLM-S; NV-P; NV-S1	Endemic to Esmeralda and Nye Counties, Nevada on dry rocky soils and low outcrops of rhyolite, tuff, and possibly other rock types, on gentle slopes in open areas or under shrubs in the upper salt desert and lower sagebrush zones. Elevation ranges between 5,700 and 5,800 ft. Known to occur in Esmeralda County, Nevada. About 2,370,300 acres of potentially suitable habitat occurs in the SEZ region.	3,850 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	88,600 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See the Bullfrog Hills sweetpea for a list of potential mitigations.
Weasel phacelia	*Phacelia mustelina*	NV-S2	Mojave desert scrub and pinyon-juniper woodlands on volcanic or gravelly substrates at elevations between 5,000 and 5,500 ft. Nearest recorded occurrence is 35 mi southeast of the SEZ. About 1,462,700 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	1,450 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.

TABLE 11.6.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds							
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident in project area in grasslands, sagebrush and saltbrush habitats, as well as the periphery of pinyon-juniper woodlands throughout the project area. Known to occur in Esmeralda County, Nevada. About 790,000 acres of potentially suitable habitat occurs in the SEZ region.	200 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	225 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	28,100 acres of potentially suitable foraging habitat (3.6% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Greater sage-grouse	*Centrocercus urophasianus*	ESA-C; BLM-S;	Year-round resident in SEZ region. Plains, foothills, and mountain valleys dominated by sagebrush. Lek sites are located in relatively open areas surrounded by sagebrush or in areas where sagebrush density is low. Nesting usually occurs on the ground where sagebrush density is higher. Some populations may travel up to 60 mi between summer and winter habitats. Known to occur in Esmeralda County, Nevada. About 312,800 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	50 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	900 acres of potentially suitable foraging habitat (0.3% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance or minimization of disturbance to occupied habitats and/or suitable leks and nesting sites in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in coordination with the USFWS and NDOW.

TABLE 11.6.12.1-1 (Cont.)

				Maximum Area of Potential Habitat Affected[c]			
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Prairie falcon	*Falco mexicanus*	BLM-S	Year-round resident in the project area, primarily in open habitats in mountainous areas, steppe, grasslands, or cultivated areas. Nests in well-sheltered ledges of rocky cliffs and outcrops. Known to occur in Esmeralda County, Nevada. About 2,387,300 acres of potentially suitable habitat occurs in the SEZ region.	4,500 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	500 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	81,350 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. No direct effects on nesting habitat. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Swainson's hawk	*Buteo swainsoni*	BLM-S; NV-P; CA-S2; NV-S2	Summer breeding resident in the SEZ region. Savanna, open pine-oak woodlands, grasslands, and cultivated lands. Nests typically in solitary trees, bushes, or small groves; sometimes nests near urban areas. Known to occur in Esmeralda County, Nevada. About 735,600 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	50 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	9,650 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	Small overall impact. No direct impact on nesting habitat. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.6.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; FWS-SC	Year-round resident in open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports throughout the SEZ region. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Known to occur in Esmeralda County, Nevada. About 3,082,700 acres of potentially suitable habitat occurs in the SEZ region.	4,625 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	650 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	97,000 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys; avoidance or minimization of disturbance to occupied burrows and habitats in the area of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Mammals							
Brazilian free-tailed bat	*Tadarida brasiliensis*	BLM-S; NV-P	Year-round resident in SEZ region. Forages in desert grassland, old fields, savanna, shrubland, and woodland habitats as well as urban areas. Roosts in old buildings, caves, mines, and hollow trees. Nearest recorded occurrence is 15 mi west of the SEZ. About 2,651,850 acres of potentially suitable habitat occurs in the SEZ region.	4,800 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	590 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	83,500 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.6.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Fringed myotis	*Myotis thysanodes*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in SEZ region. Wide range of habitats including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roost in buildings and caves. Known to occur in Esmeralda County, Nevada. About 3,051,200 acres of potentially suitable habitat occurs in the SEZ region.	4,700 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	620 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	88,200 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, but may use them as corridors for travel between mountain ranges. Known to occur in Esmeralda County, Nevada. About 941,500 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	150 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	24,100 acres of potentially suitable habitat (2.6% of available potentially	Small overall impact. Impacts could be reduced by conducting pre-disturbance surveys and avoiding occupied habitats and important movement corridors in the area of direct effects.

TABLE 11.6.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Pale kangaroo mouse	*Microdipodops pallidus*	NV-P; NV-S2	Known from southwestern Nevada and southeastern California. Inhabits fine sands in alkali sink and desert scrub dominated by shadscale or big sagebrush. Often burrows in areas of soft, windblown sand piled at the bases of shrubs. Known to occur in Esmeralda County, Nevada. About 1,251,250 acres of potentially suitable habitat occurs in the SEZ region.	4,700 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	200 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	50,500 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys; avoidance or minimization of disturbance to occupied habitats on the SEZ; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Pallid bat	*Antrozous pallidus*	BLM-S; NV-P; FWS-SC	Year-round resident in SEZ region. Low-elevation desert communities, including grasslands, shrublands, and woodlands. Roosts in caves, crevices, and mines. Nearest recorded occurrence is 15 mi west of the SEZ. About 2,616,400 acres of potentially suitable habitat occurs in the SEZ region.	4,550 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	575 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	83,175 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.6.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Silver-haired bat	*Lasionycteris noctivagans*	BLM-S; FWS-SC	Year-round resident in SEZ region. Primarily high-elevation (1,600 to 8,500 ft) forested areas comprising aspen, cottonwood, white fir, pinyon-juniper, subalpine fir, willow, and spruce communities. Roost and nursery sites occur in tree foliage, cavities, or under loose bark. Rarely hibernates in caves. Nearest recorded occurrence is 15 mi west of the SEZ. About 2,609,400 acres of potentially suitable habitat occurs in the SEZ region.	4,600 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	580 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	83,200 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Spotted bat	*Euderma maculatum*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in SEZ region. Year-round resident in SEZ region near forests and shrubland habitats throughout the SEZ region. Uses caves and rock crevices for day roosting and winter hibernation. Nearest recorded occurrence is 15 mi west of the SEZ. About 2,605,300 acres of potentially suitable habitat occurs in the SEZ region.	4,700 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	550 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	76,750 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.6.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; NV-P; NV-S2	Year-round resident in SEZ region near forests and shrubland habitats below 9,000 ft elevation throughout the SEZ region. Roosts and hibernates in caves, mines, and buildings. Nearest recorded occurrence is 8 mi west of the SEZ. About 2,347,800 acres of potentially suitable habitat occurs in the SEZ region.	4,600 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	450 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	68,550 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Western small-footed myotis	*Myotis ciliolabrum*	BLM-S; FWS-SC	Year-round resident in SEZ region in a variety of woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Nearest recorded occurrence is 9 mi south of the SEZ. About 3,374,000 acres of potentially suitable habitat occurs in the SEZ region.	4,800 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	650 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	97,950 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

[a] BLM-S = listed as a sensitive species by the BLM; ESA-C = candidate for listing under the ESA; FWS-SC = USFWS species of concern; NV-P = protected in the State of Nevada under NRS 501.110 (animals) or NRS 527 (plants); NV-S1 = ranked as S1 in the State of Nevada; NV-S2 = ranked as S2 in the State of Nevada.

[b] For plant species, potentially suitable habitat was determined by using SWReGAP land cover types. For terrestrial vertebrate species, potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

Footnotes continued on next page.

TABLE 11.6.12.1-1 (Cont.)

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of access road construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] For transmission line development, direct effects were estimated within a 22-mi (8-km), 250-ft (76-m) wide ROW from the SEZ to the nearest transmission line. Direct impacts within this area were determined from the proportion of potentially suitable habitat within the 1-mi (1.6-km) wide transmission corridor.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portion of the transmission corridor where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from projects. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[g] Overall impact magnitude categories were based on professional judgment, as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[h] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[i] To convert ft to m, multiply by 0.3048.

[j] To convert mi to km, multiply by 1.609.

[k] To convert acres to km^2, multiply by 0.004047.

[l] Although the SWReGAP did not map any wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ, in the transmission corridor, and in the area of indirect effects, including Jackson Wash and its tributaries. The area of these washes has not been quantified.

threatened or endangered under the ESA. There are no NNHP records or potentially suitable habitats for any ESA-listed species within the affected area. According to SWReGAP and USGS habitat suitability models, potentially suitable habitat for the desert tortoise, a species listed as threatened under the ESA, does not occur within the affected area of the Gold Point SEZ.

11.6.12.1.2 Species That Are Candidates for Listing under the ESA

In scoping comments on the proposed Gold Point SEZ, the USFWS did not identify any candidate species for listing under the ESA that may be directly or indirectly affected by solar energy development on the SEZ (Stout 2009). However, one candidate species, the greater sage-grouse, may occur within the affected area. This species primarily inhabits sagebrush habitats in plains, foothills, and mountain valley regions. This species is known to occur in Esmeralda County, Nevada, and potentially suitable year-round sagebrush habitat is expected to occur within the affected area (Figure 11.6.12.1-1). According to the SWReGAP habitat suitability model, suitable habitat for this species is not expected to occur on the SEZ. However, approximately 50 acres (0.2 km^2) of potentially suitable habitat for this species is estimated to occur in the assumed transmission ROW; approximately 900 acres (4 km^2) of potentially suitable habitat occurs in the area of indirect effects (Table 11.6.12.1-1). Additional basic information on life history, habitat needs, and threats to populations of the greater sage-grouse is provided in Appendix J.

11.6.12.1.3 Species That Are under Review for Listing under the ESA

On the basis of information provided by the NNHP and the USFWS (Stout 2009) and on availability of potentially suitable habitats, there are no species under review for ESA listing that may occur in the affected area of the Gold Point SEZ.

11.6.12.1.4 BLM-Designated Sensitive Species

There are 16 BLM-designated sensitive species that may occur in the affected area of the Gold Point SEZ or that may be affected by solar energy development on the SEZ (Table 11.6.12.1-1). These BLM-designated sensitive species include the following: (1) plants: Eastwood milkweed, Holmgren lupine, and Tonopah pincushion cactus; (2) birds: ferruginous hawk, greater sage-grouse, prairie falcon, Swainson's hawk, and western burrowing owl; and (3) mammals: Brazilian free-tailed bat, fringed myotis, Nelson's bighorn sheep, pallid bat, silver-haired bat, spotted bat, Townsend's big-eared bat, and western small-footed myotis. Habitats in which BLM-designated sensitive species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are presented in Table 11.6.12.1-1. The greater sage-grouse has been discussed previously because of its candidate status under the ESA (Section 11.6.12.1.2). The remaining 15 species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Eastwood Milkweed

The Eastwood milkweed is a perennial herb endemic to Nevada on public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties. It occurs in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate, or basaltic gravels, washes, or shale outcrops at elevations between 4,700 and 7,100 ft (1,430 and 2,150 m). According to the SWReGAP land cover model, potentially suitable rocky cliffs and wash habitats do not occur on the SEZ or in the transmission corridor; however, these suitable habitats may occur within the area of indirect effects (Table 11.6.12.1-1). Although the SWReGAP did not map any wash habitat on the SEZ or transmission corridor, there appear to be numerous washes that could provide habitat for this species in the area of direct effects, including Jackson Wash and its tributaries. The area of these washes has not been quantified.

Holmgren Lupine

The Holmgren lupine is a perennial herb known from southeastern California and southwestern Nevada. It inhabits dry desert slopes, washes, and valleys on volcanic substrates in sagebrush communities and pinyon-juniper woodlands. The species occurs at elevations between 4,600 and 8,200 ft (1,400 and 2,500 m). The nearest known occurrences are approximately 9 mi (14 km) west of the Gold Point SEZ. According to the SWReGAP land cover model, potentially suitable sagebrush and pinyon-juniper woodland habitats may occur within the transmission corridor and in the area of indirect effects. On the basis of an evaluation of SWReGAP land cover types, potentially suitable habitat for this species does not occur on the SEZ.

Tonopah Pincushion Cactus

The Tonopah pincushion cactus is endemic to Esmeralda and Nye Counties, Nevada. This species occurs on dry rocky soils and low outcrops on gentle slopes in open areas or under shrubs in the upper salt desert and lower sagebrush zones. This species is not known to occur in the affected area of the Gold Point SEZ; however, potentially suitable alkaline playa habitat may occur on the SEZ and within the area of indirect effects (Table 11.6.12.1-1).

Ferruginous Hawk

The ferruginous hawk occurs throughout the western United States. According to the SWReGAP habitat suitability model, only potentially suitable winter habitat for the ferruginous hawk is predicted to occur within the affected area of the Gold Point SEZ, although potentially suitable year-round habitat is expected to occur outside of the affected area within the SEZ region. The species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. This species occurs in Esmeralda County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.6.12.1-1).

Prairie Falcon

The prairie falcon occurs throughout the western United States. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat for the prairie falcon may occur within the affected area of the Gold Point SEZ. The species occurs in open habitats in mountainous areas, sagebrush-steppe, grasslands, or cultivated areas. Nests are typically constructed in well-sheltered ledges of rocky cliffs and outcrops. This species occurs in Esmeralda County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.6.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat within the area of direct effects, but approximately 350 acres (1.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Swainson's Hawk

The Swainson's hawk occurs throughout the southwestern United States. According to the SWReGAP habitat suitability model for the Swainson's hawk, only summer breeding habitat occurs in the Gold Point SEZ region. This species inhabits desert, savanna, open pine-oak woodland, grassland, and cultivated habitats. Nests are typically constructed in solitary trees, bushes, or small groves. This species occurs in Esmeralda County, Nevada. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ; however, potentially suitable foraging habitat occurs in the transmission corridor and in portions of the area of indirect effects (Table 11.6.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat within the area of direct effects, but approximately 80 acres (0.3 km^2) of pinyon-juniper woodland habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Western Burrowing Owl

According to the SWReGAP habitat suitability model for the western burrowing owl, the species is a summer breeding resident of open, dry grasslands and desert habitats in the Gold Point SEZ region. The species occurs locally in open areas with sparse vegetation, where it forages in grasslands, shrublands, open disturbed areas, and nests in burrows typically constructed by mammals. The species occurs in Esmeralda County, Nevada, and potentially suitable summer breeding habitat may occur in the SEZ, the transmission corridor, and portions of the area of indirect effects (Table 11.6.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Brazilian Free-Tailed Bat

The Brazilian free-tailed bat is known from isolated locations throughout the southwestern United States and is considered to be a year-round resident in the Gold Point SEZ region. The species roosts in buildings, caves, mines, and hollow trees. Foraging occurs in desert grasslands, old fields, savannas, shrublands, woodlands, and urban areas. This species occurs approximately 15 mi (24 km) west of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, in the transmission corridor, and in portions of the area of indirect effects (Table 11.6.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ or in the transmission corridor, but approximately 350 acres (1.5 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Fringed Myotis

The fringed myotis is a year-round resident in the Gold Point SEZ region, where it occurs in a variety of habitats including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. Roosting occurs in buildings and caves. This species occurs in Esmeralda County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, in the transmission corridor, and in portions of the area of indirect effects (Table 11.6.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ or transmission corridor, but approximately 350 acres (1.5 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is one of several subspecies of bighorn sheep that occurs in the southwestern United States. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats, and may utilize desert valleys as corridors for travel between range habitats. According to information provided by the NDOW, the Nelson's bighorn sheep occurs in Esmeralda County, Nevada and potentially suitable habitat may occur in the Silver Peak Range west of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ; however, potentially suitable habitat may occur in the transmission corridor and in portions of the area of indirect effects. Despite the apparent lack of suitable habitat on the SEZ, this species may utilize portions of the Gold Point SEZ and the transmission corridor as migratory habitat between range habitats (Table 11.6.12.1-1).

Pallid Bat

The pallid bat is a large pale bat with large ears locally common in desert grasslands and shrublands in the southwestern United States. It roosts in caves, crevices, and mines. The species is a year-round resident throughout southern Nevada. The nearest recorded occurrence is approximately 15 mi (24 km) west of the Gold Point SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, in the transmission corridor, and in portions of the area of indirect effects (Table 11.6.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ or in the transmission corridor, but approximately 350 acres (1.5 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Silver-Haired Bat

The silver-haired bat is a year-round resident in the Gold Point SEZ region, where it occurs in montane forested habitats such as aspen, pinyon-juniper, and spruce communities. Foraging may occur in desert shrubland habitats. This species roosts in tree foliage, rock outcrops, cavities, or under loose bark. The species is known to occur about 15 mi (24 km) west of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, in the transmission corridor, and in portions of the area of indirect effects (Table 11.6.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (woodlands) on the SEZ or transmission corridor, but approximately 80 acres (0.3 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

Spotted Bat

The spotted bat is a year-round resident in the Gold Point SEZ region, where it occurs in a variety of forested and shrubland habitats. It roosts in caves and rock crevices. The species is known to occur approximately 15 mi (24 km) west of the SEZ. Potentially suitable foraging habitat may occur on the SEZ, in the transmission corridor, and in portions of the area of indirect effects (Table 11.6.12.1-1). On the basis of an evaluation of SWReGAP land-cover types, there is no suitable roosting habitat within the SEZ or transmission corridor, but approximately 350 acres (1.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, the species forages year-round in a wide variety of desert and nondesert habitats in the Gold Point SEZ region. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. Nearest recorded occurrences are approximately 8 mi (13 km) west of the Gold Point SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, in the transmission corridor, and in portions of the area of indirect effects (Table 11.6.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ or transmission corridor, but approximately 350 acres (1.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects.

Western Small-Footed Myotis

The western small-footed myotis is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, this species is a year-round resident in southern Nevada, where it occupies a wide variety of desert and nondesert habitats including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, tunnels, beneath boulders or loose bark, buildings, and other man-made structures. Nearest recorded occurrences are approximately 9 mi (14 km) south of the Gold Point SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, in the transmission corridor, and in portions of the area of indirect effects (Table 11.6.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ or transmission corridor, but approximately 350 acres (1.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects.

11.6.12.1.5 State-Listed Species

There are 8 species listed by the State of Nevada that may occur in the Gold Point SEZ affected area or may be affected by solar energy development on the SEZ (Table 11.6.12.1-1). These state-listed species include the following: (1) plants: Tonopah pincushion cactus; (2) bird: Swainson's hawk; and (3) mammals: Brazilian free-tailed bat, fringed myotis, pale kangaroo mouse, pallid bat, spotted bat, and Townsend's big-eared bat. All of these species are protected in the State of Nevada under NRS 501.110 or NRS 527. Of these state-listed species, only the pale kangaroo mouse has not been previously discussed and is described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

The pale kangaroo mouse is a rodent endemic to southwestern Nevada and southeastern California. This species inhabits fine sands in alkali sink and desert scrub habitats dominated by shadscale (*Atriplex confertifolia*) or big sagebrush (*Artemisia tridentata*). The species often burrows in areas of soft windblown sand piled at the bases of shrubs. Although the pale kangaroo mouse is not known to occur in the affected area of the Gold Point SEZ, the species is known to occur in Esmeralda County, Nevada, and potentially suitable habitat may occur on the SEZ, transmission corridor, and throughout portions of the area of indirect effects (Table 11.6.12.1-1).

11.6.12.1.6 Rare Species

There are 19 rare species (i.e., state rank of S1 or S2 in the State of Nevada or a species of concern by the State of Nevada or the USFWS) that may be affected by solar energy development on the Gold Point SEZ (Table 11.6.12.1-1). Of these species, five—all plants—have not been previously discussed: Bullfrog Hills sweetpea, Clokey paintbrush, Panamint Mountains bedstraw, squalid milkvetch, and weasel phacelia. The habitats and known occurrences of these species relative to the SEZ are shown in Table 11.6.12.1-1. Additional life history information for these species is provided in Appendix J.

11.6.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Gold Point SEZ is presented in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 11.6.12.1, following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 11.6.12.3).

Solar energy development within the Gold Point SEZ could affect a variety of habitats (see Sections 11.6.9 and 11.6.10). Impacts on these habitats could in turn affect special status species that are dependent on those habitats. As discussed in Section 11.6.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species. Based on NNHP records, there are no special status species known to occur within the affected area of the Gold Point SEZ. There are no groundwater-dependent species within the affected area of the Gold Point SEZ based upon NNHP records, information provided by the USFWS (Stout 2009), and the evaluation of groundwater resources within the SEZ region (Section 11.6.9).

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 11.6.1.2, a 22-mi (35-km) long transmission corridor is assumed to be needed to serve solar facilities within this SEZ. No new access road development is assumed to be needed because of the proximity of State Route 774 adjacent to the eastern boundary of the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ and the transmission line ROW where ground-disturbing activities are expected to occur. Indirect impacts could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project development are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be relatively easy to avoid (e.g., washes and playas). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust.

11.6.12.2.1 Impacts on Species Listed under the ESA

On the basis of information provided by the NNHP and the USFWS (Stout 2009) and on availability of potentially suitable habitats, there are no species listed under the ESA that may be affected by solar energy development on the Gold Point SEZ. According to SWReGAP and USGS habitat suitability models, potentially suitable habitat for the desert tortoise, a species listed as threatened under the ESA, does not occur within the affected area of the Gold Point SEZ.

11.6.12.2.2 Impacts on Species That Are Candidates for Listing under the ESA

The greater sage-grouse is the only ESA candidate species that could occur in the affected area of the Gold Point SEZ, based upon information provided by the NNHP (NDCNR 2004) and the SWReGAP (USGS 2007). This species is known to occur in Esmeralda County, Nevada, and potentially suitable year-round sagebrush habitat is expected to occur in portions of the affected area (Figure 11.6.12.1-1). According to the SWReGAP habitat suitability model, suitable habitat for this species is not expected to occur on the SEZ. However, approximately 50 acres (0.2 km^2) of potentially suitable habitat in the assumed transmission corridor may be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat for the greater sage-grouse in the SEZ region. About 900 acres (4 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 0.3% of the available suitable habitat in the SEZ region (Table 11.6.12.1-1).

The overall impact on the greater sage-grouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features alone may not be sufficient to reduce impacts to negligible levels, because it may not be possible to avoid all potentially suitable sagebrush habitats in the area of direct effects.

Efforts to mitigate the impacts of solar energy development on the greater sage-grouse should be developed in coordination with the USFWS and the NDOW following the *Strategic*

Plan for Management of Sage Grouse (UDWR 2002) and *Guidelines to Manage Sage Grouse Populations and Their Habitats* (Connelly et al. 2000). Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats (especially active leks and suitable nesting areas) in the areas of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. Any mitigation plans should be developed in consultation with the USFWS and the NDOW.

11.6.12.2.3 Impacts on Species That Are under Review for Listing under the ESA

On the basis of information provided by the NNHP and the USFWS (Stout 2009) and on availability of potentially suitable habitats, there are no species under review for ESA listing that may be affected by solar energy facilities on the Gold Point SEZ.

11.6.12.2.4 Impacts on BLM-Designated Sensitive Species

BLM-designated sensitive species that may be affected by solar energy development on the Gold Point SEZ and are not previously discussed as ESA-listed (Section 11.6.12.2.1), candidates for ESA listing (Section 11.6.12.2.2), or under review for ESA listing (Section 11.6.12.2.3) are discussed below.

Eastwood Milkweed

According to the SWReGAP land cover model, potentially suitable habitats do not occur in the SEZ or transmission corridor; however, these suitable habitats may occur within the area of indirect effects (Table 11.6.12.1-1). Although SWReGAP did not map any wash habitat on the SEZ, there appear to be numerous washes that could provide habitat for this species on the SEZ, in the transmission corridor, and in the area of indirect effects, including Jackson Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.6.12.1-1). About 420 acres (1.5 km^2) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.6.12.1-1).

Impacts of solar energy development in the Gold Point SEZ on the Eastwood milkweed cannot be determined without quantification of the amount of potentially suitable wash habitat in the area of direct effects, but is expected to be small given the unquantified, but apparently large amount of wash habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to wash habitat in the area of direct effects could reduce direct impacts on the Eastwood milkweed. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization is not feasible, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Holmgren Lupine

The Holmgren lupine is not known to occur in the affected area of the Gold Point SEZ. According to the SWReGAP land cover model, potentially suitable sagebrush and pinyon-juniper woodland habitats do not occur on the SEZ. However, approximately 10 acres (<0.1 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 27,300 acres (110 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.8% of the potentially suitable habitat in the SEZ region (Table 11.6.12.1-1).

The overall impact on the Holmgren lupine from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to sagebrush habitat in the transmission line corridor could reduce direct impacts on the Holmgren lupine. In addition, impacts could be reduced with the implementation of the mitigation options described previously for the Eastwood milkweed. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Tonopah Pincushion Cactus

The Tonopah pincushion cactus is not known to occur in the affected area of the Gold Point SEZ; however, approximately 3,850 acres (16 km^2) of potentially suitable habitat on the SEZ and 30 acres (0.1 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents 0.2% of potentially suitable habitat in the SEZ region. About 88,600 acres (559 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.7% of the potentially suitable habitat in the SEZ region (Table 11.6.12.1-1).

The overall impact on the Tonopah pincushion cactus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Tonopah pincushion cactus is not feasible, because potentially suitable shrubland is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Eastwood milkweed. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Ferruginous Hawk

The ferruginous hawk is a winter resident in the Gold Point SEZ region and is known to occur in Esmeralda County, Nevada. According to the SWReGAP habitat suitability model, approximately 200 acres (0.8 km^2) of potentially suitable habitat on the SEZ and 225 acres (0.9 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 28,100 acres (114 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.6% of the potentially suitable habitat in the SEZ region (Table 11.6.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of direct impacts on foraging habitat (shrublands) is not feasible, because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area.

Prairie Falcon

The prairie falcon is a year-round resident in the Gold Point SEZ region, and potentially suitable foraging and nesting habitat is expected to occur in the affected area. Approximately 4,500 acres (18 km^2) of potentially suitable habitat on the SEZ and 500 acres (2 km^2) of potentially suitable habitat within the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents 0.2% of potentially suitable habitat in the SEZ region. About 81,350 acres (329 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.4% of the potentially suitable habitat in the SEZ region (Table 11.6.12.1-1). Most of this area could serve as foraging habitat (open shrublands). On the basis of SWReGAP land cover data, potentially suitable nesting habitat (cliffs and rock outcrops) does not occur on the SEZ. However, approximately 350 acres (1.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the prairie falcon from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of direct impacts on foraging habitat (shrublands) is not feasible, because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area.

Swainson's Hawk

The Swainson's hawk is a summer breeding resident within the Gold Point SEZ region and is known to occur in Esmeralda County, Nevada. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, approximately 50 acres (0.2 km^2) of potentially suitable habitat within the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 15,200 acres (62 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.6.12.1-1). On the basis of SWReGAP land cover data, potentially suitable nesting habitat (solitary trees) does not occur on the SEZ or within the transmission corridor. However, approximately 80 acres (0.3 km^2) of woodland habitat (pinyon-juniper) that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the Swainson's hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of direct impacts on foraging habitat (shrublands) is not feasible, because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area.

Western Burrowing Owl

The western burrowing owl is a summer breeding resident within the Gold Point SEZ region and is known to occur in Esmeralda County, Nevada. According to the SWReGAP habitat suitability model, approximately 4,625 acres (19 km^2) of potentially suitable habitat on the SEZ and 650 acres (3 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents about 0.2% of potentially suitable habitat in the SEZ region. About 97,000 acres (393 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.1% of the potentially suitable habitat in the SEZ region (Table 11.6.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging and nesting habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the western burrowing owl, because potentially suitable shrubland habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. Impacts on the western burrowing owl could be reduced by implementing programmatic design features, conducting pre-disturbance surveys, and avoiding or minimizing disturbance to occupied burrows and habitat on the SEZ. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Brazilian Free-Tailed Bat

The Brazilian free-tailed bat is a year-round resident within the Gold Point SEZ region and is known to occur approximately 15 mi (24 km) west of the SEZ. According to the SWReGAP habitat suitability model, approximately 4,800 acres (19 km^2) of potentially suitable habitat on the SEZ and 590 acres (2 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents 0.2% of potentially suitable habitat in the SEZ region. About 83,500 acres (338 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.1% of the available suitable habitat in the region (Table 11.6.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (rocky cliffs and outcrops) does not occur on the SEZ or transmission corridor, but about 350 acres (1.5 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the Brazilian free-tailed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Fringed Myotis

The fringed myotis is a year-round resident within the Gold Point SEZ region and is known to occur in Esmeralda County, Nevada. According to the SWReGAP habitat suitability model, approximately 4,700 acres (19 km^2) of potentially suitable habitat on the SEZ and 620 acres (2.5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents 0.2% of potentially suitable habitat in the SEZ region. About 88,200 acres (357 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.9% of the available suitable habitat in the region (Table 11.6.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (buildings and caves) does not occur on the SEZ or in the transmission corridor, but about 350 acres (1.5 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Nelson’s Bighorn Sheep

The Nelson’s bighorn sheep occurs within the affected area of the Gold Point SEZ, but suitable range habitat is not expected to occur on the SEZ. According to the SWReGAP habitat suitability model; however, approximately 150 acres (0.6 km^2) of potentially suitable habitat within the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 24,100 acres (98 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.6% of the available suitable habitat in the region (Table 11.6.12.1-1). Despite the apparent lack of suitable habitat on the SEZ, the Nelson’s bighorn sheep may utilize portions of the SEZ as a migratory corridor between range habitats.

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of the potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Direct impacts on the Nelson's bighorn sheep could be reduced to small or negligible levels by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats and important movement corridors within the area of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Pallid Bat

The pallid bat is a year-round resident within the Gold Point SEZ region and is known to occur approximately 15 mi (24 km) west of the SEZ. According to the SWReGAP habitat suitability model, approximately 4,550 acres (18 km^2) of potentially suitable habitat on the SEZ and 575 acres (2.5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents 0.2% of potentially suitable habitat in the SEZ region. About 83,175 acres (337 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.2% of the available suitable habitat in the region (Table 11.6.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (caves and crevices) does not occur on the SEZ or in the transmission corridor, but about 350 acres (1.5 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on pallid bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Silver-Haired Bat

The silver-haired bat is a year-round resident within the Gold Point SEZ region and is known to occur approximately 15 mi (25 km) west of the SEZ. According to the SWReGAP habitat suitability model, approximately 4,600 acres (19 km^2) of potentially suitable habitat on the SEZ and 580 acres (2.5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents 0.2% of potentially suitable habitat in the SEZ region. About 83,200 acres (337 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.2% of the available suitable habitat in the region (Table 11.6.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (woodlands) does not occur on the SEZ or in the transmission corridor, but about 80 acres (0.3 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the silver-haired bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Spotted Bat

The spotted bat is a year-round resident within the Gold Point SEZ region and is known to occur approximately 15 mi (24 km) west of the SEZ. According to the SWReGAP habitat suitability model, approximately 4,700 acres (19 km^2) of potentially suitable habitat on the SEZ and 550 acres (2 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents 0.2% of potentially suitable habitat in the SEZ region. About 76,750 acres (311 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.2% of the available suitable habitat in the region (Table 11.6.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (caves and crevices) does not occur on the SEZ or transmission corridor, but about 350 acres (1.5 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident within the Gold Point SEZ region and is known to occur approximately 8 mi (13 km) west of the SEZ. According to the SWReGAP habitat suitability model, approximately 4,600 acres (19 km^2) of potentially suitable habitat on the SEZ and 450 acres (2 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents 0.2% of potentially suitable habitat in the SEZ region. About 68,550 acres (277 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.9% of the available suitable habitat in the region (Table 11.6.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (caves and rocky cliffs and outcrops) does not occur on the SEZ or in the transmission corridor, but about 350 acres (1.5 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

Western Small-Footed Myotis

The western small-footed myotis is a year-round resident within the Gold Point SEZ region and is known to occur approximately 9 mi (14 km) south of the SEZ. According to the SWReGAP habitat suitability model, approximately 4,800 acres (19 km^2) of potentially suitable habitat on the SEZ and 650 acres (2.5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 97,950 acres (396 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.9% of the available suitable habitat in the region (Table 11.6.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (rocky cliffs and outcrops) does not occur on the SEZ or in the transmission corridor, but about 350 acres (1.5 km^2) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the western small-footed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region.

The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

11.6.12.2.5 Impacts on State-Listed Species

There are eight species listed by the State of Nevada that may occur in the Gold Point SEZ affected area or that may be affected by solar energy development on the SEZ (Table 11.6.12.1-1). Of these species, only the pale kangaroo mouse has not been previously discussed. Impacts on this species are discussed below.

The pale kangaroo mouse is known to occur in Esmeralda County, Nevada, although it is not known to occur in the affected area of the Gold Point SEZ. According to the SWReGAP habitat suitability model, approximately 4,700 acres (19 km^2) of potentially suitable habitat on the SEZ and 200 acres (0.8 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 11.6.12.1-1). This direct effects area represents 0.4% of potentially suitable habitat in the SEZ region. About 50,500 acres (204 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 4.0% of the available suitable habitat in the region (Table 11.6.12.1-1).

The overall impact on the pale kangaroo mouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the Gold Point SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Direct impacts on the pale kangaroo mouse could be further reduced by conducting pre-disturbance surveys and avoiding occupied habitats within the area of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

11.6.12.2.6 Impacts on Rare Species

There are 19 rare species (state rank of S1 or S2 in Nevada or a species of concern by the State of Nevada or the USFWS) that may be affected by solar energy development on the Gold Point SEZ. Five species—all plants—have not been previously discussed: Bullfrog Hills sweetpea, Clokey paintbrush, Panamint Mountains bedstraw, squalid milkvetch, and weasel phacelia. Impacts and potentially applicable mitigation measures (if necessary) for each of these species is provided in Table 11.6.12.1-1. Additional life history information is provided in Appendix J.

11.6.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when specific project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 11.6.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Avoiding or minimizing disturbance to desert wash and playa habitats within the area of direct effects could reduce or eliminate impacts on the Eastwood milkweed.

- Avoiding or minimizing disturbance to sagebrush habitat within the area of direct effects could reduce or eliminate impacts on the Holmgren lupine.

- Coordination with the USFWS and the NDOW should be conducted for the greater sage-grouse—a candidate species for listing under the ESA. Coordination would identify an appropriate survey protocol and mitigation requirements, which may include avoidance, minimization, translocation, or compensation.

- Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and the NDOW.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species could be reduced.

11.6.13 Air Quality and Climate

11.6.13.1 Affected Environment

11.6.13.1.1 Climate

The proposed Gold Point SEZ is located in the southern portion of Esmeralda County in southwestern Nevada. Nevada lies on the eastern lee side of the Sierra Nevada Range, which markedly influences the climate of the state under the prevailing westerlies (NCDC 2010a). In addition, the mountains east and north of Nevada act as barriers to the cold arctic air masses, thus making long periods of extremely cold weather uncommon. The SEZ lies at an average elevation of about 4,960 ft (1,512 m) in the southwestern portion of the Great Basin Desert, which has a high desert climate marked by pleasant weather (mild winters and warm summers) with large daily temperature swings due to dry air, scant precipitation, low relative humidity, and abundant sunshine. Meteorological data collected at the Tonopah Airport, about 45 mi (72 km) north-northeast of the Gold Point SEZ boundary, and at Goldfield, about 20 mi (32 km) north-northeast, are summarized below.

A wind rose from the Tonopah Airport, taken at a level of 33 ft (10 m), for the 5-year period 2005 to 2009 is presented in Figure 11.6.13.1-1 (NCDC 2010b). During this period, the annual average wind speed at the airport was about 9.6 mph (4.3 m/s), with the prevailing wind direction from the north (about 19.7% of the time) and secondarily from the north-northwest (about 16.4% of the time). The northerly wind component predominates, with about 46.7% of wind directions from the northwest clockwise to the north. Winds blew more frequently from the north every month throughout the year except January and April, when wind blew more frequently from the north-northwest. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 10% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds were relatively uniform by season: they were highest in spring at 11.2 mph (5.0 m/s), lower in summer and fall at 9.2 mph (4.1 m/s), and lowest in winter at 9.0 mph (4.0 m/s).

For the period 1906 to 2009, the annual average temperature at Goldfield was 51.4°F (10.8°C) (WRCC 2010e). January was the coldest month, with an average minimum temperature of 20.3°F (–6.5°C), and July was the warmest, with an average maximum of 89.6°F (32.0°C). In the summer, daytime maximum temperatures higher than 90°F (32.2°C) are common, and minimums are in the 50s. The minimum temperatures recorded were below freezing (≤32°F [0°C]) throughout the year except July and August (with a peak of about 29 days in January and December), and subzero temperatures were recorded about 1.5 days per year during winter months. During the same period, the highest temperature, 108°F (42.2°C), was reached in July 1906 and the lowest, –23°F (−30.6°C), in January 1937. In a typical year, about 36 days had a maximum temperature of at least 90°F (32.2°C), while about 146 days had minimum temperatures at or below freezing.

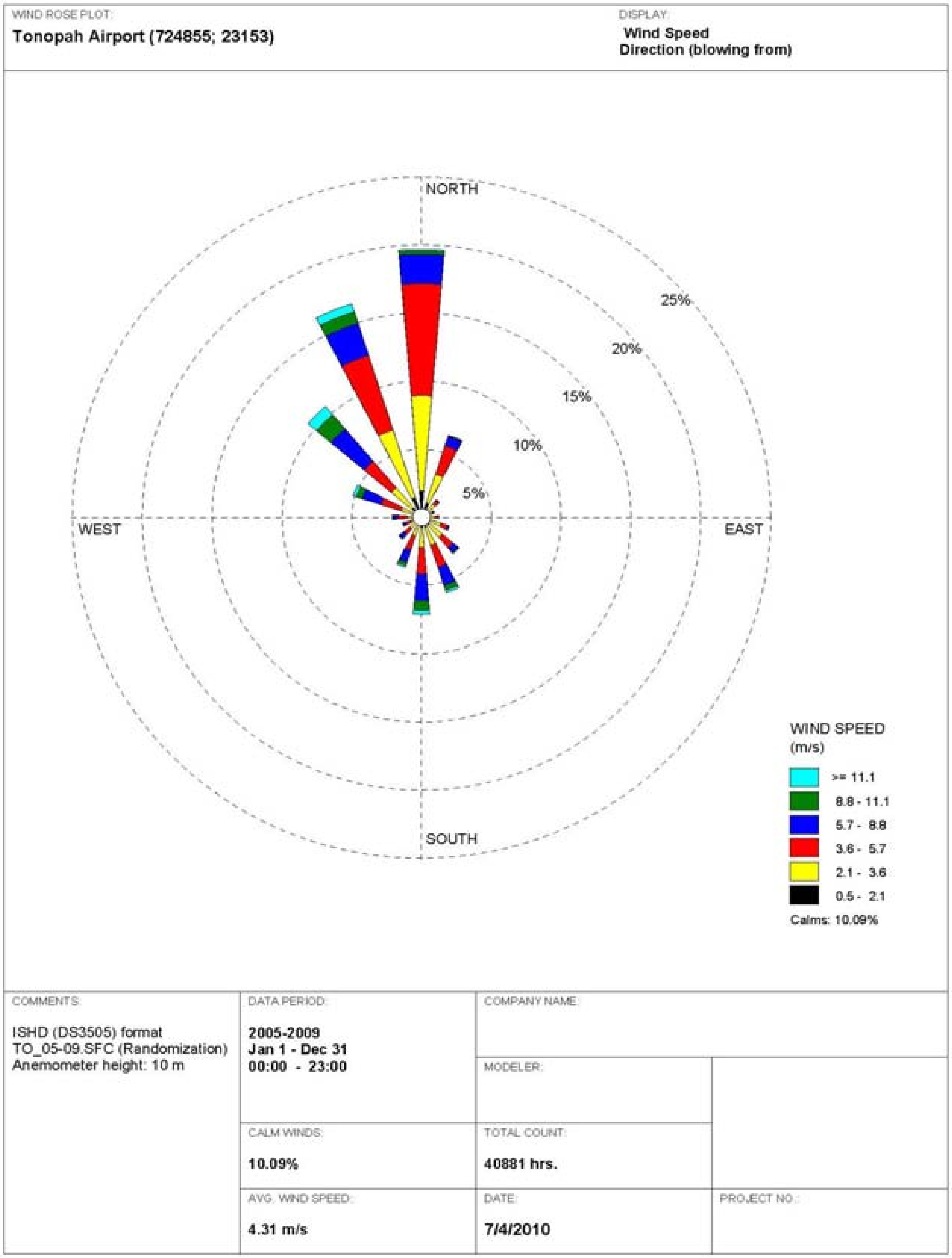

FIGURE 11.6.13.1-1 Wind Rose at 33 ft (10 m) at Tonopah Airport, Nevada, 2005 to 2009 (Source: NCDC 2010b)

Along with prevailing westerlies, Pacific air masses lose most of their moisture on the windward side of the Sierra Nevada Range parallel to Nevada's western boundary with California. Thus, leeward areas such as the region around Gold Point SEZ experience a lack of precipitation (NCDC 2010a). For 1906 to 2009, annual precipitation at Goldfield averaged about 6.06 in. (15.4 cm) (WRCC 2010e). On average, 29 days annually have measurable precipitation (0.01 in. [0.025 cm] or higher). Precipitation is relatively evenly distributed by season, although it is slightly higher in winter and spring than in summer and fall. Snow falls as early as October and continues as late as May; most of the snow falls from December to March. The annual average snowfall at Goldfield is about 17.8 in. (45.2 cm).

The proposed Gold Point SEZ is far from major water bodies (more than 240 mi [386 km] to the Pacific Ocean). Severe weather events, such as severe thunderstorms and tornadoes, are rare in Esmeralda County, which encompasses the Gold Point SEZ (NCDC 2010c).

In Nevada, flooding could occur from melting of heavy snowpack. On occasion, heavy summer thunderstorms also cause flooding of local streams, usually in sparsely populated mountainous areas, but they are seldom destructive (NCDC 2010a). Since 1997, four flash floods have been reported in Esmeralda County, two of which occurred about 10 mi (16 km) from the SEZ and one of which caused minor property damage.

In Esmeralda County, no hail storms have been reported (NCDC 2010c). Forty-two high wind events have been reported since 1999. Events with a maximum wind speed of up to 127 mph (57 m/s) can occur any month of the year, with peaks in March and June; they have caused no deaths or injuries but some property damage (NCDC 2010c). In addition, one thunderstorm wind event with a maximum wind speed of 52 mph (23 m/s) was reported in 2010, which caused minor property damage.

No dust storms have been reported in Esmeralda County (NCDC 2010c). However, the ground surface of the SEZ is covered primarily with sandy loams, gravelly sandy loams, and gravelly loams, which have a relatively moderate dust storm potential. High winds can trigger large amounts of blowing dust in areas of Esmeralda County that have dry and loose soils with sparse vegetation. Dust storms can deteriorate air quality and visibility and may have adverse effects on health, particularly for people with asthma or other respiratory problems.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes never hit Nevada, but one tropical depression has passed within 100 mi (160 km) of the proposed Gold Point SEZ (CSC 2010). Historically, only one tornado was reported in 1982 in Esmeralda County (NCDC 2010c). However, the tornado occurred far from the SEZ, was relatively weak (i.e., F0 on the Fujita tornado scale), and did not cause deaths, injuries, or property damage.

11.6.13.1.2 Existing Air Emissions

Esmeralda County has a few industrial emission sources related to minerals and mining, but their emissions are relatively small. All industrial sources are located far from the proposed Gold Point SEZ. Because of the sparse population, only a handful of major roads, such as U.S. 6, U.S. 95, and several State Routes (264, 265, 266, 773, and 774) are present in Esmeralda County. Thus, onroad mobile source emissions are not substantial. Data on annual emissions of criteria pollutants and volatile organic compounds (VOCs) in Esmeralda County are presented in Table 11.6.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, point sources were major contributors to total emissions of SO_2 (about 78%). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions primarily contributed to NO_x and CO emissions (about 62% and 64%, respectively) and accounted for most of the VOC emissions (about 99%). Area sources were major contributors to total emissions of PM_{10} (about 96%) and $PM_{2.5}$ (about 91%), and secondary contributors to SO_2 emissions (about 20%). Onroad sources were secondary contributors to NO_x and CO emissions (about 30% and 35%, respectively). In Esmeralda County, nonroad sources were minor contributors to criteria pollutants and VOCs. (Fire emissions were not estimated in Esmeralda County in 2002.)

TABLE 11.6.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Esmeralda County, Nevada, Encompassing the Proposed Gold Point SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)[c]
SO_2	106
NO_x	1,116
CO	13,832
VOCs	59,144
PM_{10}	937
$PM_{2.5}$	202

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

[c] To convert tons to kilograms, multiply by 907.

Source: WRAP (2009).

In 2005, Nevada produced about 56.3 MMt of *gross*[5] carbon dioxide equivalent (CO_2e)[6] emissions, which is about 0.8% of total U.S. GHG emissions in that year (NDEP 2008). Gross GHG emissions in Nevada increased by about 65% from 1990 to 2005 because of Nevada's rapid population growth, compared to 16.3% growth in U.S. GHG emissions during the same period. In 2005, electrical generation (48%) and transportation (30%) were the primary contributors to gross GHG emission sources in Nevada. Fuel use in the residential, commercial, and industrial sectors combined accounted for about 12% of total state emissions. Nevada's *net* emissions were about 51.3 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated

5 Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

6 A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

2005 emissions in Nevada. Its estimate of CO_2 emissions from fossil fuel combustion was 49.6 MMt, which was comparable to the state's estimate. Electric power generation and transportation accounted for about 52.7% and 33.6% of the CO_2 emissions total, respectively, while the residential, commercial, and industrial sectors accounted for the remainder (about 13.7%).

11.6.13.1.3 Air Quality

The EPA set NAAQS for six criteria pollutants (EPA 2010a): SO_2, NO_2, CO, O_3, PM (PM_{10} and $PM_{2.5}$), and Pb. Nevada has its own SAAQS, which are generally similar to the NAAQS but with some differences (NAC 445B.22097). In addition, Nevada has set standards for 1-hour H_2S, which are not addressed by the NAAQS. The NAAQS and Nevada SAAQS for criteria pollutants are presented in Table 11.6.13.1-2.

Esmeralda County is located administratively in the Nevada Intrastate AQCR, along with 10 other counties in Nevada. Not included are Las Vegas Intrastate AQCR, including Clark County only, which encompasses Las Vegas; and Northwest Nevada Intrastate AQCR, including five northwest counties, which encompasses Reno. Currently, the area surrounding the proposed SEZ is designated as being in unclassifiable/attainment of NAAQS for all criteria pollutants (Title 40, Part 81, Section 329 of the *Code of Federal Regulations* [40 CFR 81.329]).

Because of Esmeralda County's low population density, it has no significant emission sources of its own and only minor mobile emissions along major highways. Accordingly, ambient air quality in Esmeralda County is relatively good. No ambient air-monitoring stations are located in Esmeralda County. To characterize ambient air quality around the SEZ, one monitoring station in Clark County was chosen as being representative of a rural environment: Jean, about 156 mi (251 km) southeast of the SEZ. The Jean station is located upwind of the Las Vegas area but to some extent its air quality is influenced by transport of air pollutants from the South Coast Air Basin, which includes Los Angeles, along with prevailing westerlies and nearby highway traffic on I-15 (about 1.6 mi [2.6 km] away). Ambient concentrations of NO_2, O_3, PM_{10}, and $PM_{2.5}$ are recorded at Jean. The East Sahara Avenue station, which is on the outskirts of Las Vegas, has only one SO_2 monitor in the area. The CO concentrations at the East Tonopah Avenue station in Las Vegas, which is the farthest downwind of Las Vegas among CO monitoring stations, were presented. No Pb measurements have been made in the State of Nevada because of low Pb concentration levels after the phase-out of leaded gasoline. The background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 11.6.13.1-2 (EPA 2010b). Monitored concentration levels at either station were lower than their respective standards (up to 44%), except O_3, which approaches the 1-hour NAAQS/SAAQS and exceeds the 8-hour NAAQS. Except for PM_{10} and $PM_{2.5}$, ambient concentrations around the SEZ are anticipated to be lower than those presented in the table, which are mostly associated with industrial activities and road traffic in and around urban areas, However, PM_{10} and $PM_{2.5}$ might be either higher or lower, as their concentrations in arid non-urbanized areas may be influenced by windblown dust or agricultural activities.

The PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major

TABLE 11.6.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed Gold Point SEZ in Esmeralda County, Nevada, 2004 to 2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	SAAQS	Concentration[b,c]	Measurement Location, Year[d]
SO_2	1-hour	75 ppb[e]	NA[f]	NA	NA
	3-hour	0.5 ppm	0.5 ppm	0.009 ppm (1.8%)	Las Vegas, 2005
	24-hour	0.14 ppm	0.14 ppm	0.008 ppm (5.7%)	Las Vegas, 2005
	Annual	0.030 ppm	0.030 ppm	0.006 ppm (20%)	Las Vegas, 2005
NO_2	1-hour	100 ppb[g]	NA	NA	NA
	Annual	0.053 ppm	0.053 ppm	0.004 ppm (7.5%)	Jean, 2007
CO	1-hour	35 ppm	35 ppm	5.7 ppm (16%)	Las Vegas, 2004
	8-hour	9 ppm	9 ppm	3.9 ppm (43%)	Las Vegas, 2005
O_3	1-hour	0.12 ppm[h]	0.12 ppm	0.098 ppm (82%)	Jean, 2005
	8-hour	0.075 ppm	NA	0.083 ppm (111%)	Jean, 2007
PM_{10}	24-hour	150 μg/m^3	150 μg/m^3	66 μg/m^3 (44%)	Jean, 2008
	Annual	NA	50 μg/m^3	17 μg/m^3 (34%)	Jean, 2005
$PM_{2.5}$	24-hour	35 μg/m^3	NA	12.9 μg/m^3 (37%)	Jean, 2008
	Annual	15.0 μg/m^3	NA	4.9 μg/m^3 (33%)	Jean, 2008
Pb	Calendar quarter	1.5 μg/m^3	1.5 μg/m^3	NA	NA
	Rolling 3-month	0.15 μg/m^3 [i]	NA	NA	NA

[a] Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

[b] Monitored concentrations are the second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5}$ and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

[c] Values in parentheses are background concentration levels as a percentage of NAAQS or SAAQS, respectively. Calculation of 1-hour SO_2 and NO_2 to NAAQS was not made, because no measurement data based on new NAAQS are available.

[d] All air monitoring stations listed are located in Clark County.

[e] Effective August 23, 2010.

[f] NA = not applicable or not available.

[g] Effective April 12, 2010.

[h] The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

[i] Effective January 12, 2009.

Sources: EPA (2010a,b); NAC 445B.22097.

source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. Several Class I areas are located around the Gold Point SEZ, two of which are situated within 62 mi (100 km): John Muir WA and Kings Canyon NP in California (40 CFR 81.405), about 58 mi (93 km) west and about 61 mi (98 km) west-southwest, respectively, of the proposed Gold Point SEZ. These Class I areas are not located downwind of prevailing winds at the Gold Point SEZ (Figure 11.6.13.1-1). The next nearest Class I areas in California include Sequoia NP, Ansel Adams WA, and Kaiser WA, which are about 71 mi (115 km) southwest, 84 mi (135 km) west-northwest, and 93 mi (150 km) west of the Gold Point SEZ, respectively.

11.6.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low levels of emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using HTFs, fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, use of solar facilities to generate electricity could displace air emissions that would otherwise be released from fossil fuel power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Gold Point SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.6.13.3, below, identifies SEZ-specific design features of particular relevance to the Gold Point SEZ.

11.6.13.2.1 Construction

The Gold Point SEZ site has a relatively flat terrain; thus, only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed by using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Appendix M, Section M.13. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with PSD increment levels at nearby Class I areas.[7] However, no receptors were modeled for PSD analysis at the nearest Class I area, John Muir WA in California, because this area is about 58 mi (93 km) from the SEZ, which is more than the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the John Muir WA in California were selected as surrogates for the PSD analysis. For the Gold Point SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions of 3,000 acres (12.1 km^2) in the southern portion of the SEZ, close to the nearest residences near Gold Point,

- Surface hourly meteorological data from the Tonopah Airport[8] and upper air sounding data from the Mercury/Desert Rock Airport for the 2005 to 2009 period, and

- A regularly spaced receptor grid over a modeling domain of 62 × 62 mi (100 km × 100 km) centered on the proposed SEZ, and additional discrete receptors at the SEZ boundaries.

Results

The modeling results for concentration increments and total concentrations (modeled plus background concentrations) for both PM_{10} and $PM_{2.5}$ that would result from construction-related fugitive emissions are summarized in Table 11.6.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 465 $\mu g/m^3$, which far exceeds the relevant standard level of 150 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 531 $\mu g/m^3$ would also exceed the standard level at the SEZ boundary. However, high PM_{10}

7 To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/SAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

8 The number of missing hours at the Tonopah Airport amounts to about 17.6% of the total hours, which may not be acceptable for regulatory applications because that percentage exceeds the 10% limit defined by the EPA. However, because the wind patterns at Tonopah Airport are more representative of wind at the Gold Point SEZ than the wind patterns at other airports (which have more complete data but are located in different topographic features), the former values were used for the screening analysis.

TABLE 11.6.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Gold Point SEZ

			Concentration ($\mu g/m^3$)				Percentage of NAAQS/SAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ SAAQS	Increment	Total
PM_{10}	24 hours	H6H	465	66.0	531	150	310	354
	Annual	–[d]	68.3	17.0	85.3	50	137	171
$PM_{2.5}$	24 hours	H8H	27.8	12.9	40.7	35	79	116
	Annual	–	6.8	4.9	11.8	15.0	46	78

[a] $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

[b] Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

[c] See Table 11.6.13.1-2.

[d] A dash indicates not applicable.

concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 15 $\mu g/m^3$ at Gold Point (closest town, about 2 mi [3 km] south of the SEZ), about 3 $\mu g/m^3$ at Lida, and about 2 $\mu g/m^3$ or less at Goldfield and Silver Peak. Annual average modeled concentration increments and total concentrations (increment plus background) for PM_{10} at the SEZ boundary would be about 68.3 $\mu g/m^3$ and 85.3 $\mu g/m^3$, respectively, both of which are higher than the SAAQS level of 50 $\mu g/m^3$. Annual PM_{10} increments would be much lower, about 2.5 $\mu g/m^3$ at Gold Point, about 0.1 $\mu g/m^3$ at Lida, and less than 0.1 $\mu g/m^3$ at Goldfield and Silver Peak. Total 24-hour $PM_{2.5}$ concentrations would be 40.7 $\mu g/m^3$ at the SEZ boundary, which is higher than the NAAQS level of 35 $\mu g/m^3$; modeled increments contribute about two times the amount of background concentration to this total. The total annual average $PM_{2.5}$ concentration would be 11.8 $\mu g/m^3$, which is lower than the NAAQS level of 15.0 $\mu g/m^3$. At Gold Point, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 1.0 and 0.3 $\mu g/m^3$, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—John Muir WA, California—would be about 4.1 $\mu g/m^3$ and 0.06 $\mu g/m^3$, or 51% and 1.5% of the PSD increments for the Class I area, respectively. These surrogate receptors are more than 28 mi (46 km) from the John Muir WA, and thus, predicted concentrations in John Muir WA would be lower than the above values (about 27% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Annual $PM_{2.5}$ concentration levels are predicted to be lower than the standard level. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area (John Muir WA in California). Construction activities are not subject to the PSD program, and the comparison provides only a screen for gauging the magnitude of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Emissions from the engine exhaust from heavy construction equipment and vehicles have the potential to cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearby federal Class I areas. However, SO_x emissions from engine exhaust would be very low, because programmatic design features would require ultra-low-sulfur fuel with a sulfur content of 15 ppm. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

Transmission lines within a designated ROW would be constructed to connect to the nearest regional grid. A regional 120-kV transmission line is located about 22 mi (35 km) from the proposed Gold Point SEZ; thus, construction of a transmission line over this relatively long distance would likely be needed. Construction activities would result in fugitive dust emissions from soil disturbance and engine exhaust emissions from heavy equipment and vehicles. Construction time for the transmission line could be about 2 years. However, the site of construction along the transmission line ROW would move continuously, so no particular area would be exposed to air emissions for a prolonged period. Therefore, potential air quality impacts on nearby residences along the transmission line ROW, if any, would be minor and temporary in nature.

11.6.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power-tower technology, if wet cooling was implemented (drift constitutes low-level PM emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Section M.13.4 of Appendix M.

Estimates of potential air emissions displaced by solar project development at the Gold Point SEZ are presented in Table 11.6.13.2-2. Total power generation capacity ranging from 428 to 770 MW is estimated for the Gold Point SEZ for various solar technologies

TABLE 11.6.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Gold Point SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
4,810	428–770	749–1,348	1,057–1,902	906–1,632	0.006–0.011	582–1,047
Percentage of total emissions from electric power systems in Nevada[d]			2.0–3.6%	2.0–3.6%	2.0–3.6%	2.0–3.6%
Percentage of total emissions from all source categories in Nevada[e]			1.6–2.9%	0.60–1.1%	–[f]	1.1–1.9%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.42–0.76%	0.25–0.44%	0.21–0.37%	0.22–0.40%
Percentage of total emissions from all source categories in the six-state study area[e]			0.22–0.40%	0.03–0.06%	–	0.07–0.13%

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

[b] A capacity factor of 20% was assumed.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.82, 2.42, 1.6×10^{-5}, and 1,553 lb/MWh, respectively, were used for the State of Nevada.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] A dash indicates not estimated.

Sources: EPA (2009a,c); WRAP (2009).

(see Section 11.6.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). It is estimated that if the Gold Point SEZ eventually had development on 80% of its land, emissions avoided could range from 2.0 to 3.6% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the State of Nevada (EPA 2009c). Avoided emissions could be up to 0.76% of total emissions from electric power systems in the six-state study area. When compared to all source categories, power production from the same solar facilities could displace up to 2.9% of SO_2, 1.1% of NO_x, and 1.9% of CO_2 emissions in the State of Nevada (EPA 2009a; WRAP 2009). These emissions could be up to 0.40% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for about 93% of the total electric power generated in Nevada (EPA 2009c). The contribution of natural gas combustion is about 47%, followed by that of coal combustion at about 45%. Thus, solar facilities built in the Gold Point SEZ could displace relatively more fossil fuel emissions than those built in other states that rely less on fossil fuel–generated power.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for high-voltage lines during rain or very humid conditions. Since the proposed Gold Point SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

11.6.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but occur on a more limited scale and are of shorter duration. Potential impacts on ambient air quality would be correspondingly smaller than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.6).

11.6.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Gold Point SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

11.6.14 Visual Resources

11.6.14.1 Affected Environment

The proposed Gold Point SEZ is located in Esmeralda County in southwestern Nevada. The SEZ occupies 4,810 acres (19.47 km^2) within Lida Valley. It extends about 2.5 mi (4.0 km) north–south and is about 4.0 mi (6.4 km) wide. The SEZ ranges in elevation from 4,840 ft (1,475 m) in the northeastern portion to 5,050 ft (1,539 m) in the northwestern portion.

The SEZ is within the Central Basin and Range Level III ecoregion, which consists of northerly trending fault-block ranges and intervening drier basins. Valleys, lower slopes, and alluvial fans are either shrub- and grass-covered or shrub-covered. Higher elevation mountain slopes support woodland, mountain brush, and scattered forests. The land is used primarily for grazing, with some irrigated cropland in valleys near mountain water sources. Gold Point SEZ is located within the Tonopah Basin Level IV ecoregion, which is a transition between the Great Basin and the more southerly Mojave Desert. It is typified by broad, nearly flat to rolling valleys containing lake plains, scattered hills, alluvial fans, bajadas, sand dunes, and hot springs. Ephemeral washes occur. Surface water comes from springs and sporadic foothill precipitation events, but is generally scarce (Bryce et al. 2003).

The SEZ occupies a narrow northeast-to-southwest trending valley surrounded by mountains. Although scenic quality within the SEZ itself is low, the nearby mountains add substantially to the overall visual qualities within the SEZ viewshed. Magruder Mountain (elevation 9,044 ft [2,756 m]), located west of the SEZ, is sacred to the Timbisha Shoshone. Mt. Jackson at 6,411 ft (1,954 m) is north of the SEZ. The mountain slopes and peaks surrounding the SEZ generally are visually pristine. The SEZ and surrounding mountain ranges are shown in Figure 11.6.14.1-1.

The SEZ is flat to slightly sloping, with the strong horizon line and surrounding mountain ranges being the dominant visual features. There is very little topographic relief, with playas occurring in the northeast portion of the SEZ, and washes that slope downward slightly from southwest to northeast. The surrounding mountains are generally a muted brown, with white and dark accents in some areas; more distant mountains appear blue to purple. In contrast, pink, tan, and gray gravels dominate the desert floor, which is sparsely dotted with the subtle greens, browns, and grays of vegetation. No permanent surface water is present within the SEZ.

Vegetation is generally sparse in much of the SEZ, with widely spaced shrubs growing on more or less barren gravel flats. Vegetation within the SEZ is predominantly scrubland, with shadscale, greasewood, and winterfat dominating the desert floor. Small Joshua trees add short vertical accents and color contrasts that add visual interest to portions of the SEZ. During an August 2009 site visit, the vegetation presented a range of muted greens, grays, and browns, with medium to coarse textures. Visual interest is generally low.

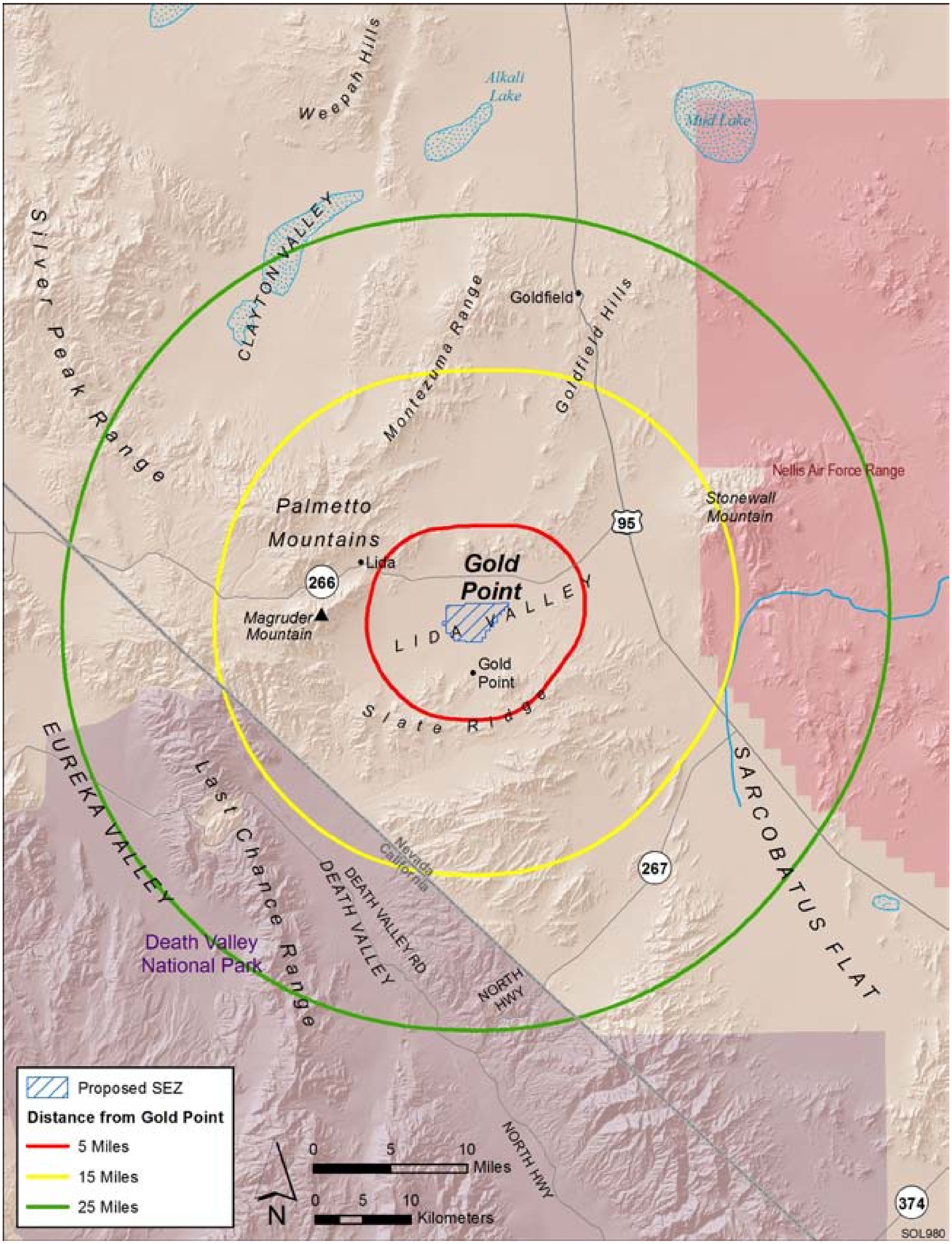

FIGURE 11.6.14.1-1 Proposed Gold Point SEZ and Surrounding Lands

Other than roads, transmission lines, and the very small community of Gold Point visible south of the SEZ, the area is relatively free of cultural modifications that would detract from the scenic qualities of the landscape. Upslope roads provide a noticeable line contrast in the landscape.

The general lack of topographic relief, water, and physical variety results in low scenic value within the SEZ itself; however, because of the flatness of the landscape, the lack of trees, and the breadth of the open desert, the SEZ presents a vast panoramic landscape with sweeping views of the surrounding mountains that add significantly to the scenic values within the SEZ viewshed. In general, the mountains appear to be devoid of vegetation, and their varied and irregular forms and muted brown colors provide visual contrasts to the strong horizontal line, particularly when viewed from nearby locations within the SEZ. Panoramic views of the SEZ are shown in Figures 11.6.14.1-2, 11.6.14.1-3, and 11.6.14.1-4.

The BLM conducted a visual resource inventory (VRI) for the SEZ and surrounding lands in 2010; however, the VRI was not completed in time for the new data to be included in the draft PEIS. The new VRI data will be incorporated into the analyses presented in the final PEIS. The VRI evaluates BLM-administered lands on the basis of scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or KOPs. Based on these three factors, BLM-administered lands are placed into one of four VRI Classes, which represent the relative value of the visual resources. Class I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is presented in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The Tonopah Resource Management Plan (BLM 1997) indicates that the SEZ and surrounding area is managed as VRM Class IV, which permits major modification of the existing character of the landscape. More information about the BLM VRM program is presented in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

11.6.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Gold Point SEZ and surrounding lands, as well as the impacts of related projects (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project and a relatively complete and accurate description of its major components and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential

FIGURE 11.6.14.1-2 Approximately 120° Panoramic View of the Proposed Gold Point SEZ from Northwest Corner of the SEZ Facing Southeast, with Mount Dunfee and Slate Ridge in Background

FIGURE 11.6.14.1-3 Approximately 180° Panoramic View of the Proposed Gold Point SEZ from Southwestern Portion of SEZ Facing Northeast, with Magruder Mountain at Left, Mt. Jackson and Mt. Jackson Ridge at Right

FIGURE 11.6.14.1-4 Approximately 120° Panoramic View of the Proposed Gold Point SEZ from Southeastern Edge of SEZ Facing West-Southwest, with Slate Ridge at Left, Last Chance Mountains at Far Background Center, and Magruder Mountain at Right

visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment used in this PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of the PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

11.6.14.2.1 Impacts on the Proposed Gold Point SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of their construction, operation, and decommissioning. In addition, large impacts could occur at solar facilities incorporating highly reflective surfaces or major light-emitting components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby. Additional, and potentially large impacts could occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed. For discussion of cumulative impacts, see Section 11.6.22.4.13 of this PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as seen from nearby KOPs. As noted above, the lands that include the SEZ are currently managed as VRM Class IV. More information about impact determination using the BLM VRM program is presented in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

11.6.14.2.2 Impacts on Lands Surrounding the Proposed Gold Point SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ would have views of solar facilities in at least some portion of the SEZ (see Appendix M for information on the assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project components associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are presented in Appendix N.

Figure 11.6.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas

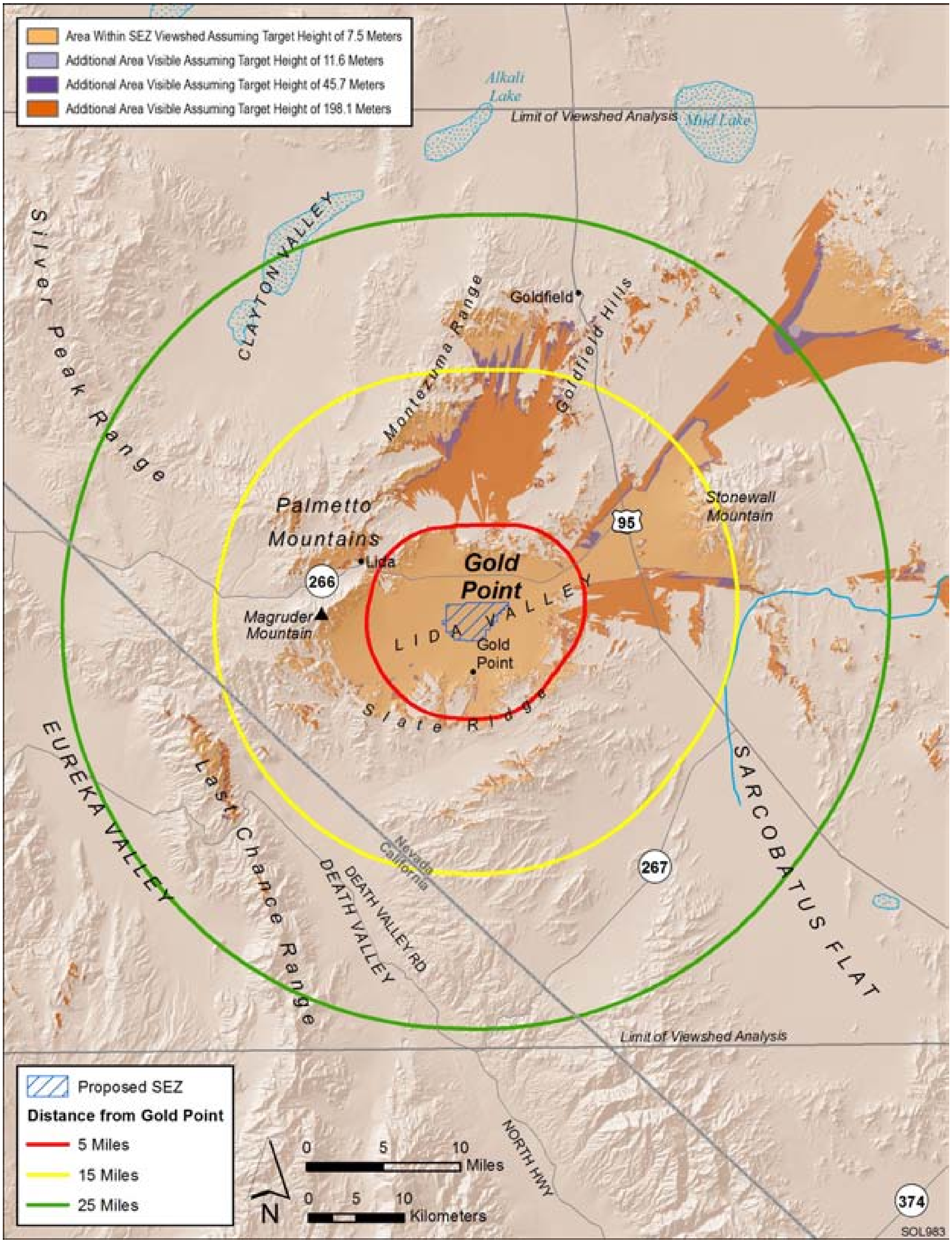

FIGURE 11.6.14.2-1 Viewshed Analyses for the Proposed Gold Point SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in the figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in this PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]) and for transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 11.6.14.2-2 shows the results of a GIS analysis that overlays selected federal, state, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds to illustrate which of these sensitive visual resource areas would have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone also are shown to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analyses were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;
- Congressionally authorized Wilderness Areas;
- Wilderness Study Areas;
- National Wild and Scenic Rivers;
- Congressionally authorized Wild and Scenic Study Rivers;

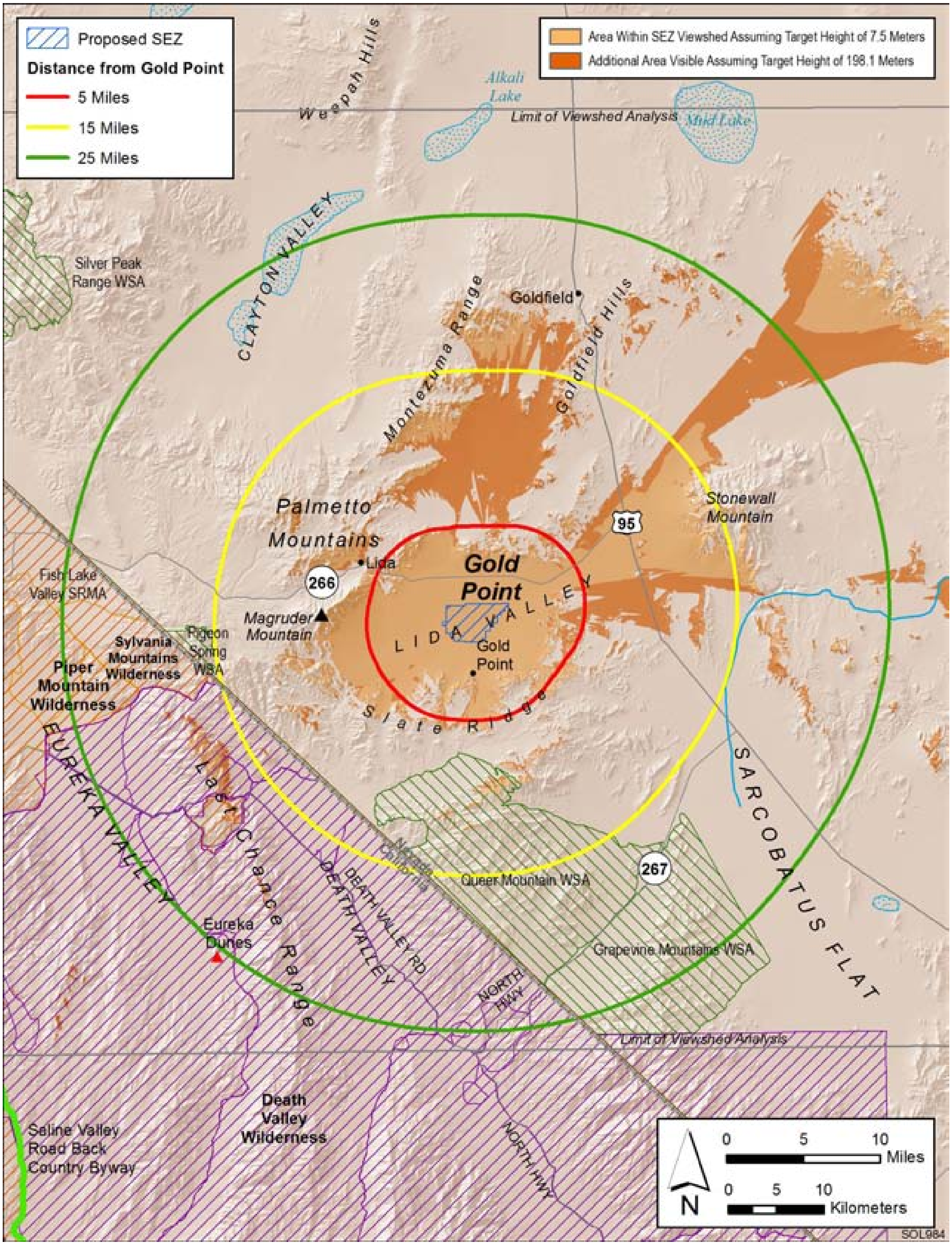

FIGURE 11.6.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Gold Point SEZ

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

- All-American Roads, National Scenic Byways, State Scenic Highways; and BLM- and USFS-designated scenic highways/byways;

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Gold Point SEZ are discussed below. The results of this analysis are also summarized in Table 11.6.14.2-1. Further discussion of impacts on these areas is presented in Sections 11.6.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and Section 11.6.17 (Cultural Resources) of this PEIS.

TABLE 11.6.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40-km) Viewshed of the Proposed Gold Point SEZ, Assuming a Target Height of 650 ft (198.1 m)

		Feature Area[b]		
			Visible between	
Feature Type	Feature Name (Total Acreage)[a]	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Park	Death Valley (3,397,062 acres)	0 acres	67 acres (0.002%)	3,747 acres (0.1%)
National Conservation Area	California Desert (25,919,319 acres)	0 acres	67 acres (0.0003%)	4,198 acres (0.02%)
Was	Death Valley (3,074,256 acres)	0 acres	67 acres (0.002%)	3,707 acres (0.1%)
WSAs	Pigeon Spring (3,651 acres)	0 acres	0 acres	8 acres (0.2%)
	Queer Mountain (85,294 acres)	0 acres	1,276 acres (2%)	0 acres
SRMA	Fish Lake Valley (196,811 acres)	0 acres	0 acres	460 acres (0.2%)

[a] To convert acres to km^2, multiply by 0.004047.

[b] Percentage of total feature viewable.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the landscape as seen by viewers, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations where the project might be viewed from; and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

National Park

- *Death Valley.* Death Valley NP is located in California, about 13 mi (21 km) southwest of the SEZ at the point of closest approach. The vast Death Valley NP is a popular winter hiking area. The Death Valley NP contains paved roads popular for scenic driving and biking, several miles of hiking trails, and four-wheel drive roads. There are campgrounds, and backcountry camping is allowed. Death Valley NP has some of the darkest night skies in the country (NPS 2010), and they are considered an important part of the national park visitor experience. Stargazing is popular year round, as are bird watching and viewing spring wildflowers. Most of the park's services and facilities, as well as most recreational use, are in the central and northeastern portions of the park.

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

Solar facilities within the SEZ could be visible from the summits and northeast-facing slopes of higher peaks of the Last Chance Range within the NP. Visibility of solar facilities within the SEZ would primarily be from the area surrounding Last Chance Mountain, at about 16 to 18 mi (23 to 26 km) from the SEZ. These areas include about 3,814 acres (15.4 km^2) in the 650-ft (198.1-m) viewshed, or 0.1% of the total NP acreage, and 2,213 acres (9.0 km^2) in the 24.6-ft (7.5-m) viewshed, or 0.07% of the total Death Valley NP acreage. Areas of Death Valley NP within the SEZ 25-mi (40 km) viewshed extend from 14 mi (23 km) to around 21 mi (34 km) from the southwestern boundary of the SEZ. Additional areas of the NP are within the SEZ viewshed beyond 30 mi (48 km) from the SEZ.

For about one-third of the area in the NP within the SEZ 25-mi (40-km) viewshed, visibility would be restricted to taller solar facility components, such as transmission towers and power towers. Furthermore, most of the area has scattered vegetation, and views of the SEZ could therefore be subject to screening. Three additional areas with visibility exist at distances from 14 to 21 mi (23 to 34 km) from the SEZ, but the largest of these areas is less than 200 acres (0.81 $km^{2)}$ in size, and in these smaller areas, visibility would be limited to the upper portions of tall power towers in the SEZ.

In the area around Last Chance Mountain, some viewpoints would have clear views of the SEZ, but the SEZ would occupy only a very small part of the horizontal field of view, and the vertical viewing angle would be very low, despite the elevated viewpoints. Figure 11.6.14.2-3 is a Google Earth visualization of the SEZ as seen from near the summit of Last Chance Mountain in Death Valley NP, about 18 mi (29 km) from the southwest corner of the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aide for assessing the approximate size and viewing angle of utility-scale solar facilities.

The receiver towers depicted in the visualization are properly scaled models of a 459-ft (140-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing about 100 MW of electric generating capacity. One group of two models was placed in the SEZ for this and other visualizations shown in this section of the PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 3,500 ft (1,070 m) higher in elevation than the SEZ. The visualization suggests that from this elevated viewpoint, the tops of collector arrays within the SEZ would likely be visible, but the angle of view would be low because of the 18-mi (29-km) distance to the SEZ. The SEZ and solar facilities within it would occupy a very small portion of the horizontal field of view.

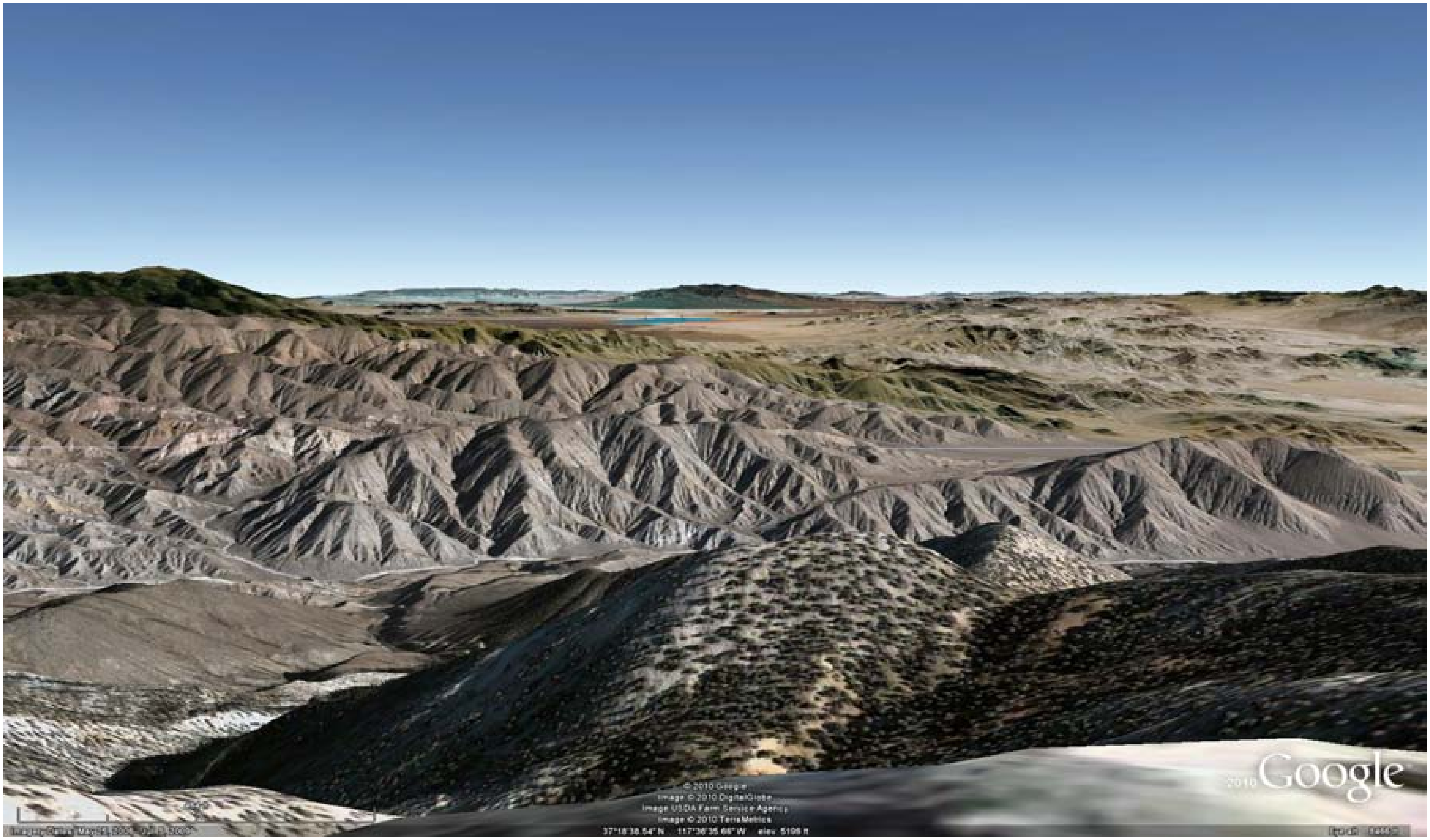

FIGURE 11.6.14.2-3 Google Earth Visualization of the Proposed Gold Point SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Last Chance Mountain in Death Valley NP (also California Desert Conservation Area and Death Valley WA)

If power towers were present within the SEZ, they would be visible as points of light against a backdrop of the valley floor. At night, if more than 200 ft (61 m) tall, power towers would have hazard navigation lights that could potentially be visible from this location. The lights could be red flashing lights or red or white strobe lights, and the light could be visible from this viewpoint, and could attract visual attention, especially given the dark night skies typical in the remote location of the SEZ. Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this location.

The summit of Last Chance Mountain is the highest-elevation viewpoint in Death Valley NP within the 25-mi (40-km) viewshed of the SEZ. Other viewpoints in the NP that are within the 25-mi (40 km) SEZ viewshed are at about the same distance from the SEZ, but would be lower in elevation and would therefore be subject to similar or slightly lower contrast levels from solar development within the SEZ, particularly given that in some of the areas, visibility would be limited to taller solar facilities, thereby reducing impact. In general, visual contrast levels arising from solar facilities within the SEZ would not be expected to exceed weak levels for viewpoints within Death Valley NP.

National Conservation Area

- *California Desert.* The California Desert Conservation Area (CDCA) is a 26-million-acre (105,000-km^2) parcel of land in southern California designated by Congress in 1976 through the Federal Land Policy and Management Act. About 10 million acres (40,000 km^2) of the CDCA is administered by the BLM.

  The CDCA management plan (BLM 1999) notes the "superb" variety of scenic values in the CDCA and lists scenic resources as needing management to preserve their value for future generations. The CDCA management plan divides CDCA lands into multiple-use classes based on management objectives. The class designations govern the type and degree of land use actions allowed within the areas defined by class boundaries. All land use actions and resource-management activities on public lands within a multiple-use class delineation must meet the guidelines given for that class.

  CDCA land within the viewshed of the Gold Point SEZ is within Death Valley NP. Portions of the CDCA within the 650-ft (198.1-m) viewshed for the Gold Point SEZ include about 4,265 acres (17.3 km^2), or 0.02% of the total CDCA acreage. Portions of the CDCA within the 24.6-ft (7.5-m) viewshed encompass about 2,221 acres (9.0 km^2), or 0.009% of the total CDCA acreage. Areas of the CDCA within the SEZ 25-mi (40 km) viewshed extend from 14 mi (23 km) to around 21 mi (34 km) from the southwestern boundary of the SEZ. Additional areas of the CDCA are within the SEZ viewshed beyond 30 mi (48 km) from the SEZ.

Death Valley NP is located entirely within the CDCA, and the portions of the CDCA within the 25-mi (40-km) viewshed of the SEZ are identical to those within the NP. Expected visual contrast levels for the CDCA are the same as those expected for the NP, as described above.

Wilderness Area

- *Death Valley*. Death Valley WA is a 3,074,256-acre (12,441-km^2) congressionally designated WA located 13 mi (21 km) southwest of the SEZ. It is the largest area of designated National Park wilderness within the contiguous United States (NPS 2010). Within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from portions of the WA (about 3,774 acres [15.3 km^2], or 0.1% of the total WA acreage, in the 650-ft [198.1-m] viewshed, and 2,210 acres [8.9 km^2], or 0.1% of the total WA acreage, in the 25-ft [7.5-m] viewshed). The visible area of the Death Valley NP extends from 14 mi (23 km) to beyond 25 mi (40 km) from the southwestern boundary of the SEZ.

  Death Valley WA is located entirely within Death Valley NP, and the portions of the WA within the 25-mi (40 km) viewshed of the SEZ are identical to those within the NP. Expected visual contrast levels for the WA are the same as those expected for the NP, as described above.

Wilderness Study Areas

- *Pigeon Spring*. Pigeon Spring Wilderness Study Area (WSA) is a 3,651-acre (14.8-km^2) WSA located 15 mi (24 km) west of the SEZ. Within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from about 8 acres (0.03 km^2), or 0.2% of the total WSA acreage, in the 650-ft (198.1-m) viewshed. None of the WSA is visible within the 25-ft (7.5-m) viewshed. The visible area of the WSA is about 16 mi (26 km) from the western boundary of the SEZ.

  The receivers and upper portions of sufficiently tall power towers placed in the far southern portion of the SEZ could potentially be visible from a very small portion of the WSA. This portion of the WSA is wooded, and trees would likely partially or completely block the view of solar facilities within the SEZ. If operating power towers were visible in this portion of the SEZ, they would be visible as points of light just above the intervening mountains. At night, if more than 200 ft (61 m) tall, power towers would have hazard navigation lights that could potentially be visible from this location. The lights could be red flashing lights or red or white strobe lights, and the light could potentially be visible from the WSA. Expected visual impacts on the WSA would be minimal.

- *Queer Mountain.* Queer Mountain WSA is an 85,294-acre (345.2-km^2) wilderness study area located 7.0 mi (11.3 km) south of the SEZ. Within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from local summits and north-facing slopes of Gold Mountain and some ridges west of Gold Mountain. Portions of the WSA within the SEZ 25-mi (40 km) viewshed include about 1,276 acres (5.2 km^2), or 2% of the total WSA acreage, in the 650-ft (198.1-m) viewshed and 522 acres (2.1 km^2), or 1% of the total WSA acreage, in the 25-ft (7.5-m) viewshed. The visible area of the WSA is about 8.7 to 12 mi (14 to 19 km) from the southern boundary of the SEZ.

  From the highest peaks and ridges in those portions of the WSA that have views of the SEZ, the ridges of Slate Ridge generally screen at least some of the SEZ from view; however, from some viewpoints, most of the SEZ would be visible, and the SEZ would occupy a moderate amount of the horizontal field of view. Although the vertical angle of view is low, it is high enough that the tops of collector/reflector arrays within the SEZ would likely be visible. From these very high-elevation viewpoints, visual contrast levels from solar facilities could potentially reach moderate levels, but for lower elevation viewpoints, weak levels of visual contrast would be expected.

  Figure 11.6.14.2-4 is a Google Earth visualization of the SEZ as seen from the summit of Gold Mountain in the WSA, about 10 mi (16 km) directly south of the SEZ. The viewpoint in the visualization is about 3,000 ft (900 m) higher in elevation than the SEZ. Solar facilities within the SEZ would be seen in a band just above the top of Slate Ridge.

  The visualization suggests that from this elevated viewpoint, the tops of collector/reflector arrays within the SEZ would likely be visible, which would increase the apparent size of the collector/reflector arrays and would make the strong regular geometry of the arrays more apparent. The SEZ and solar facilities within it would occupy a moderate portion of the horizontal field of view. If power towers were present within the SEZ, the receivers could be visible as bright points of light against a backdrop of the valley floor. They would be likely to attract visual attention and likely could not be missed by casual viewers. At night, sufficiently tall power towers could have red or white flashing hazard lights that would be visible from Gold Mountain, and they would likely attract attention given the dark night skies typical of the area. Other lighting associated with solar facilities in the SEZ could be visible as well. Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, moderate visual

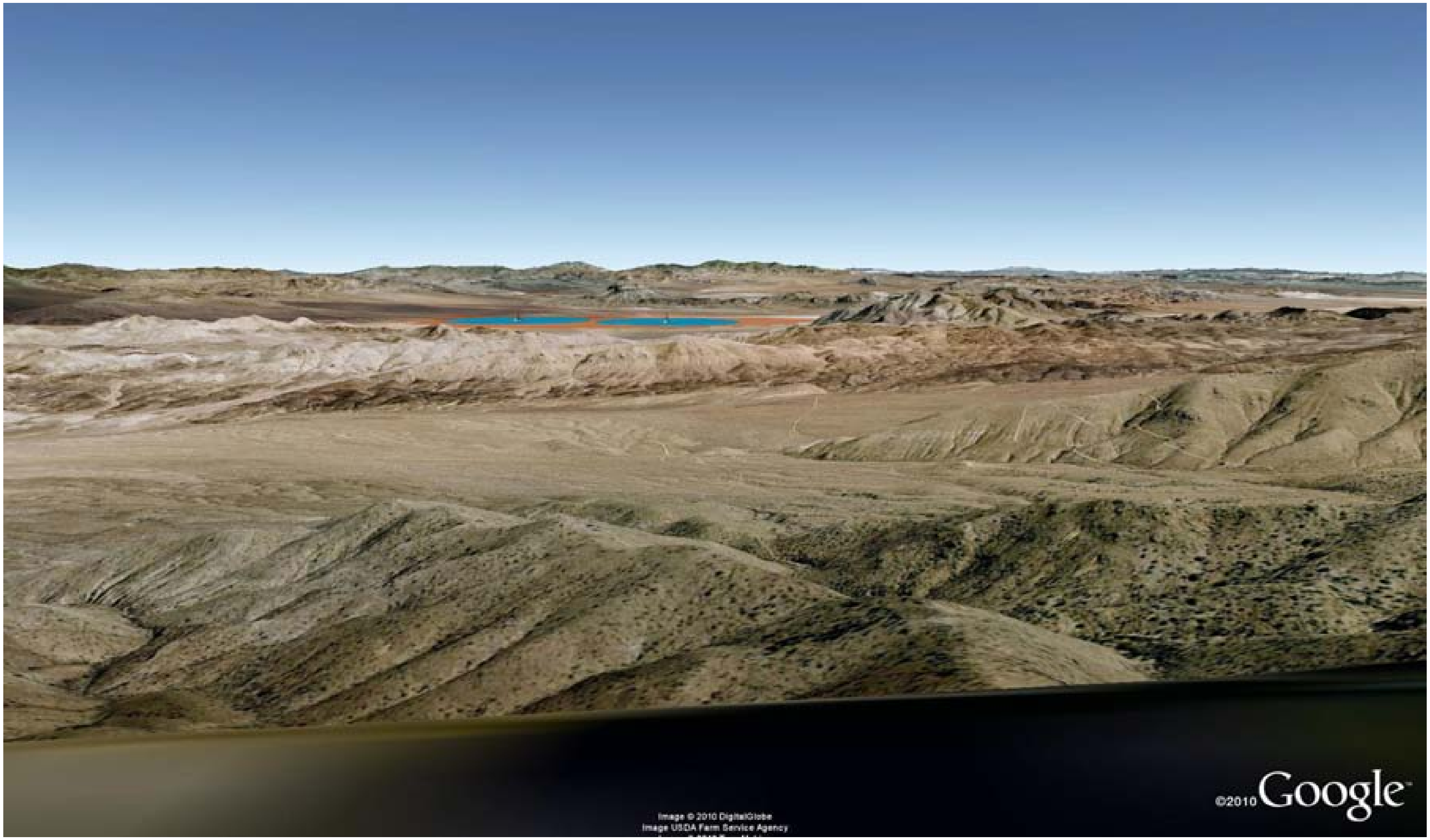

FIGURE 11.6.14.2-4 Google Earth Visualization of the Proposed Gold Point SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Gold Mountain in Queer Mountain WSA

contrasts from solar energy development within the SEZ could be expected at this location.

The summit of Gold Mountain is the highest-elevation viewpoint in the WSA within the 25-mi (40-km) viewshed of the SEZ. Other viewpoints in the WSA that are within the 25-mi (40 km) SEZ viewshed are at about the same distance or slightly less distant from the SEZ, but would be lower in elevation. These viewpoints would therefore be subject to similar or lower contrast levels from solar development within the SEZ, particularly given that in some of the areas, visibility would be limited to taller solar facilities, thereby reducing impact. In general, moderate levels of visual contrast would be expected for some high-elevation viewpoints in the WSA, with weaker contrasts expected for lower elevation viewpoints in the WSA.

Special Recreation Management Area

- *Fish Lake Valley*—The Fish Lake Valley SRMA is a BLM-designated SRMA located in California that contains two separate areas. The portion of the SRMA that is within the viewshed of Gold Point SEZ is located 17 mi (28 km) southwest of the SEZ at the point of closest approach. The total acreage of the SRMA is 196,811 acres (796.5 km^2).

  The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 460 acres (1.9 km^2), or 0.2% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes 12 acres (0.05 km^2), or 0.006% of the total SRMA acreage. The visible area extends from 16 mi (26 km) from the southwestern boundary of the SEZ to 19 mi (31 km) into the SRMA.

  As shown in Figure 11.6.14.2-2, visibility of solar facilities within the SEZ would be limited to a very small area of the SRMA, and visibility of low height facilities, such as PV panels or trough arrays, would be limited to 12 acres (0.05 km^2) within the SRMA. Areas within the 25-mi (40-km) viewshed of the SEZ include the summits and northeast-facing slopes of peaks in the Last Chance Range in the SRMA. Views of the SEZ from the SRMA are nearly completely screened by mountains and ridges between the SRMA and the SEZ, including Slate Ridge. Because of the very limited visibility of the SEZ and the long distance to the SEZ (17 mi [28 km]), under the 80% development scenario analyzed in the PEIS, expected visual contrast levels would be minimal for viewpoints within the SRMA.

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. In addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by other facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. The nearest large transmission line is 22 mi (35 km) from the SEZ, and the construction of new transmission facilities would be required both within and outside the SEZ. Depending on their location and visibility, these new facilities could potentially cause large additional visual impacts to the sensitive visual resource areas and sensitive viewing areas listed above, as well as other areas not listed above.

Impacts on Selected Other Lands and Resources

Magruder Mountain. Magruder Mountain (elevation 9,044 ft [2,756 m]), located 5 to 10 mi (8 to 16 km) west of the SEZ, is sacred to the Timbisha Shoshone. The summit of the mountain is about 4,000 ft (1,200 m) higher in elevation than the SEZ, and where vegetation and intervening terrain do not provide screening, there are commanding views of the SEZ.

Figure 11.6.14.2-5 is a Google Earth visualization of the SEZ as seen from the main peak of Magruder Mountain, about 8 mi (13 km) due west of the SEZ, facing east. The visualization suggests that from this elevated viewpoint, solar facilities within the SEZ would be in full view. The tops of solar facilities within the SEZ would be visible, which would reveal their size and the strong regular geometry of the solar collector/reflector arrays. These views would tend to increase visual contrasts with the natural appearing surroundings. In general, the SEZ would occupy only a small portion of the horizontal field of view, but for some viewpoints on the northeastern portion of Magruder Mountain, the SEZ is close enough that it would occupy a moderate amount of the horizontal field of view.

The receivers of operating power towers within the SEZ would be visible and would likely appear as bright point or non-point (i.e., having a visible cylindrical or rectangular surface) light sources atop discernable tower structures. The lights would likely attract visual attention. At night, sufficiently tall power towers could have red or white flashing hazard lights that would be visible from Magruder Mountain. These lights would likely attract attention, given the dark night skies typical of the area. Other lighting associated with solar facilities in the SEZ could be visible as well.

Under the 80% development scenario analyzed in the PEIS, depending on the type, number, sizes, and layouts of solar facilities within the SEZ, moderate visual contrasts would be expected for this viewpoint. In general, higher contrast levels of contrast would be expected for viewpoints on the eastern portions of the mountain, as they would be somewhat closer to the SEZ, and lower contrast levels would be expected for viewpoints farther west on the mountain.

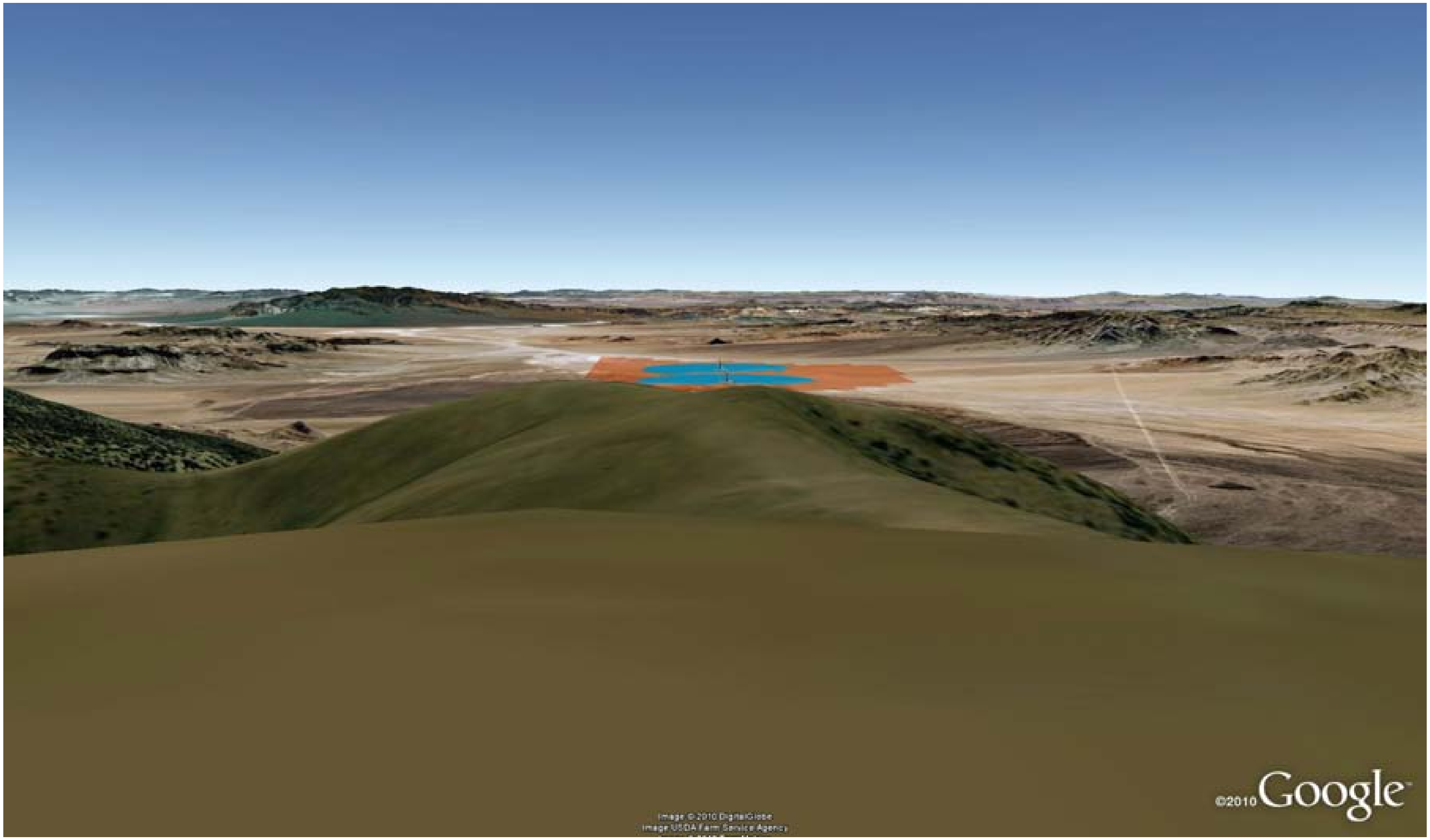

FIGURE 11.6.14.2-5 Google Earth Visualization of the Proposed Gold Point SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Magruder Mountain West of the SEZ

Lower visual contrast levels would also be expected at lower-elevation viewpoints on the mountain, both because the vertical angle of view to the SEZ would be lower (tending to reduce visual contrast levels) and because in many areas the lower slopes of the mountain are vegetated, and some screening of the SEZ by vegetation would be expected. Overall, under the 80% development scenario analyzed in the PEIS, moderate visual contrast levels would be expected for viewpoints on Magruder Mountain.

U.S. Highway 95. About 10 mi (16 km) of U.S. 95 are within the SEZ viewshed at a distance of 9 to 10.5 mi (14.5 to 16.9 km). The AADT value for U.S. 95 in the vicinity of the SEZ was about 1,900 in 2009 (NV DOT 2010).

Solar facilities would be viewed perpendicular to the direction of travel in both directions, along the narrow axis of both the SEZ and the narrow Lida Valley. For northbound travelers on U.S. 95, solar facilities within the SEZ could first come into view just north of Stonewall Pass. For about 4 mi (7 km) (about 3½ minutes at highway speeds), only the upper portions of sufficiently tall power towers could be seen. However, just after crossing the Esmeralda-Nye county line, low-height solar facilities within the SEZ could come into view, depending on their location within the SEZ. Low-height facilities would remain in view for about 5 mi (8 km) (about 4 minutes at highway speeds), after which taller solar facilities might be visible for about 1 more mile (1.6 km).

For those portions of U.S. 95 within the viewshed of the SEZ, the elevation of the roadway is 200 to 300 ft (60 to 90 m) lower than the SEZ, hence the vertical angle of view to the SEZ is extremely low. The SEZ would occupy a small portion of the horizontal field of view. While the receivers of operating power towers within the SEZ could appear as bright points of light at a distance of 10 mi (16 km), in general, because of the small apparent size of the SEZ and the very low angle of view, under the 80% development scenario analyzed in the PEIS, visual contrast levels from solar facilities within the SEZ would not be expected to exceed weak levels for travelers on U.S. 95.

Southbound travelers on U.S. 95 would have a generally similar visual experience, but the order would be reversed; that is, solar facilities within the SEZ would first come into view about 6 mi (10 km) north of the county line, and disappear from view shortly before travelers reached Stonewall Pass. Visual contrast levels would be similar to those observed by northbound travelers.

State Route 266. As shown in Figure 11.6.14.2-2, within 25 mi (40 km) of the SEZ, about 18 mi (29 km) of State Route 266 are within the SEZ viewshed at distances from 2 to 9.5 mi (3.2 to 15.3 km). The AADT value for State Route 266 in the vicinity of the SEZ was about 210 vehicles in 2009 (NV DOT 2010).

From both directions, the road first directly approaches the SEZ but then parallels the SEZ's northern boundary at a distance of about 2 mi (3 km). For westbound travelers on State Route 266, solar facilities within the SEZ could be in view at the junction of State Route 266 with U.S. 95, about 10 mi (16 km) northeast of the SEZ's northeast corner. The elevation of the roadway is lower than the SEZ but would gradually increase to that of the SEZ as travelers approached the SEZ. Regardless of elevation, the angle of view would be very low, causing the collector/reflector arrays of solar facilities within the SEZ to be viewed on edge, causing them to appear as thin lines at the western horizon. The edge-on view would conceal much of the arrays' strong regular geometry, reduce their apparent size, and cause them to appear to repeat the strong line of the horizon, all of which would tend to reduce their visual contrast. However, taller ancillary facilities, such as cooling towers, buildings, transmission components, and plumes (if present), would likely be visible above the collector/reflector arrays. These elements could add noticeable form, line, and color contrasts, which would increase as travelers approached the SEZ. The receivers of operating power towers within the SEZ would likely appear as bright or very bright light sources against the backdrop of Slate Ridge west of the SEZ. At night, sufficiently tall power towers could have red or white flashing hazard lighting that would be visible for many miles and would likely be visually conspicuous in the dark sky conditions of this remote location. Other lighting associated with solar facilities within eth SEZ could be visible and would add increasing visual contrast as travelers approached the SEZ. In general, as travelers approached the SEZ, expected visual contrast levels from solar facilities within the SEZ would rise from weak to strong levels. The approach to the SEZ is a little more than 9 mi (15 km), and would take about 8 minutes at highway speeds.

By the time westbound travelers reached that part of State Route 266 north of the SEZ, visual contrast levels from solar facilities within the SEZ under the 80% development scenario would likely have risen to strong levels. Figure 11.6.14.2-6 is a Google Earth perspective visualization of the SEZ as seen from State Route 266 about 1.7 mi (2.8 km) north of the SEZ, facing south toward two power tower models 2.8 mi (4.5 km) south of the viewpoint. The visualization suggests that from this location, solar facilities would be in full view, and the SEZ would occupy nearly the entire horizontal field of view. Solar facilities located within the closest portions of the SEZ would strongly attract visual attention and would likely dominate the view toward the south. The viewpoint from the road is about 60 ft (20 m) higher in elevation than the nearest part of the SEZ, so solar collector arrays would be seen nearly edge-on and would repeat the horizontal line of the plain in which the SEZ is situated. This would tend to reduce visual line contrast somewhat. Ancillary facilities, such as buildings, transmission towers, cooling towers and plumes (if present), would likely be visible projecting above the collector/reflector arrays. Their forms, lines, colors, and reflective properties could contrast strongly with the horizontal collector/reflector arrays and surrounding mostly natural-appearing landscape.

The receivers of operating power towers within the SEZ would likely appear as brilliant white non-point light sources atop towers whose structural details could be visible. At night, sufficiently tall power towers would have red or white flashing lights that would likely strongly attract visual attention in the dark night sky typical of the area.

Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ to the south would likely dominate views on State Route 266 within a few miles of the SEZ, and would be expected to cause strong levels of visual contrast. Moderate to weak levels of visual contrasts would be expected for viewpoints on State Route 266 farther from the SEZ.

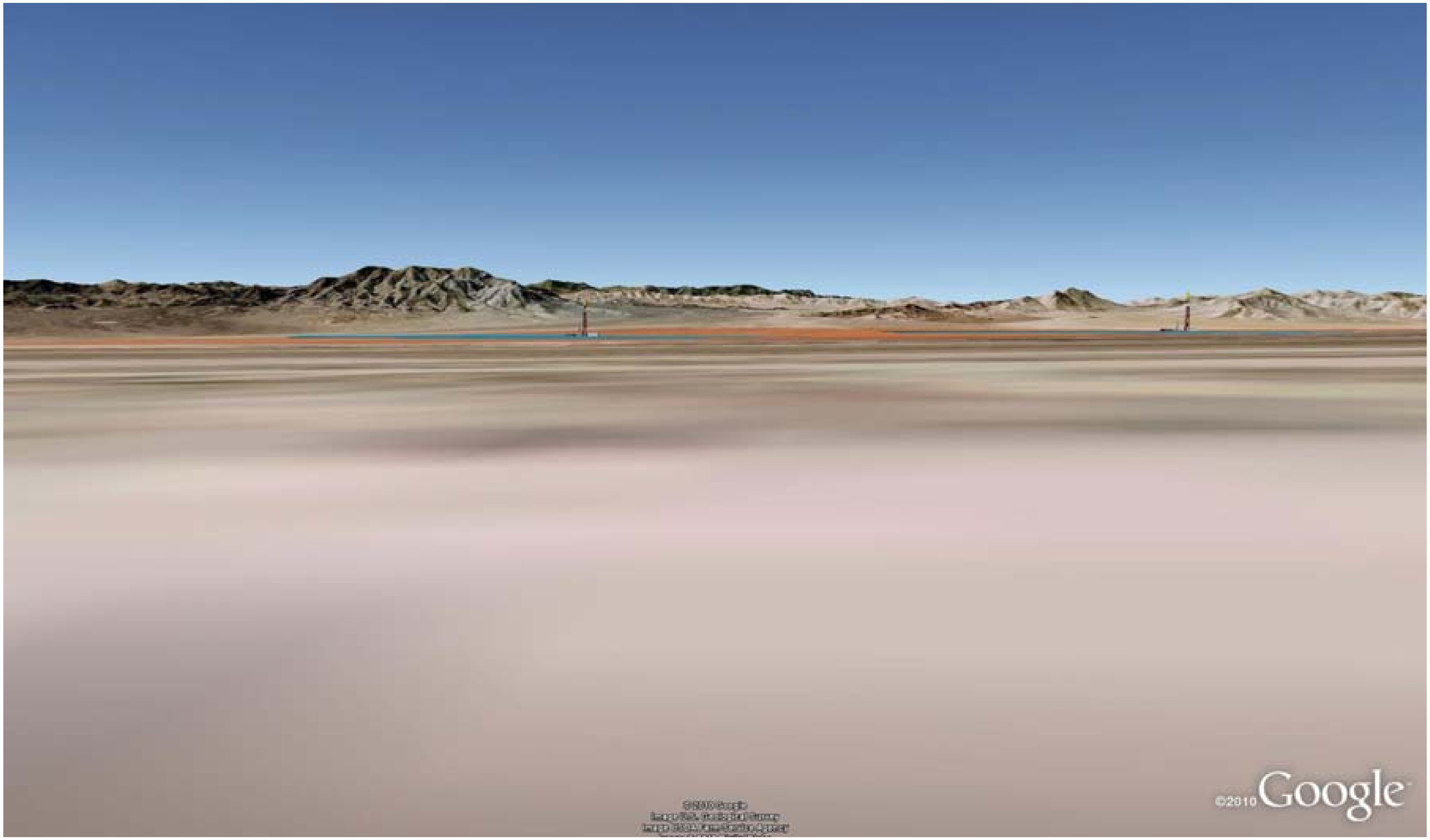

FIGURE 11.6.14.2-6 Google Earth Visualization of the Proposed Gold Point SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from State Route 266 Directly North of the SEZ

Eastbound travelers on State Route 266 would experience the same visual contrast levels as westbound travelers, but because the eastbound travelers would enter the viewshed after leaving Lida Canyon much closer to the SEZ (about 4 mi [6 km]) than westbound travelers, contrast levels from solar facilities within the SEZ would reach strong levels much faster than for westbound travelers. The total time solar facilities would be in view in the general direction of travel would also be shorter, as eastbound travelers would approach and pass the SEZ more quickly than westbound travelers.

Community of Gold Point. As shown in Figure 11.6.14.2-1, the community of Gold Point is less than 2 mi (3.2 km) directly south of the SEZ. Because of the proximity of the SEZ and the slightly elevated viewpoints within Gold Point, solar facilities within the SEZ would be expected to dominate views to the north from Gold Point, creating strong visual contrasts. A site visit in August 2009 indicated largely open views of the proposed SEZ from Gold Point. However, from some viewpoints in the community, at least partial screening of solar facilities within the SEZ would occur, due to slight variations in topography or structures. A detailed future site-specific NEPA analysis would be required to determine visibility precisely.

From the community of Gold Point, the SEZ would occupy nearly the entire horizontal field of view looking north, because views from Gold Point toward the SEZ would be perpendicular to the long axis of the SEZ and also because of the relatively short distance to the SEZ. The elevation of Gold Point is about 400 ft (120 m) higher than the SEZ, so although the vertical angle of view would be low, the tops of collector/reflector arrays of solar facilities within the SEZ would likely be visible, tending to increase their contrasts with the surrounding natural-appearing landscape. The structural details of facility components could be visible, with taller solar facility components and plumes projecting above the collector/reflector arrays. Depending on their location within the SEZ, operating power tower receivers in the closest portions of the SEZ would likely be seen as brilliant white non-point light sources against either the backdrop of the Lida Valley floor or the Mt. Jackson Ridge north of the SEZ. Also, under certain viewing conditions, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). At night, if more than 200 ft (61 m) tall, power towers would have hazard navigation lights that could potentially be visible from this location. The lights could be red flashing lights or red or white strobe lights, and the lights would likely be very conspicuous from Gold Point, given the dark night skies found in the area. Other lighting associated with solar facilities would likely be visible as well. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected to result from solar energy development within the SEZ, as seen from unscreened viewpoints within the community of Gold Point.

Other Impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

11.6.14.2.3 Summary of Visual Resource Impacts for the Proposed Gold Point SEZ

Under the 80% development scenario analyzed in the PEIS, the SEZ would contain multiple solar facilities utilizing differing solar technologies, as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal landscape of the flat valley in which the SEZ is located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development within the proposed Gold Point SEZ because of major modification of the character of the existing landscape. Potential exists for additional impacts from construction and operation of transmission lines and access roads within and outside the SEZ.

Under the 80% development scenario analyzed in the PEIS, utility-scale solar energy development within the proposed Gold Point SEZ is likely to result in moderate visual contrasts for some viewpoints within the Queer Mountain WSA, which is within 7 mi (11 km) of the SEZ at the point of closest approach. Moderate visual contrast levels would also be expected for viewpoints on Macgruder Mountain. Minimal to weak visual contrasts would be expected for some viewpoints within other sensitive visual resource areas within the SEZ 25-mi (40-km) viewshed.

Residents of the community of Gold Point would likely experience strong visual contrasts from solar energy development within the SEZ. About 18 mi (29 km) of State Route 266 are within the SEZ viewshed at distances of 2 to 9.5 mi (3.2 to 15.3 km) from the SEZ. Travelers on State Route 266 could be subjected to strong visual contrasts from solar energy development within the SEZ. Visitors to the area, workers, and residents of the community of Gold Point may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel other area roads.

11.6.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified to protect visual resources for the proposed Gold Point SEZ. As noted in Section 5.12, the presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

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11.6.15 Acoustic Environment

11.6.15.1 Affected Environment

The proposed Gold Point SEZ is located in the southern portion of Esmeralda County in southwestern Nevada. Neither the State of Nevada nor Esmeralda County has established quantitative noise-limit regulations applicable to solar energy development.

The proposed Gold Point SEZ is in an undeveloped area, the overall character of which is rural. U.S. 95 runs north–south as close as 9 mi (14 km) east of the SEZ. State Route 266 runs east–west less than 2 mi (3 km) north of the SEZ, while State Route 774 runs along the SEZ's eastern boundary as close as 0.25 mi (0.4 km). Lida Road runs along the SEZ's western boundary as close as 300 ft (91 m). Several dirt roads run through the SEZ. No railroad line exists around the SEZ. The nearest airport is Lida Junction Airport, which is located about 9 mi (14.5 km) east-northeast of the SEZ. Other nearby airport includes Goldfield Airport, about 21 mi (34 km) north-northeast of the SEZ. There are no agricultural activities in and around the SEZ, but cattle grazing seems to occur within the SEZ. No industrial activities other than small-scale mining are located around the SEZ. No significant recreational land use exists within the SEZ. No sensitive receptors (e.g., residences, hospitals, schools, or nursing homes) exist close to the proposed Gold Point SEZ. The nearest residences (squatters) lie about 2 mi (3 km) south of the SEZ near Gold Point, which is a well-preserved ghost town and point of interest for many tourists. Noise sources around the SEZ include road traffic, aircraft flyover, cattle grazing, and road traffic related to tourism around Gold Point. To date, no environmental noise survey has been conducted around the proposed Gold Point SEZ. On the basis of the population density, the day–night average noise level (L_{dn} or DNL) is estimated to be 17 dBA for Esmeralda County, well below the 33 to 47 dBA L_{dn} range level typical of a rural area (Eldred 1982; Miller 2002).[9]

11.6.15.2 Impacts

Potential noise impacts associated with solar projects in the Gold Point SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment and vehicular traffic on the nearest residences (about 2 mi [3 km] to the south of the SEZ boundary) would be anticipated, albeit of short duration. During the operations phase, potential impacts on the nearest residences would be anticipated, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed Gold Point SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the applications of any additional SEZ-specific design features (see Section 11.6.15.3 below). This

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[9] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during the daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

11.6.15.2.1 Construction

The proposed Gold Point SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area, where key components (e.g., steam turbine/generator) needed to generate electricity are located; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background levels. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment, and by temperature lapse conditions typical of daytime hours; thus, noise attenuation to a 40-dBA level would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the residences closest to the southern SEZ boundary, estimated noise levels at the nearest residences would be about 34 dBA[10], which is lower than the typical daytime mean rural background level of 40 dBA. In addition, an estimated 40 dBA L_{dn}[11] at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas.

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[10] Due to the large difference in elevations between potential noise sources within the SEZ (about 4,960 ft [1,512 m) and receptors near Gold Point (5,400 ft [1,646 m]) located to the south, sound attenuation due to ground effects would likely be smaller as the source location moves north because the line-of-sight between them is higher above the ground. Without considering this effect, noise levels could be underestimated if the source location is located in the northern portion of the SEZ. It is possible that as a receptor moves farther north, the noise level would increase, depending on meteorological conditions. Accordingly, this elevation difference should be taken into account in refined noise calculations during the permitting process.

[11] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in a day–night average noise level (L_{dn}) of 40 dBA.

There are no specially designated areas within a 5-mi (8-km) range from the Gold Point SEZ, which is the farthest distance that noise, except extremely loud noise, would be discernable. Thus, noise impact analysis for nearby specially designated areas was not conducted.

Depending on soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet, in contrast to the impulsive impact pile drivers frequently used at large-scale construction sites. Potential impacts on the nearest residences would be anticipated to be minimal, considering the distance to the nearest residences (about 2 mi [3 km] from the southern SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction within the proposed Gold Point SEZ would cause minimal unavoidable, but localized, short-term noise impacts on neighboring communities.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

Transmission lines would be constructed within a designated ROW to connect to the nearest regional power grid. A regional 120-kV transmission line is located about 22 mi (35 km) from the proposed Gold Point SEZ; thus, construction of a transmission line over this relatively long distance would be needed to connect to the regional grid. For construction of transmission lines, noise sources and their noise levels might be similar to construction noise sources at an industrial facility of a comparable size. Transmission line construction for the Gold Point SEZ could be performed in about 2 years. However, the area under construction along the transmission line ROW would move continuously, so no particular area would be exposed to noise for a prolonged period. Therefore, potential noise impacts on nearby residences along the transmission line ROW, if any, would be minor and temporary in nature.

11.6.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area; commuter/visitor/support/delivery traffic within and around the solar facility; and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and firewater pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southern SEZ boundary, the predicted noise level would be about 36 dBA at the nearest residences, located about 2 mi (3 km) from the SEZ boundary, which is below the typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[12]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area, and thus, would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 41 dBA L_{dn} (i.e., minimal contribution from facility operation) would be estimated. This is well below the EPA guideline of 55 dBA L_{dn} for residential areas. However, day–night average noise levels higher than those estimated above by using simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Gold Point SEZ setting, the air temperature would likely increase with height (temperature inversion), because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[13] within 1 or 2 mi (1.6 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are lowest. To estimate the day–night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residences (about 2 mi [3.2 km] from the southern SEZ boundary) would be 46 dBA, which is well above the typical nighttime mean rural background level of 30 dBA. The day–night average noise level is estimated to be about 48 dBA L_{dn}, which is below the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be

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12 Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

13 A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

lower than 48 dBA L_{dn} at the nearest residences, even if TES were used at a solar facility. Consequently, operating parabolic trough or power tower facilities using TES could result in some adverse noise impacts on the nearest residences, depending on background noise levels and meteorological conditions. In the permitting process, refined noise propagation modeling considering topographical features might be warranted, along with measurement of background noise levels.

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the proposed Gold Point SEZ, on the basis of the assumption of dish engine facilities of up to 428-MW total capacity (covering 80% of the total area, or 3,848 acres [15.6 km^2]), up to 17,100 25-kW dish engines could be employed. For a large dish engine facility, several hundred step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility. For example, they would be about 48 dBA at 1.0 mi (1.6 km) and 43 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field; both values are higher than the typical daytime mean rural background level of 40 dBA. However, these levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed dish engines were placed all over the Gold Point SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residences, about 2 mi (3.2 km) south of the SEZ boundary, would be about 43 dBA, which is somewhat higher than the typical daytime mean rural background level of 40 dBA. On the basis of 12-hr daytime operation, the estimated 43 dBA L_{dn} at these residences is well below the EPA guideline of 55 dBA L_{dn} for residential areas. On the basis of other noise attenuation mechanisms, noise levels at the nearest residences would be lower than the values estimated above. However, noise from dish engines could cause adverse impacts on the nearest residences, depending on background noise levels and meteorological conditions. Thus, consideration of minimizing noise impacts is very important when siting dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also be considered.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the proposed Gold Point SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be negligible.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and not be heard at the nearest residences, assuming a 2.5-mi (4.0-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 2 mi [3.2 km] to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be minimal.

For impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of 230-kV transmission line towers would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. Corona noise includes high-frequency components, considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts unless a residence was located nearby (e.g., within 500 ft [152 m] of a 230-kV transmission line). The proposed Gold Point SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residences from corona noise along transmission lines within the SEZ would be negligible.

11.6.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction, but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minimal and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus negligible.

11.6.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. While some SEZ-specific design features are best established when specific project details are being considered, measures that can be identified at this time include the following:

- Noise levels from cooling systems equipped with TES should be managed so that levels at the nearby residences to the south of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

- Dish engine facilities within the Gold Point SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearby residences. Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at nearby residences.

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11.6.16 Paleontological Resources

11.6.16.1 Affected Environment

The surficial geology of the proposed Gold Point SEZ is composed entirely of thick alluvial deposits (more than 100 ft [30 m] thick), ranging in age from the Pliocene to Holocene. In the absence of a PFYC map for Nevada, a preliminary classification of PFYC Class 2 is assumed for the young Quaternary alluvial deposits, similar to that assumed for the Amargosa Valley SEZ (Section 11.1.16; see Section 4.14 for a discussion of the PFYC system). Class 2 indicates a low potential for the occurrence of significant fossil material.

11.6.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in the proposed Gold Point SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above and are classified as PFYC Class 2, further assessment of paleontological resources in the SEZ is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found within the proposed Gold Point SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely, because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

Approximately 22 mi (35 km) of new transmission line is assessed in this PEIS. Construction of this line would result in approximately 667 acres (2.7 km^2) of disturbance. This disturbance would occur in alluvial deposits as well as in residual materials developed in igneous and metamorphic rock (preliminarily classified as PFYC Class 1) and in residual materials developed in fine-grained sediments and in sedimentary rocks (preliminarily classified as PFYC Class 3b), depending on the exact location of the corridor. For PFYC Class 1 areas that would be crossed, there would be little or no potential for significant paleontological resources. For PFYC Class 3b areas, with an unknown potential for containing paleontological material, impacts are possible. A more detailed investigation of the residual sedimentary deposits is needed prior to project approval. A paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 (BLM 2007) and IM2009-011 (BLM 2008a). Impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

11.6.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features as described in Appendix A, Section A.2.2.

The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations; however, based on the current level of information, a need for mitigation of areas potentially classified as PFYC Class 2 or lower is not anticipated. For the transmission line corridor, mitigation may be necessary if significant paleontological resources are encountered during the survey in PFYC Class 3b areas.

11.6.17 Cultural Resources

11.6.17.1 Affected Environment

11.6.17.1.1 Prehistory

The proposed Gold Point SEZ is located in the Lida Valley, within the basin and range province in western Nevada. The earliest known use of the area was likely during the Paleoindian Period, sometime between 12,000 and 10,000 B.P. Surface finds of Paleoindian projectile points, the hallmark of the Clovis culture, have been found in the Big Smoky Valley, 35 mi (56 km) north of the SEZ, and in the Mojave Desert, 20 mi (32 km) southeast of the SEZ, but no sites in the area with any stratigraphic context have been excavated. The Clovis culture is characterized by the aforementioned fluted projectile points and a hunting and gathering subsistence economy that followed migrating herds of Pleistocene mega fauna. The ephemeral nature of Paleoindian sites in the southeastern Great Basin has given rise to the idea that Paleoindians may have been inclined to subsist off of the lake and marsh habitats provided by the ancient Pleistocene pluvial lakes that occupied a large portion of the Great Basin. Consequently, the sites are difficult to find as they have been buried by the ebb and flow of the pluvial lakes. This slightly later cultural material associated with the pluvial lake habitations is referred to as the Western Pluvial Lakes Tradition, or Lake Mojave culture. The archaeological assemblage associated with this cultural tradition is characterized by stemmed projectile points, leaf-shaped bifaces, scrapers, crescents, and in some cases groundstone tools for milling plant material. Often projectile points and tools were made from locally procured obsidian, sources of which are not far from the proposed Gold Point SEZ—Montezuma Range, 15 mi (24 km) north of the SEZ, Cave Spring, 35 mi (56 km) northwest of the SEZ, and Silver Peak, 50 mi (80 km) northwest of the SEZ (Fowler and Madsen 1986; NROSL 2009).

The Early Archaic Period in the region began with the recession of most of the pluvial lakes in the area, about 8,000 to 6,000 B.P., and extended until about 4,000 B.P. Archaic Period groups likely congregated around marsh areas that were still extant, but also utilized the vast caves in the mountains of the Great Basin. The settlement system in some areas was likely based around a central base camp, with temporary camps located on the margins of their territory to exploit resources that were not in the immediate vicinity of the base camp. Archaic groups would sometimes perform communal hunts, especially antelope drives, in which antelope were herded into a corral and then shot, and rabbit drives, in which large nets were used. Some of the key Archaic Period sites in the Great Basin region are Gatecliff Shelter and Toquima Cave, near Austin, Nevada, about 150 mi (241 km) north of the SEZ. The archaeological assemblage from the Early Archaic Period maintains some cultural continuity with the previous period, consisting of large notched Elko and Gatecliff points, leaf-shaped bifaces, scrapers, drills, gravers, and manos and metates. A site with an Elko point was identified within a 5-mi (8-km) radius of the proposed Gold Point SEZ (Fowler and Madsen 1986; Neusius and Gross 2007; McGonagle and Waski 1978).

The Middle Archaic Period, 4,000 to 1,500 B.P., is the time of the climatic shift known as the Little Pluvial, a wetter and cooler climate that caused some of the pluvial lakes to re-fill. The cultural material of this time period is similar to that of the Early Archaic, with an increased concentration of millingstones, mortars, and pestles and the appearance of normally perishable items that become well preserved in the arid Great Basin climate, such as wicker baskets, split-twig figurines, duck decoys, and woven sandals (Beck and Jones 2008).

In the vicinity of the proposed Gold Point SEZ, the Late Archaic Period began about 1,500 B.P. and extended until about 800 B.P. Major technological shifts occurred during this period, evidenced by smaller projectile points that were more useful because groups began using bow-and-arrow technology instead of the atlatl and dart technology. There were also changes in subsistence techniques, particularly in the use of horticulture. Around A.D. 1000 Numic-speaking groups migrated into the region; however, the exact timing of these events is unclear and is a subject for further research in the region. These Numic-speaking people were the antecedents of the Northern Paiute and Western Shoshone, and the archaeological assemblage associated with this time period consists of Desert Series projectile points, brown-ware ceramics, unshaped manos and millingstones, incised stones, mortars, pestles, and shell beads. Contemporary Native Americans dispute the separation of periods between the Late Archaic and Numic periods, because they believe that they have been in the area since time immemorial, and see themselves as descendants of all prehistoric people, not just of Numic derivation. The following section describes the cultural history of the time period in greater detail.

11.6.17.1.2 Ethnohistory

The proposed Gold Point SEZ is located in territory most often ascribed to the Western Shoshone (Thomas et al. 1986), but is close to areas used jointly by the Western Shoshone and the Owens Valley branch of the Northern Paiute. Both Shoshone and Paiute speakers lived around modern Lida, 6 mi (10 km) northwest of the proposed SEZ, and Paiute families lived at Pigeon Spring, 14 mi (23 km) west of the SEZ. The families based around Lida joined the Fish Lake Valley Northern Paiute during the pine nut harvest near Pigeon Springs (Steward 1938).

Western Shoshone

The Western Shoshone are a group of ethnically similar Central Numic speakers who traditionally occupied a swath of the central Great Basin stretching from Death Valley in California through central Nevada and northwestern Utah to southeastern Idaho (Thomas et al. 1986), lying primarily within the basin and range province of the Great Basin. The Western Shoshone lived in small groups with rather fluid membership, usually identified with the land on which they were based. Their subsistence base and lifestyle varied with the resources within their traditional range. Groups often established stable base camps near reliable water sources where they could grow crops. From these base camps, they would move seasonally in a flexible round to exploit resources in the surrounding mountains and other areas as they became available. They gathered a wide variety of plant resources, which they supplemented by hunting and fishing (Stoffle et al. 1990; Crum 1994; Fowler 1986; Steward 1938). Pine nuts, available in the mountains, were a storable staple. Pronghorn antelope, bighorn sheep, and mule deer were among the large game animals they hunted, but smaller game, including rodents, birds, and, where available, fish, provided more of the protein in their diet. Groups varied in size and composition with the season. The largest groups gathered for the pine nut harvest, which could include a rabbit or antelope drive as well. Winter villages were usually close to stores of pine nuts.

The Timbisha Shoshone are the proposed SEZ's closest Western Shoshone neighbors. Recognized as a Tribe by the Federal Government in 1983, they remained landless until 2000 when the Timbisha Shoshone Homeland Act granted them lands within Death Valley National Park and four parcels outside the park, including 3,000 acres (12 km^2) outside Lida, Nevada, about 6 mi (10 km) northwest of the SEZ. Additional information on the Western Shoshone may be found in Section 11.1.17.1.2.

Owens Valley Paiute

The Owens Valley Paiute inhabit the valley of the Owens River that parallels the eastern slope of the Sierra Nevada. They speak Mono, a Western Numic language, and are linguistically closely tied to the Northern Paiute (Liljeblad and Fowler 1986). A brief description of the Owens Valley Paiute is given in Section 11.1.17.1.2.

11.6.17.1.3 History

The Great Basin was one of the last areas in the continental United States to be fully explored. The harsh and rugged landscape deterred most European and American explorers until the late eighteenth century. Several early explorers made their way into the southern portion of Nevada by the late eighteenth century, but the area around the proposed Gold Point SEZ was not explored by non-native people until about 1826. Fur trapping was a popular enterprise during this time, and overzealous trappers were quickly depleting their supplies of furs as they moved west in search of further materials. Peter Ogden of the Hudson's Bay Company and Jedidiah Smith of the Rocky Mountain Fur Company were part of two different expeditions that entered Nevada in 1827 and 1826, respectively. These men were seeking new beaver fields, Ogden took a more northerly route through Elko, Pershing, and Humbolt Counties, and Smith entered Nevada near Mesquite and traveled across the southern tip of Nevada into California. When he entered California, Smith was detained by Mexican authorities, as he had entered Mexican territory, and was ordered to go back the way from which he had come. However, he decided to travel farther north into California, being the first non-native person to cross the Sierra Nevada Mountains and entered Nevada just south of Lake Tahoe. From there he crossed the State of Nevada and passed about 50 mi (80 km) north of the proposed Gold Point SEZ. Fur trapping never became a lucrative enterprise in Nevada; however, these trailblazers paved the way for later explorers and mappers, like John C. Frémont. Frémont, a member of the Topographical Engineers, was commissioned to map and report on the Great Basin area in 1843 and 1844. The results of his work gained wide circulation and were of great importance in understanding the topography of the Great Basin, both for official use and by those moving westward to seek new homes and fortunes. Frémont passed about 75 mi (121 km) north of the proposed Gold Point SEZ, at the northern-most point of Esmeralda County, where it meets Mineral and Nye Counties. Another fur trapping party, the Walker-Bonneville party, explored the region in 1833 to 1834. This group also likely explored the lands north of the proposed Gold Point SEZ, on its way to exploring large portions of the Yosemite Valley in California and the Great Basin (Elliott 1973).

Nevada and the Great Basin region have provided a corridor of travel for those seeking to emigrate west. Several heavily traveled trails crossed the region, although none of these trails passes particularly close to the proposed Gold Point SEZ. The Old Spanish Trail was an evolving trail system generally established in the early nineteenth century, but tended to follow previously established paths used by earlier explorers and Native Americans. The 2,700-mi (4,345-km) network of trails passes through six states, beginning in Santa Fe, New Mexico, and ending in Los Angeles, California. The closest portion of the congressionally designated Old Spanish National Historic Trail is about 131 mi (211 km) south of the proposed Gold Point SEZ, as it passes near Las Vegas, Nevada. Mormons also frequently used the Old Spanish Trail in emigrating farther west to Nevada, Arizona, and California, and often the trail is referred to as the Old Spanish Trail/Mormon Road. Other notable trails that crossed Nevada were the California Trail, a trail that followed portions of the Oregon Trail and then broke off from that trail and continued through the northern portion of Nevada along the Humbolt River, about 135 mi (217 km) north of the proposed Gold Point SEZ, until it reached California. The Pony Express Trail, a mail route that connected Saint Joseph, Missouri, to Sacramento, California, entered Nevada, just northeast of Ely, and exited just south of Lake Tahoe, the closest portion being about 145 mi (233 km) north of the SEZ (von Till Warren 1980).

With the ratification of the Treaty of Guadalupe Hidalgo in 1848, closing out the Mexican-American War, the area came under American control. In 1847, the first American settlers arrived in the Great Basin, among them Mormon immigrants under the leadership of Brigham Young, who settled in the Valley of the Great Salt Lake in Utah. They sought to bring the entire Great Basin under their control, establishing an independent State of Deseret. From its center in Salt Lake City, the church sent out colonizers to establish agricultural communities in surrounding valleys and missions to acquire natural resources such as minerals and timber. Relying on irrigation to support their farms, the Mormons often settled in the same places as the Native Americans had centuries before. The result was a scattering of planned agricultural communities from northern Arizona to southern Idaho, and parts of Wyoming, Nevada, and southern California. One of the first Mormon settlements in Nevada was a trading post, located just north of Genoa, Nevada, about 166 mi (267 km) northwest of the SEZ. Established in 1850, this trading post provided supplies for those traversing the California Trail.

Nevada's nickname is the "Silver State," for the 1859 Comstock Lode strike in Virginia City, about 179 mi (288 km) northwest of the proposed Gold Point SEZ. This was the first major silver discovery in the United States, and with the news of the strike, hopeful prospectors flocked to the area in an effort to capitalize on the possible wealth under the surface of the earth. The discovery of the Comstock Lode led to the creation of Virginia City and other nearby towns that served the population influx. The population increase was so dramatic that in 1850 there were fewer than a dozen non-native people in the State of Nevada; by 1860 there were 6,857; and by

1875 an estimated 75,000 people had migrated to the state. The Comstock Lode strike is important to the history of Nevada, not only because of the population growth and significant amount of money that was consequently brought to the area, but also because of several technological innovations that were created and employed in the mines, namely, the use of square-set timbering. This technique kept loose soil from collapsing on miners, a concept that eventually was employed around the world in other mines (Paher 1970).

Mining for valuable deposits occurred in all regions of the State of Nevada, including in the vicinity of the proposed Gold Point SEZ. The closest mine to the SEZ was the Gold Point mine, just 2 mi (3 km) south of the SEZ. The Gold Point mine, originally called the Lime Mine, was mined for its lime deposits. About 1908 the mine adopted the name Hornsilver, as that became the more lucrative mineral for which to mine. More than 225 wooden buildings covered the town, but by 1915 mining had slowed. The mine was purchased by another investor in 1922, and in 1930 when more gold was mined than silver, the town changed its name to Gold Point. By 1942 mining operations ceased, and most of the town was abandoned when workers for the war effort were needed. Other mines and small towns popped up in the mountains surrounding the SEZ at Gold Mountain, 9 mi (14 km) south of the SEZ, Tule Canyon, 9 mi (14 km) west of the SEZ, Lida, 7 mi (11 km) northwest of the SEZ, and Oriental, 10 mi (16 km) south of the SEZ. Goldfield, about 20 mi (32 km) northeast of the SEZ, was one of the single most prosperous gold strikes in the west. Initially discovered in 1902, the mining stampede to the Goldfield area began in 1904, with the most lucrative years 1906 and 1907 producing about $15 million in gold ore (Paher 1970). The Goldfield Historic District is listed in the NRHP.

Nevada's desert-mountain landscape has made it a prime region for use by the U.S. military for several decades. Beginning in October 1940, President Franklin D. Roosevelt established the Las Vegas Bombing and Gunnery Range, a 3.5-million acre (14,164 km^2) parcel of land northwest of Las Vegas, near Indian Springs, Nevada, 107 mi (172 km) southeast of the SEZ. At the start of the Cold War in 1948, the range was renamed Nellis Air Force Base. For the next 41 years testing of nuclear weapons, as well as regular Air Force training missions, occurred throughout the regions of the NTS. The proposed Gold Point SEZ does not fall within the specific boundaries of the NTS and Range; the closest portion of the military installation is about 20 mi (36 km) east. However, the Air Force Base and associated ranges have affected the overall history and context of the region.

11.6.17.1.4 Traditional Cultural Properties—Landscape

The Native Americans whose historical homelands lie within the Great Basin have traditionally tended to take a holistic view of the world. They tend to view the sacred and profane as inextricably intertwined. Landscapes as a whole are often culturally important. Adverse effects on one part damage the whole (Stoffle 2001). From their perspective, landscapes include places of power. Among the most important such places are sources of water; peaks, mountains, and elevated features; caves; distinctive rock formations; and panels of rock art. Places of power are important to the religious beliefs of the Western Shoshone and Paiute. They may be sought out for individual vision quests or healing. The view from such a point of power or the ability to see from one important place to another can be an important element of its integrity (Stoffle and

Zedeño 2001b). Landscapes as a whole are often tied together by a network of culturally important trails (Stoffle and Zedeño 2001a).

The proposed Gold Point SEZ is located in the Lida Valley between Mount Jackson, the Jackson Ridge, Magruder Mountain, and Slate Ridge. Traditionally, Tribal camps in the area were located near springs in the foothills or mountains. Those closest to the proposed SEZ were clustered around Lida, in the area now included in the Timbisha Shoshone Reservation. Other single-family camps with ties to the Lida group were located near springs in Tule Canyon, 10 mi (16 km) southwest of the SEZ; Gold Mountain, 10 mi (16 km) south of the SEZ; Stonewall Mountain, 16 mi (26 km) northeast; Montezuma Peak, 20 mi (33 km) north; and near Goldfield, 25 mi (40 km) northeast. Rockshelters near the mouth of Lida Canyon may have served as a meeting place for these groups and retain cultural significance. These groups hunted game and gathered plant resources in the surrounding hills. Plant or small game resources on the valley floor would have been exploited in season as well. The Lida group managed the vegetation on Magruder Mountain by selective burning to encourage the growth of preferred plants. They traveled through Lida Valley to reach seasonally available resources on Stonewall Flat and in Clayton Canyon near Gold Point (Steward 1938).

Mountain prominences are often culturally important landscape features and may be places of power. Magruder Mountain is reported to have cultural significance for the Timbisha. Project-specific investigations would need to establish cultural importance through consultation with the relevant Native American Tribe(s). Mt. Grant, where the Northern Paiute believe their ancestors emerged (Fowler et al. 1970), is 110 mi (177 km) northwest and is not likely to be visible from the SEZ.

11.6.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources

In the proposed Gold Point SEZ, no surveys have been conducted, and consequently no cultural resources have been identified. However, within 5 mi (8 km) of the SEZ, 18 surveys have been conducted, resulting in the recording of 12 cultural resources. Nine of these sites are prehistoric in nature, two are rockshelters, and seven are isolated flakes or lithic scatters. The other three sites located within 5 mi (8 km) of the SEZ are historic resources (de Dufour 2009). One of these sites is a mill site, and another is the Gold Point mining camp and associated buildings, which has been determined to be eligible for listing in the NRHP. The other historic site is an historic Native American meeting place and medicine making area, referred to as "medicine rock." Historic mining debris was also documented at the site.

The proposed Gold Point SEZ has potential to yield significant cultural resources, especially those related to historical mining operations that took place in the vicinity of the SEZ. Prehistoric resources are not as likely to be encountered in the vicinity of the SEZ.

The BLM has also designated several locations within 50 mi (80 km) of the proposed Gold Point SEZ as cultural resources that should be managed for conservation (BLM 1997); these areas include significant petroglyph sites.

National Register of Historic Places

There are no historic properties listed in the NRHP in the SEZ or within 5 mi (8 km) of the SEZ. However, the Gold Point town site, 2 mi (3 km) south of the proposed Gold Point SEZ, has been determined to be eligible for listing in the NRHP. The rockshelters mentioned above, if grouped as a district with several other nearby sites, could be considered eligible for listing in the NRHP as well.

The county of Esmeralda maintains only one property in the NRHP, the Goldfield Historic District, about 21 mi (34 km) northeast of the proposed Gold Point SEZ. The only other NRHP property in the vicinity of the SEZ is the Death Valley Scotty Historic District, 25 mi (40 km) south of the SEZ in Inyo County, California.

11.6.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Gold Point SEZ; however, further investigation is needed, because no cultural resource surveys have been conducted within the boundaries of the SEZ. The area around the proposed Gold Point SEZ has the potential to provide significant resources related to historic mining operations. A cultural resource survey of the entire APE, including consultation with Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. Section 5.15 discusses the types of effects that could occur on any significant cultural resources found within the proposed Gold Point SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur. No traditional properties have been identified to date within the vicinity of the SEZ.

Indirect impacts on cultural resources that result from erosion outside of the SEZ boundary (including along ROWs) are unlikely, assuming programmatic design features to reduce water runoff and sedimentation are implemented (as described in Appendix A, Section A.2.2).

The Gold Point town site is in view of the SEZ. Depending on the full range of reasons for its eligibility for listing in the NRHP, visual impacts on this property are likely as a result of solar energy development in the valley below.

The nearest transmission line is about 22 mi (35 km) northeast of the proposed Gold Point SEZ, and the construction of a new transmission line to connect to this one would result in the disturbance of 667 acres (2.7 km^2). Four sites that are potentially eligible for inclusion in the NRHP and three additional sites that have not been evaluated for NRHP inclusion could potentially be affected either directly or indirectly, depending on the exact location of the line. One site is a multicomponent site consisting of multiple prehistoric lithic scatters, a circular rock alignment, petroglyphs, historic shelters/lean-tos, and associated historic debris; another site is an historic and modern dump associated with the town of Goldfield that could possibly be affected with construction of the transmission line. A prehistoric campsite could also be affected by this transmission line. Another site is a potentially eligible multicomponent site, made up of petroglyphs, a lithic scatter, and an historic coyote trap. Visual impacts on the Goldfield Historic District are also possible. Indirect impacts, such as vandalism or theft, could occur if significant resources are close to the transmission ROW. The nearest access road is NV 774, and it runs adjacent to the SEZ, so no further construction for access is anticipated assuming this road would be used. Programmatic design features assume that the necessary surveys, evaluations, and consultations for the ROWs will occur, as with the project footprint within the SEZ. Impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

11.6.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations. SEZ-specific design features could include:

- Implementation of design features to address visual impacts discussed in Section 11.6.14 and in the programmatic design features listed in Appendix A, Section A.2.2, would help to mitigate visual impacts on the Gold Point town site from development in the SEZ and on the Goldfield Historic District as a result of transmission line construction.

11.6.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns specific to Native Americans and to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Gold Point SEZ, Section 11.6.17 discusses archaeological sites, historic structures, landscapes, and traditional cultural properties; Section 11.6.8 discusses mineral resources; Section 11.6.9.1.3 discusses water rights and water use; Section 11.6.10 discusses plant species; Section 11.6.11 discusses wildlife species, including wildlife migration patterns; Section 11.6.13 discusses air quality; Section 11.6.14 discusses visual resources; Sections 11.6.19 and 11.6.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21.

11.6.18.1 Affected Environment

The proposed Gold Point SEZ falls within the Tribal traditional use area generally attributed to the Western Shoshone (Liljeblad and Fowler 1986) and is within the area recognized as traditionally belonging to the Western Shoshone by the Indian Claims Commission (Clemmer and Stewart 1986). Lying near the northwestern edge of Western Shoshone territory, the SEZ was also accessible to the Owens Valley branch of the Northern Paiutes, who were neighbors of and on friendly terms with the Western Shoshone (Steward 1938). All federally recognized Tribes with Western Shoshone or Owens Valley Paiute roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 11.6.18.1-1. Details of government-to-government consultation efforts are presented in Chapter 14; a list of all federally recognized Tribes contacted for this PEIS is given in Appendix K.

11.6.18.1.1 Territorial Boundaries

Western Shoshone

The Western Shoshone traditionally occupied a swath of the central Great Basin stretching from Death Valley in California through central Nevada and northwestern Utah to southeastern Idaho (Thomas et al. 1986). The proposed Gold Point SEZ lies near the northwestern periphery of the Shoshone traditional range, where Shoshone territory blends into Owens Valley Paiute territory. The closest Western Shoshone reservation is that of the Timbisha Shoshone. The Timbisha Shoshone Homeland Act of 2000 provided the Timbisha with a discontinuous reservation that includes parcels of land at Furnace Creek in Death Valley National Park; Death Valley Junction, California; Centennial, California; Scotty's Junction, Nevada; and Lida, Nevada. The parcel near Lida is only 6 mi (10 km) northwest of the proposed Gold Point SEZ.

TABLE 11.6.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed Gold Point SEZ

Tribe	Location	State
Benton Paiute-Shoshone Tribe	Benton	California
Big Pine Paiute Tribe	Big Pine	California
Bishop Paiute Tribe	Bishop	California
Bridgeport Indian Colony	Bridgeport	California
Duck Valley Shoshone-Paiute Tribes	Owyhee	Nevada
Duckwater Shoshone Tribe	Duckwater	Nevada
Ely Shoshone Tribe	Ely	Nevada
Lone Pine Paiute-Shoshone Tribe	Lone Pine	California
Reno-Sparks Indian Colony	Reno	Nevada
Te-Moak Tribe of Western Shoshone	Elko	Nevada
Timbisha Shoshone Tribe	Death Valley	California
Yomba Shoshone Tribe	Austin	Nevada

Owens Valley Paiutes

The Owens Valley Paiutes occupy five relatively small reservations within Owens Valley in Inyo and Mono Counties, California, west of the proposed SEZ. Their traditional use area ranged from the headwaters of the Owens River near Benton, California, southward to Owens Lake. They shared the shores of Owens Lake with Western Shoshone groups. The Indian Claims Commission placed Owens Valley within the traditional territory of the Northern Paiutes, with whom the Owens Valley Tribes are linked linguistically (Liljeblad and Fowler 1986; Clemmer and Stewart 1986; Royster 2008).

11.6.18.1.2 Plant Resources

Native Americans continue to make use of a wide range of indigenous plants for food, medicine, construction materials, and other uses. Although the proposed SEZ is sparsely vegetated, some species traditionally used by Native Americans have been observed or are possible in the proposed SEZ. The vegetation present at the proposed Gold Point SEZ is described in Section 11.6.10. In general, the vegetation consists of widely spaced low shrubs. The vegetation cover types present at the SEZ are all part of the Inter-mountain Basin series. Mixed Salt Desert Scrub dominates, but there are substantial areas of Greasewood Flat, smaller amounts of Playa, and a sprinkling of Semi-desert Shrub Steppe. The proposed transmission line corridor would extend from the proposed SEZ to Goldfield, crossing the Mount Jackson Ridge and following the line of the Goldfield Hills. At these somewhat higher elevations with rolling hills, Big Sagebrush Shrubland and Xeric Mixed Sagebrush Shrubland would be encountered. Plant species in these cover types have much in common with those found in the SEZ. They would include a wider variety of sagebrush, seed-bearing grasses, and possibly juniper trees (USGS 2005b). As shown in Table 11.6.18.1-2, there are some plants found in the SEZ and along the transmission corridor that have been traditionally used by Native Americans for food

TABLE 11.6.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Gold Point SEZ

Common Name	Scientific Name	Status
Food		
Basin wildrye	*Leymus cinerus*	Possible
Beavertail prickly pear	*Opuntia basilaris*	Observed
Buckwheat	*Eriognum* spp.	Observed
Dropseed	*Sporobolus airoides*	Possible
Galleta	*Pleuraphis jamesii*	Possible
Joshua tree	*Yucca brevifolia*	Observed
Nevada bluegrass	*Poa Secunda*	Possible
Sagebrush	*Artemisia* spp.	Possible
Saltbush	*Atriplex* spp.	Observed
Spikerush	*Eleocharis palustris*	Possible
Wheatgrass	*Elymus lanceolatus*	Possible
Wolfberry	*Lycium andersonii*	Possible
Medicine		
Mormon tea	*Ephedra nevadensis*	Possible
Saltbush	*Atriplex* spp.	Observed

Sources: Field visit; USGS (2005b); Steward (1938); Fowler (1986).

and medicine (Steward 1938; Fowler 1986). However, project-specific analyses will be needed to determine their presence at any proposed development site. The importance of any stand to Native Americans must be determined in consultation with the affected Tribe(s). For this proposed SEZ, the Timbisha are likely to be the most directly affected. Magruder Mountain, on the western end of the valley, has traditionally been an important place for gathering plant resources. Western Shoshone families living in the Lida area would burn the brush on its slopes to create a better environment for preferred food plants including wheatgrass (Steward 1938).

11.6.18.1.3 Other Resources

Water is an essential prerequisite for life in the arid areas of the Great Basin. As a result, it is a keystone of many desert cultures' religions. Desert cultures tend to consider all water sacred and a purifying agent. Water sources are often associated with rock art. Springs are often associated with powerful beings, and hot springs in particular figure prominently in Owens Valley Paiute creation stories. Water sources are seen as connected; damage to one source damages all (Stoffle and Zedeño 2001a). Tribes are also sensitive about the use of scarce local water supplies for the benefit of distant communities and recommend that determination of adequate water supplies be a primary consideration as to whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

Wildlife likely to be found in the proposed Gold Point SEZ is described in Section 11.6.11. Species traditionally hunted by local Native Americans whose range includes the SEZ are listed in Table 11.6.18.1-3. Most of these are small animals and birds common throughout much of the great basin. Traditionally important large game animals include mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), and pronghorn (*Antilocapra americana*) (Steward 1938). Pronghorn are possible, but not common, in Lida Valley. Bighorn sheep mostly occur father north (BLM 1994). The proposed SEZ and transmission corridor are within the range of mule deer.

11.6.18.2 Impacts

In the past, the Western Shoshone and Owens Valley Paiutes have expressed concern over project impacts on a variety of resources. They tend to take a holistic view of their

TABLE 11.6.18.1-3 Animal Species used by Native Americans as Food Whose Range Includes the Proposed Gold Point SEZ

Common Name	Scientific Name	Status
Mammals		
Badger	*Taxidea taxus*	All year
Black-tailed jackrabbit	*Lepus californicus*	All year
Chipmunk	*Tamias* spp.	All year
Cottontail	*Silvilagus* spp.	All year
Coyote	*Canis latrans*	All year
Gray fox	*Urocyon cinereoargenteus*	All year
Kangaroo rat	*Dipodomys* spp.	All year
Kit fox	*Vulpes macotis*	All year
Mule deer	*Odocoileus hemionus*	All year
Pocket mouse	*Perognathus* spp.	All year
Porcupine	*Erethizon dorsatum*	All year
White-tailed antelope squirrel	*Ammospermophilus leucurus*	All year
Wood rat	*Neotoma* spp.	All year
Birds		
Burrowing owl	*Athene cunicular*	Summer
Common raven	*Corvus corax*	All year
Ferruginous hawk	*Buteo regalis*	Winter
Golden eagle	*Aquila chrysaetos*	All year
Great horned owl	*Bubo virginianus*	All year
Northern mockingbird	*Mimus polyglottos*	All year
Reptiles		
Western rattlesnake	*Crotalus viridis*	All year
Desert horned-lizard	*Phrynosoma platyrhinos*	All year

Sources: Field visit; USGS (2005b); Steward (1938); Fowler (1986).

traditional homelands. For them, cultural and natural features are inextricably bound together. Western distinctions between the sacred and the secular have no meaning in their traditional worldview. Impacts on one part are seen as having ripple effects on the whole (Stoffle and Zedeño 2001b). While no comments specific to the proposed Gold Point SEZ have been received from Native American Tribes to date, the Big Pine Paiute Tribe of the Owens Valley has commented on the scope of the PEIS. The Tribe recommends that the BLM preserve undisturbed lands intact and that recently disturbed lands, such as abandoned farm fields, rail yards, mines, and airfields, be given primary consideration for solar energy development (Moose 2009).

Potential impacts on existing water supplies are also a primary concern (Moose 2009). There are springs located throughout the hills that surround Lida Valley. Excessive drawdown of groundwater for the construction and operation of solar energy facilities could reduce or eliminate the flow from these culturally important resources.

During energy development projects in adjacent areas, other Great Basin Tribes have expressed concern over adverse effects on a wide range of resources. Among these are geophysical features and physical cultural remains. Known resources of this type in the area of the proposed Gold Point SEZ are discussed in Section 11.6.17.1.4. Such places are often seen as important because they are thought to be places of power. They are often the location of or have ready access to a variety of plant, animal, and mineral resources (Stoffle et al. 1997). Resources that Native Americans have identified as important include food plants, medicinal plants, plants used in basketry, and plants used in construction; game animals and birds; and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those likely to be found within the proposed Gold Point SEZ are discussed in Section 11.6.18.1.

In the past, the mountains and hills surrounding the Lida Valley have been the sites of Western Shoshone camps and villages (Steward 1938; Thomas et al. 1986). The valley floor where the SEZ would be located appears to have been a travel corridor, not a habitation area. The valley floor is sparsely vegetated; however, food plants traditionally used by the Shoshone have been observed there. It is likely that the Shoshone in the surrounding hills made seasonal use of the flora on the valley floor. An early ethnography reported great quantities of wolfberries (*Lycium* sp.) growing near Gold Point were gathered by local Tribal groups (Steward 1938).

The construction of solar energy facilities in the proposed SEZ will result in the elimination of some plants traditionally used by Native Americans. Consultation with affected Tribes will be necessary to determine whether or not traditional plant resources are present in significant amounts at a proposed project site. Lida Valley is also within the range of a number of traditional Native American game species. Construction of solar facilities will eliminate some habitat for these species. For the most part, these species are common throughout the area (see Section 11.6.11). Project-specific consultation with Western Shoshone and Northern Paiute Tribes will be required to determine whether the resources present at the proposed SEZ are significant.

As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concern over potential visual, acoustic, and other effects of solar energy development within the SEZ on specific resources, including culturally important landscapes.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on tribes' reserved water rights and the potential for groundwater contamination issues.

11.6.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features that would address impacts of potential concern to Native Americans, such as avoidance of sacred sites, water sources, and tribally important plant and animal species are provided in Appendix A, Section A.2.2. Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 11.6.17.3, in addition to the programmatic design features for historic properties presented in Appendix A, Section A.2.2.

The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with affected Tribes listed in Table 11.6.18.1-1.

11.6.19 Socioeconomics

11.6.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Gold Point SEZ. The ROI is a two-county area comprising Esmeralda and Nye Counties in Nevada. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

11.6.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 16,484 (Table 11.6.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was 0.5% in Nye County and −2.7% in Esmeralda County. At 0.4%, the growth rate in the ROI as a whole was lower than the average rate for the entire state (2.7%).

In the ROI in 2006, the services sector provided the highest percentage of employment at 47.6%, followed by wholesale and retail trade at 19.3%, with a smaller employment shares held by construction (10.2%) and mining (8.3%) (Table 11.6.19.1-2).

11.6.19.1.2 ROI Unemployment

The average unemployment rate in Nye County over the period 1999 to 2008 was 6.9%, higher than the 6.1% rate for Esmeralda County (Table 11.6.19.1-3). The average rate in the

TABLE 11.6.19.1-1 ROI Employment in the Proposed Gold Point SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Esmeralda County	590	448	–2.7
Nye County	15,325	16,036	0.5
ROI	15,915	16,484	0.4
Nevada	978,969	1,282,012	2.7

Sources: U.S. Department of Labor (2009a,b).

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TABLE 11.6.19.1-2 2006 Employment by Sector in the ROI for the Proposed Gold Point SEZ

	Esmeralda County		Nye County		ROI	
Industry	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	10	7.0	325	3.6	335	3.7
Mining	10	7.0	750	8.3	760	8.3
Construction	10	7.0	925	10.2	935	10.2
Manufacturing	60	42.0	329	3.6	389	4.2
Transportation and public utilities	20	14.0	292	3.2	312	3.4
Wholesale and retail trade	60	42.0	1,714	19.0	1,774	19.3
Finance, insurance, and real estate	0	0.0	328	3.6	328	3.6
Services	30	21.0	4,340	48.1	4,370	47.6
Other	0	0.0	0	0.0	0	0
Total	143		9,029		9,172	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009).

TABLE 11.6.19.1-3 Unemployment Rates in the ROI for the Proposed Gold Point SEZ (%)

Location	1999–2008	2008	2009[a]
Esmeralda County	6.1	5.1	8.4
Nye County	6.9	9.7	14.3
ROI	6.9	9.6	14.2
Nevada	5.0	6.7	11.0

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

ROI as a whole over this period was 6.9%, higher than the average rate for Nevada (5.0%). Unemployment rates for the first 11 months of 2009 contrast with rates for 2008 as a whole; in Nye County, the unemployment rate increased to 14.3%, and in Esmeralda County to 8.4%. The average rates for the ROI (14.2%) and for Nevada as a whole (11.0%) were also higher during this period than the corresponding average rates for 2008.

11.6.19.1.3 ROI Urban Population and Income

There are no incorporated places in the ROI and, consequently, no urban population or income.

11.6.19.1.4 ROI Population

Table 11.6.19.1-4 presents recent and projected populations in the ROI and for the state as a whole. Population in the ROI stood at 44,839 in 2008, having grown at an average annual rate of 3.7% since 2000. Growth rates for the ROI were higher than those for the entire state (3.4%) over the same period. Only one of the two counties in the ROI experienced growth in population between 2000 and 2008; population in Nye County grew at an annual rate of 3.9%, while in Esmeralda County population fell at −4.6%. The ROI population is expected to increase to 78,122 by 2021 and to 80,872 by 2023.

11.6.19.1.5 ROI Income

Total personal income in the ROI stood at $1.4 billion in 2007 and has grown at an annual average rate of 4.7% over the period 1998 to 2007 (Table 11.6.19.1-5). Per-capita income

TABLE 11.6.19.1-4 ROI Population for the Proposed Gold Point SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Esmeralda County	971	664	–4.6	1,387	1,420
Nye County	32,485	44,175	3.9	76,735	79,452
ROI	33,456	44,839	3.7	78,122	80,872
Nevada	1,998,257	2,615,772	3.4	3,675,890	3,779,745

Sources: U.S. Bureau of the Census (2009d,e); Nevada State Demographers Office (2008).

TABLE 11.6.19.1-5 ROI Personal Income for the Proposed Gold Point SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Esmeralda County			
Total income ($ billion 2008)	<0.05	<0.05	0.2
Per-capita income ($)	26,781	41,370	4.4
Nye County			
Total income ($ billion 2008)	0.9	1.4	4.8
Per-capita income ($)	28,857	31,836	1.0
ROI			
Total income ($ billion 2008)	0.9	1.4	4.7
Per-capita income ($)	28,788	31,983	1.1
Nevada			
Total income ($ billion 2008)	68.9	105.3	4.3
Per-capita income ($)	37,188	41,022	1.0

Sources: U.S. Department of Commerce (2009); U.S. Bureau of the Census (2009d,e).

also rose over the same period at a rate of 1.1%, increasing from $28,788 to $31,983. Per-capita incomes were higher in Esmeralda County ($41,370) than in Nye County ($31,836) in 2007. Growth rates in total personal income have been higher in Nye County than in Esmeralda County. Personal income growth rates in the ROI (4.7%) were higher than the rate for Nevada (4.3%), while per-capita income growth rates in the two counties were slightly lower (Esmeralda County) or much lower (Nye County) than in Nevada as a whole (1.0%).

Median household income in 2006 to 2008 varied from $42,275 in Nye County to $42,749 in Esmeralda County (U.S. Bureau of the Census 2009c).

11.6.19.1.6 ROI Housing

In 2007, more than 17,400 housing units were located in the two ROI counties, with about 95% of these located in Nye County (Table 11.6.19.1-6). Owner-occupied units account for about 72% of the occupied units in the two counties, with rental housing making up 28% of the total. Vacancy rates in 2007 were 45.4% in Esmeralda County and 19.3% in Nye County; with an overall vacancy rate of 20.6%. In 2007, 3,591 housing units in the ROI were vacant, of which 1,014 are estimated to be rental units that would be available to construction workers. There were 641 units in seasonal, recreational, or occasional use in the ROI at the time of the 2000 Census, with 9.5% of housing units in Esmeralda County and 3.5% in Nye County used for seasonal or recreational purposes.

Housing stock in the ROI as a whole grew at an annual rate of 0.6% over the period 2000 to 2007, with 682 new units added (Table 11.6.19.1-6).

The median value of owner-occupied housing in 2006 to 2008 varied from $75,600 in Esmeralda County to $122,100 in Nye County (U.S. Bureau of the Census 2009f).

11.6.19.1.7 ROI Local Government Organizations

The various local, county, and Tribal government organizations in the ROI are listed in Table 11.6.19.1-7. Although there are no Tribal government located in the ROI, members of other Tribal groups whose Tribal governments are located in adjacent counties or states reside in the ROI.

11.6.19.1.8 ROI Community and Social Services

This section describes educational, health-care, law enforcement, and firefighting resources in the ROI.

Schools

In 2007, the two-county ROI had a total of 28 public and private elementary, middle, and high schools (NCES 2009). Table 11.6.19.1-8 provides summary statistics for enrollment and

TABLE 11.6.19.1-6 Housing Characteristics in the ROI for the Proposed Gold Point SEZ

Parameter	2000	2007[a]
Esmeralda County		
Owner-occupied	305	314
Rental	150	154
Vacant units	378	389
Seasonal and recreational use	79	NA[b]
Total units	833	857
Nye County		
Owner-occupied	10,167	9,630
Rental	3,142	3,760
Vacant units	2,625	3,202
Seasonal and recreational use	562	NA
Total units	15,934	16,592
ROI		
Owner-occupied	10,472	9,944
Rental	3,292	3,914
Vacant units	3,003	3,591
Seasonal and recreational use	641	NA
Total units	16,767	17,449

[a] 2007 data for number of owner-occupied, rental, and vacant units for Esmeralda County and Nye County are not available; data are based on 2007 total housing units and 2000 data on housing tenure.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009g-i).

TABLE 11.6.19.1-7 Local Government Organizations and Social Institutions in the ROI for the Proposed Gold Point SEZ

Governments	
City	
None	
County	
Esmeralda County	Nye County
Tribal	
None	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of Interior (2010).

TABLE 11.6.19.1-8 School District Data in the ROI for the Proposed Gold Point SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Esmeralda County	77	8	9.6	11.6
Nye County	6,427	396	16.2	9.0
ROI	6,504	404	16.1	9.0

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

educational staffing and two indices of educational quality–student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Nye County schools (16.2) is higher than that in Esmeralda County schools (9.6), while the level of service is higher in Esmeralda County (11.6) than elsewhere in the ROI, where there are fewer teachers per 1,000 population.

Health Care

The total number of physicians in Nye County is 41, while the number of physicians per 1,000 population is 0.9. No data are available for Esmeralda County (Table 11.6.19.1-9).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 11.6.19.1-10). Esmeralda County has 10 officers and would provide law enforcement

TABLE 11.6.19.1-9 Physicians in the Proposed Gold Point SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Esmeralda County	0	--
Nye County	41	0.9
ROI	41	0.9

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

TABLE 11.6.19.1-10 Public Safety Employment in the Proposed Gold Point SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Esmeralda County	10	14.5	0	0.0
Nye County	104	2.4	82	1.9
ROI	114	2.6	82	1.8

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

services to the SEZ; there are 104 officers in Nye County. Levels of service of police protection are 14.5 officers per 1,000 population in Esmeralda County and 2.4 in Nye County. Currently, there are 114 professional firefighters in the ROI (Table 11.6.19.1-10).

11.6.19.1.9 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population in smaller rural communities is between 5 and 15%, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism and illicit drug use, mental health, and divorce, which might be used as indicators of social change, are presented in Tables 11.6.19.1-11 and 11.6.19-1.12, respectively.

Some variation in the level of crime exists across the ROI, with a higher rate of violent crime in Esmeralda County (4.5 crimes per 1,000 population) than in Nye County (2.8) (Table 11.6.19.1-11). Property-related crime rates are higher in Nye County (20.2) than in Esmeralda County (15.1); overall crime rates in Nye County (23.0) were higher than in Esmeralda County (19.6).

TABLE 11.6.19.1-11 County and ROI Crime Rates for the Proposed Gold Point SEZ[a]

Location	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
Esmeralda County	3	4.5	10	15.1	13	19.6
Nye County	124	2.8	892	20.2	1,016	23.0
ROI	127	2.8	902	20.1	1,029	22.9

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 11.6.19.1-12 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Gold Point SEZ ROI[a]

Geographic Area	Alcoholism[a]	Illicit Drug Use[a]	Mental Health[b]	Divorce[c]
Nevada Rural (includes Esmeralda County and Nye County)	8.0	2.7	9.5	NA[d]
Nevada				6.5

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] NA = data not available.

Sources: SAMHSA (2009); CDC (2009).

Data on other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located (Table 11.6.19.1-12).

11.6.19.1.10 ROI Recreation

Various areas in the vicinity of the proposed Gold Point Mountain SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 11.6.5.

Because information the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method of assessing recreational use is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities formed an important part of the economy of the ROI. In 2007, 1,617 people were employed in the ROI in the various sectors identified as recreation-related, constituting 9.5% of total ROI employment (Table 11.6.19.1-13). Recreation spending also produced more than $35.4 million in

TABLE 11.6.19.1-13 Recreation Sector Activity in the Proposed Gold Point SEZ ROI, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	105	3.8
Automotive rental	13	0.4
Eating and drinking places	814	14.7
Hotels and lodging places	565	13.9
Museums and historic sites,	0	0.0
Recreational vehicle parks and campsites	54	1.5
Scenic tours	37	1.0
Sporting goods retailers	29	0.3
Total ROI	1,617	35.4

Source: MIG, Inc. (2010).

income in the ROI in 2007. The primary sources of recreation-related employment were hotels and lodging places and eating and drinking places.

11.6.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation, social change, and livestock grazing. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of projects employing various solar energy technologies are analyzed in detail in subsequent sections.

11.6.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries and on procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulated through the economy of the state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy facilities are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic, because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar development in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodations otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy development in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, insufficient evidence exists to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, and delinquency and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 2.3% in regional population during construction of the trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families and insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar development are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

Livestock Grazing Impacts

*C*attle ranching and farming supported 80 jobs and $1.7 million in income in the ROI in 2007 (MIG, Inc. 2010). The construction and operation of solar facilities in the SEZ could result in a decline in the amount of land available for livestock grazing. However, because the amount of acreage that would be used in the proposed SEZ would be small compared to the overall size of locally affected land allotments, acreage loss would not have a significant impact on overall grazing operations, with livestock management changes or the provision of additional livestock management facilities, meaning that no loss of AUMs is anticipated.

Transmission Line Impacts

The impacts of transmission line construction could include the addition of 79 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 11.6.19.2-1). Construction activities in the peak year would constitute less than 0.1% of total ROI employment. A transmission line would also produce $3.7 million in income. Direct sales taxes would be $0.1 million.

Given the likelihood of local worker availability in the required occupational categories, construction of a transmission line would mean that some in-migration of workers and their families from outside the ROI would be required, with 116 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 58 rental units expected to be occupied in

TABLE 11.6.19.2-1 Proposed Gold Point SEZ ROI Socioeconomic Impacts of Transmission Line Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	46	<1
Total	79	<1
Income ($ million 2008)		
Total	3.7	<0.1
Direct state taxes ($ million 2008)		
Sales	0.1	<0.1
In-migrants (no.)	116	0
Vacant housing[b] (no.)	58	0
Local community service employment (no.)		
Teachers	1	0
Physicians	0	0
Public safety	1	0

[a] Construction impacts assume 22 mi [35 km] of transmission line is required to connect SEZ solar facilities to the grid. Construction impacts were assessed for a single representative year, 2021.

[b] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

the ROI. This occupancy rate would represent less than 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). Accordingly, one new teacher and one new public safety employee would be required in order to meet existing levels of service in the ROI.

Total operations employment impacts on the ROI (including direct and indirect impacts) of a transmission line would be less than 1 job (Table 11.6.19.2-2) and would also produce less than $0.1 million in income. Direct sales taxes would be less than $0.1 million. Operation of a transmission line would not require the in-migration of workers and their families from outside the ROI; consequently, no impacts on housing markets in the ROI would be expected, and no new community service employment would be required in order to meet existing levels of service in the ROI.

11.6.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales), BLM acreage rental and capacity payments, population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are provided in Appendix M.

The assessment of the impact of the construction and operation of each solar technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of one project could be constructed within a given year, with a corresponding maximum land disturbance of up to 3,000 acres (12 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower, 2022 for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period, because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 2,287 jobs

(Table 11.6.19.2-2). Construction activities would constitute 8.0% of total ROI employment. A solar facility would also produce $138.9 million in income and $0.1 million in direct sales taxes.

Based on the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 1,827 persons in-migrating into the ROI. The relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would be expected to be large, with 914 rental units expected to be occupied in the ROI. This occupancy rate would represent 51.6% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 16 new teachers, 2 physicians, and 8 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 2.3% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 224 jobs (Table 11.6.19.2-2). Such a solar facility would also produce $7.6 million in income and $0.1 million in direct sales taxes. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $0.3 million, and solar generating capacity payments would total at least $5.1 million.

Based on the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 107 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 96 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

TABLE 11.6.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Gold Point SEZ with Trough Facilities

Parameter	Maximum Annual Construction Impacts[a]	Operations Impacts[b]
Employment (no.)		
Direct	1,641	168
Total	2,287	224
Income ($ million 2008)		
Total	138.9	7.6
Direct state taxes[c] ($ million 2008)		
Sales	0.1	0.1
BLM payments ($ million 2008)		
Rental	NA	0.3
Capacity[d]	NA	5.1
In-migrants (no.)	1,827	107
Vacant housing[f] (no.)	914	96
Local community service employment		
Teachers (no.)	16	1
Physicians (no.)	2	0
Public safety (no.)	8	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 600 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 770 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 911 jobs (Table 11.6.19.2-3). Construction activities would constitute 3.2% of total ROI employment. Such a solar facility would also produce $55.3 million in income and less than $0.1 million in direct sales taxes.

Based on the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 728 persons in-migrating into the ROI. The relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 364 rental units expected to be occupied in the ROI. This occupancy rate would represent 20.6% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, seven new teachers, one physician, and three public safety employees would be required in the ROI. These increases would represent 0.9% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 106 jobs (Table 11.6.19.2-3). Such a solar facility would also produce $3.4 million in income. Direct sales taxes would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $0.3 million, and solar generating capacity payments would total at least $2.8 million.

Based on the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 55 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 50 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

TABLE 11.6.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Gold Point SEZ with Power Tower Facilities

Parameter	Maximum Annual Construction Impacts[a]	Operations Impacts[b]
Employment (no.)		
Direct	654	87
Total	911	106
Income ($ million 2008)		
Total	55.3	3.4
Direct state taxes[c] ($ million 2008)		
Sales	<0.1	<0.1
BLM payments ($ million 2008)		
Rental	NA	0.3
Capacity[d]	NA	2.8
In-migrants (no.)	728	55
Vacant housing[f] (no.)	364	50
Local community service employment		
Teachers (no.)	7	0
Physicians (no.)	1	0
Public safety (no.)	3	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 428 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

1

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 370 jobs (Table 11.6.19.2-4). Construction activities would constitute 1.3% of total ROI employment. Such a solar facility would also produce $22.5 million in income and less than $0.1 million in direct sales taxes.

Based on the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 296 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 148 rental units expected to be occupied in the ROI. This occupancy rate would represent 8.4% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, three new teachers, and one public safety employees would be required in the ROI. These increases would represent less than 0.4% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 103 jobs (Table 11.6.19.2-4). Such a solar facility would also produce $3.4 million in income and less than $0.1 million in direct sales taxes. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $0.3 million, and solar generating capacity payments would total at least $2.8 million.

Based on the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 54 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 48 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

TABLE 11.6.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Gold Point SEZ with Dish Engine Facilities

Parameter	Maximum Annual Construction Impacts[a]	Operations Impacts[b]
Employment (no.)		
Direct	266	84
Total	370	103
Income ($ million 2008)		
Total	22.5	3.4
Direct state taxes[c] ($ million 2008)		
Sales	<0.1	<0.1
BLM payments ($ million 2008)		
Rental	NA	0.3
Capacity[d]	NA	2.8
In-migrants (no.)	296	54
Vacant housing[f] (no.)	148	48
Local community service employment		
Teachers (no.)	3	0
Physicians (no.)	0	0
Public safety (no.)	1	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 428 MW.

c Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

d Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 173 jobs (Table 11.6.19.2-5). Construction activities would constitute 0.6% of total ROI employment. Such a solar development would also produce $10.5 million in income and less than $0.1 million in direct sales taxes.

Based on the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 138 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 69 rental units expected to be occupied in the ROI. This occupancy rate would represent 3.9% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher and one public safety employee would be required in the ROI. This increase would represent less than 0.2% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 10 jobs (Table 11.6.19.2-5). Such a solar facility would also produce $0.3 million in income and less than $0.1 million in direct sales taxes. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $0.3 million, and solar generating capacity payments would total $2.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with five persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with five owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

TABLE 11.6.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Gold Point SEZ with PV Facilities

Parameter	Maximum Annual Construction Impacts[a]	Operations Impacts[b]
Employment (no.)		
Direct	124	8
Total	173	10
Income ($ million 2008)		
Total	10.5	0.3
Direct state taxes[c] ($ million 2008)		
Sales	<0.1	<0.1
BLM payments ($ million 2008)		
Rental	NA	0.3
Capacity[d]	NA	2.2
In-migrants (no.)	138	5
Vacant housing[f] (no.)	69	5
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built.
Operations impacts were based on full build-out of the site, producing a total output of 428 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing..

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

11.6.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the Gold Point SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

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11.6.20 Environmental Justice

11.6.20.1 Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register*, Volume 59, page 7629, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from any phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009j,k). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons who identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origin may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009j).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income.** Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009k).

The data in Table 11.6.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

Minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Nevada, 18.7% of the population is classified as minority, while 9.8% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area and does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the Nevada portion of the SEZ area.

In the California portion of the 50-mi (80-km) radius, 14.6% of the population is classified as minority, while 11.9% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the California portion of the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or

TABLE 11.6.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Gold Point SEZ

Parameter	California	Nevada
Total population	3,800	4,966
White, non-Hispanic	3,089	4,243
Hispanic or Latino	391	370
Non-Hispanic or Latino minorities	320	353
One race	247	206
Black or African American	5	56
American Indian or Alaskan Native	207	96
Asian	21	27
Native Hawaiian or Other Pacific Islander	9	10
Some other race	5	17
Two or more races	73	147
Total minority	711	723
Low-income	372	589
Percentage minority	18.7	14.6
State percentage minority	53.3	34.8
Percentage low-income	9.8	11.9
State percentage low-income	14.2	10.5

Source: U.S. Bureau of the Census (2009j,k).

more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ area.

11.6.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts would be minimized through the implementation of the programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed SEZ include noise and dust during the construction; noise and EMF effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Impacts are likely to be small, however, and there are no minority or low-income populations, as defined by CEQ guidelines (Section 11.6.20.1), within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects could not disproportionately affect minority or low-income populations.

11.6.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Gold Point SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

11.6.21 Transportation

The proposed Gold Point SEZ is accessible by road. One U.S. highway serves the immediate area. The nearest railroad access is about 160 mi (257 km) away. Four small airports serve the area within a drive of about 91 mi (146 km). General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

11.6.21.1 Affected Environment

U.S. 95 extends north to south as it passes within 9 mi (14 km) east of the proposed Gold Point SEZ, as shown in Figure 11.6.21.1-1. The small town of Tonopah is about 50 mi (80 km) north of the SEZ along U.S. 95. I-80 is about 250 mi (400 km) northwest of the SEZ at its closest approach. Southeast of the SEZ, U.S. 95 passes through Beatty, about 60 mi (97 km) away, on its way to the Las Vegas metropolitan area, a distance of about 180 mi (290 km) from the SEZ. As seen in Figure 11.6.21.1-1. State Route 266 passes along the northern edge of the SEZ at a distance of about 1.6 mi (2.6 km), connects with U.S. 95 to the east, and passes into California to the west. Access to the proposed Gold Point SEZ would be from State Route 774, which parallels the eastern edge of the SEZ as it extends from State Route 266 to Gold Point south of the SEZ. Some unimproved dirt roads are also in the area. The area is classified as open to vehicle use (BLM 1997). As listed in Table 11.6.21.1-1, State Routes 266 and 774 and U.S. 95 carry average traffic volumes of about 210, 20, and 2,000 vehicles per day, respectively, in the vicinity of the proposed Gold Point SEZ (NV DOT 2010).

The UP Railroad serves the region. A spur from the main line that crosses northern Nevada ends at Thorne (UP 2009), 160 mi (257 km) northwest of the SEZ along U.S. 95, immediately north of Hawthorne. Access to the UP Railroad is also available 180 mi (290 km) away in Las Vegas.

The nearest public airport is the Lida Junction Airport, a small BLM airport about 10 mi (16 km) from the proposed Gold Point SEZ at the junction of State Route 266 with U.S. 95. The airport has a single dirt runway in good condition, as listed in Table 11.6.21.1-2. A similar BLM-managed airport is 48 mi (77 km) away in Dyer. Other small airports are located in Tonopah, Nevada, and Bishop, California. None of these four airports has scheduled commercial passenger service or regular freight service, with the exception of the Sierra Regional Airport in Bishop, California, which has regular UPS freight service (Eastern Sierra Regional Airport 2010). In 2008, 72,724 lb (32,980 kg) of freight was shipped, and 289,323 lb (131,212 kg) of freight was received (BTS 2009). The nearest major airport to the proposed Gold Point SEZ is in Las Vegas.

11.6.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting construction worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The increase in the volume

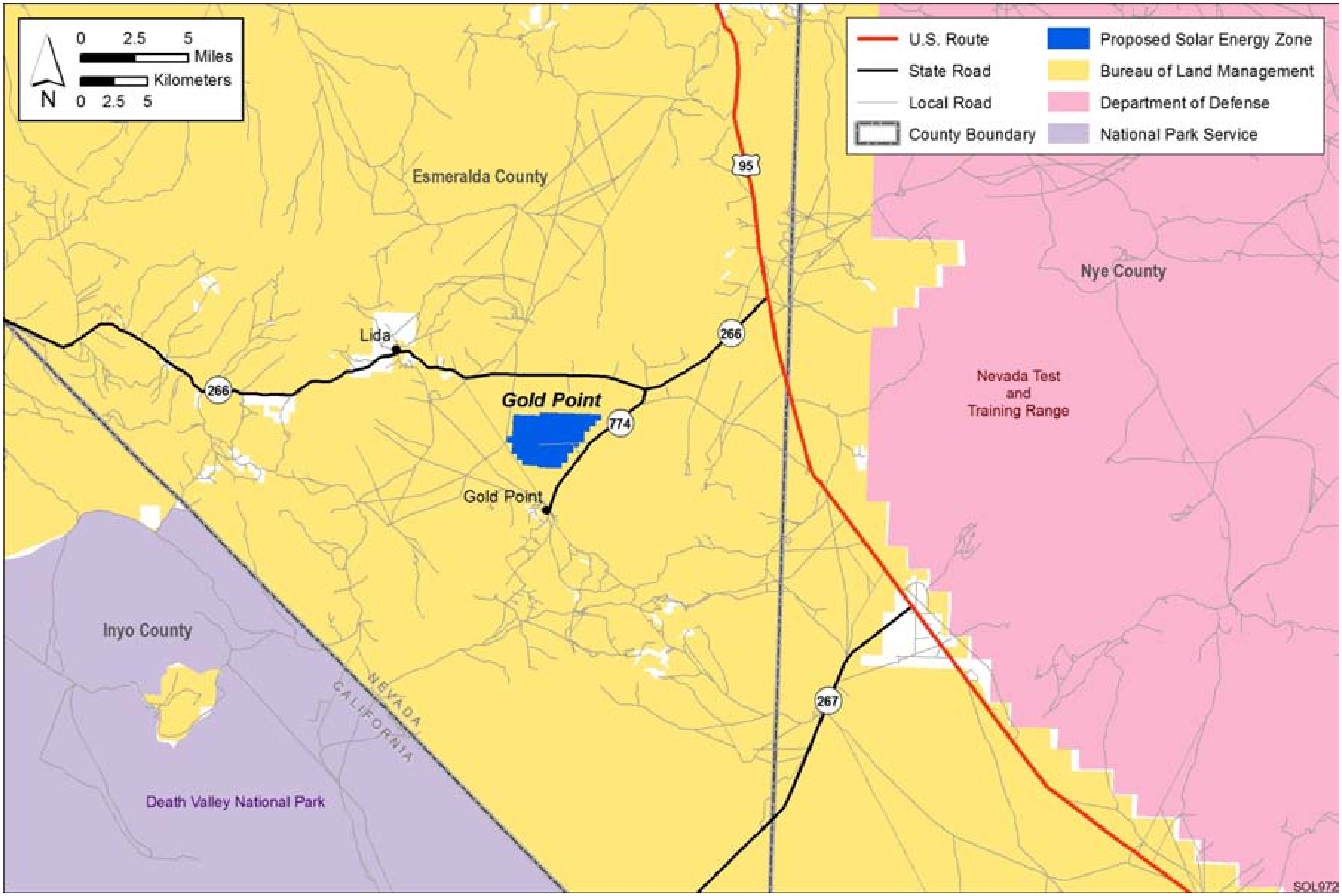

FIGURE 11.6.21.1-1 Local Transportation Network Serving the Proposed Gold Point SEZ

TABLE 11.6.21.1-1 AADT on Major Roads near the Proposed Gold Point SEZ for 2009

Road	General Direction	Location	AADT (Vehicles)
U.S. 6	East–west	East of Tonopah (west of State Route 376)	1,100
U.S. 95	Northwest–southeast	North of Tonopah, 13 mi (21 km) past the Nye/Esmeralda county line	1,900
		South of Tonopah	2,100
		South of Goldfield	2,000
		North of junction State Route 266	1,900
		South of junction State Route 266	2,000
		South of junction State Route 267 (about midway between State Route 267 and Beatty)	2,200
		North of Beatty	2,400
State Route 266	East–west	West of junction with U.S. 95	210
State Route 267	East–west	West of junction with U.S. 95	50
State Route 374	Northeast–southwest	West of Beatty and junction with U.S. 95	480
State Route 774 (Gold Point Road)	Northeast–southwest	South of junction with State Route 266	20

Source: NV DOT (2010).

TABLE 11.6.21.1-2 Airports Open to the Public in the Vicinity of the Proposed Gold Point SEZ

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Dyer	Southeast of Dyer, 48 mi (77 km) from the SEZ via State Route 266 to State Route 264	BLM	2,870 (875)	Dirt	Fair	NA[b]	NA	NA
Eastern Sierra Regional	West of the SEZ, in Bishop, Calif., a 91 mi (146 km) drive	City of Los Angeles/ Inyo County	5,567 (1,697)	Asphalt	Good	5,600 (1,707)	Asphalt/ Porous friction surfaces	Good
			7,498 (2,285)	Asphalt/ Porous friction surfaces	Good	NA	NA	NA
Lida Junction	About 10 mi (16 km) from the SEZ, at the junction State Route 266 with U.S. 95	U.S. BLM	6,100 (1,859)	Dirt	Good	NA	NA	NA
Tonopah	East of Tonopah, 58 mi (93 km) east of the SEZ on U.S. 6	Nye County	6,196 (1,889)	Asphalt	Good	7,161 (2,183)	Asphalt	Good

a Source: FAA (2009).

b NA = not applicable.

of traffic on U.S. 95 east of the proposed Gold Point SEZ, on State Route 266 past the northern border of the SEZ, and along State Route 744 along the eastern edge of the SEZ would represent increases in traffic of about 100%, 1,000%, and 10,000%, respectively. Also, higher traffic volumes would be experienced during shift changes. Thus, traffic on U.S. 95 could experience slowdowns during these periods in the vicinity of the junction with State Route 266, and local road improvements would be necessary on State Routes 266 and 774 so as not to overwhelm the local access roads near any site access points.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any routes designated as open within the proposed SEZ, open routes crossing areas issued ROWs for solar facilities would be redesignated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

11.6.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed Gold Point SEZ. The programmatic design features described in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

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11.6.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Gold Point SEZ in Esmeralda County, Nevada. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental effects of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The land surrounding the proposed Gold Point SEZ is undeveloped with several ghost towns and few permanent residents living in the area. The nearest population centers are the small communities of Goldfield, population 310, located 25 mi (40 km) northeast of the SEZ; Tonopah, population 1,500, located 45 mi (72 km) northeast of the SEZ; and Beatty, population 1,600, located approximately 45 mi (72 km) southeast of the SEZ. Death Valley NP in California is 10 mi (16 km) southwest of the SEZ. The NTTR is 12 mi (19 km) east of the SEZ, and the NTS is 45 mi (72 km) east of the SEZ. The Sylvania Mountains, Piper Mountain and White Mountains WAs are located within a 50-mi (80-km) radius of the SEZ in California.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the Gold Point SEZ is identified in Section 11.6.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 11.6.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 11.6.22.3. Cumulative impacts for each resource area are discussed in Section 11.6.22.4.

11.6.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Gold Point SEZ is provided in Table 11.6.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (e.g., air quality may have a greater regional extent of impact than visual resources). The BLM, the NPS, the DOE, and the DoD administer most of the land around the SEZ. The BLM administers approximately 47.3% of the lands within a 50-mi (80-km) radius of the SEZ.

11.6.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable"; that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;

TABLE 11.6.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Gold Point SEZ

Resource Area	Geographic Extent
Land Use	Southern Esmeralda County
Specially Designated Areas and Lands with Wilderness Characteristics	Within a 25-mi (40-km) radius of the Gold Point SEZ
Rangeland Resources	Southern Esmeralda County and Southwestern Nye County in Nevada and Western Inyo County in California
Grazing	Grazing allotments within 50 mi (80 km) of the Gold Point SEZ
Wild Horses and Burros	A 50-mi (80-km) radius from the center of the Gold Point SEZ
Recreation	Southern Esmeralda County and Southwestern Nye County in Nevada and Western Inyo County in California
Military and Civilian Aviation	Southern Nye County
Soil Resources	Areas within and adjacent to the Gold Point SEZ
Minerals	Southern Esmeralda County
Water Resources	
Surface Water	Jackson Wash and tributaries
Groundwater	Lida Valley groundwater basin
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Gold Point SEZ
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Gold Point SEZ, including portions of Esmeralda and Nye Counties in Nevada and Inyo County in California
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Gold Point SEZ
Acoustic Environment (noise)	Areas adjacent to the Gold Point SEZ
Paleontological Resources	Areas within and adjacent to the Gold Point SEZ
Cultural Resources	Areas within and adjacent to the Gold Point SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Gold Point SEZ for other properties, such as traditional cultural properties
Native American Concerns	Areas within and adjacent to the Gold Point SEZ including the surrounding mountains; viewshed within a 25-mi (40-km) radius of the Gold Point SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the Gold Point SEZ
Environmental Justice	A 50-mi (80-km) radius from the center of the Gold Point SEZ
Transportation	U.S. 95, State Routes 266 and 774

- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the *Federal Register* or state publications;
- Proposals for which enabling legislation has been passed; and
- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to renewable energy production and energy distribution, including potential solar energy projects under the proposed action (Section 11.6.22.2.1) and (2) other ongoing and reasonably foreseeable actions (Section 11.6.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

11.6.22.2.1 Energy Production and Distribution

On February 16, 2007, Governor Gibbons signed an Executive Order to encourage the development of renewable energy resources in Nevada (Gibbons 2007a). The Executive Order requires all relevant state agencies to review their permitting processes to ensure the timely and expeditious permitting of renewable energy projects. On May 9, 2007, and June 12, 2008, the Governor signed Executive Orders creating the Nevada Renewable Energy Transmission Access Advisory Committee Phase I and Phase II, which will propose recommendations for improved access to the grid system for renewable energy industries (Gibbons 2007b, 2008). On May 28, 2009, the Nevada Legislature passed Senate Bill 358, a bill modifying the Renewable Energy Portfolio Standards. The bill requires that 25% of the electricity sold be produced by renewable energy sources by 2025.

Renewable Energy and Energy Distribution Projects

Renewable energy applications are considered in two categories, fast-track and regular-track applications. Fast-track applications, which apply principally to solar and wind energy facilities, are those applications on public lands for which the environmental review and public participation process is under way and the applications could be approved by December 2010. A fast-track project would be considered foreseeable, because the permitting and environmental review processes would be under way. Regular-track proposals are considered potential future projects, but not necessarily foreseeable projects, since not all applications would be expected to be carried to completion.

No fast-track or other reasonably foreseeable future renewable energy or foreseeable energy distribution projects are within 50 mi (80 km) of the proposed Gold Point SEZ.

Pending Renewable Energy ROW Applications on BLM-Administered Lands

Applications for ROWs that have been submitted to the BLM include one pending solar project, one pending authorization for wind site testing, two authorized projects for wind site testing, and one authorized geothermal project that would be located within 50 mi (80 km) of the Gold Point SEZ. Table 11.6.22.2-1 lists these applications, and Figure 11.6.22.2-1 shows their locations.

There is a pending solar project that would be on private land about 49 mi (78 km) north of the Gold Point SEZ, about 1 mi (1.6 km) south of the Millers SEZ. In 2010, Altella Energy Corporation proposed to Esmeralda County the development of a 100-MW solar energy facility on private land near U.S. 6 and U.S. 95. The site is known as the Miller's Well site. The project's estimated cost is $500 million (Esmeralda County 2010a,b).

The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. Potential projects listed in Table 11.6.22.2-1 give an indication of the level of interest in development of renewable energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their potential aggregate effects.

Wind testing would involve some relatively minor activities that could have some environmental effects, mainly the erection of meteorological towers and monitoring of wind conditions. These towers may or may not employ guy wires and may be 200 ft (60 m) high.

11.6.22.2.2 Other Actions

Other major ongoing and foreseeable actions within 50 mi (80 km) of the proposed Gold Point SEZ are listed in Table 11.6.22.2-2 and described in the following sections.

Beatty Water and Sanitation District Water Treatment Plant. The Beatty Water and Sanitation District proposes to install a water treatment facility to remove arsenic from the drinking water supply for Beatty. The total disturbed area would be about 8.5 acres (0.034 km^2). The facility will include a septic tank leach field, backwash holding tank, and an evaporation/infilration basin (BLM 2009b).

Chemetall Foote Lithium Carbonate Facility Expansion. The DOE is proposing to upgrade an existing brine field production system, brine evaporation pond system, and lithium carbonate plant at the Chemetall Foote facility adjacent to the unincorporated town of Silver

TABLE 11.6.22.2-1 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Gold Point SEZ[a,b]

Serial Number	Applicant	Application Received	Size (acres)[c]	MW	Technology	Status	Field Office
Solar Applications							
NVN 83220	Cogentrix Solar Services	March 5, 2007	12,800	1,400	CSP	Pending	Pahrump
Wind Applications							
NVN 85746	Desert Research Institute	Aug. 1, 2008	28,428	–[d]	Wind	Pending wind site testing	Las Vegas
NVN 84067	AltaGas Renewable Energy	Aug. 30, 2007	7,360	–	Wind	Authorized wind site testing	Tonopah
NVN 87324	Pacific Wind Development	March 23, 2009	4,280	–	Wind	Authorized wind site testing	Tonopah
Geothermal Applications							
NVN 56347X	Fish Lake Power	–	47,769	–	Geothermal	Authorized	Tonopah

a BLM (2009a).

b Information for pending solar and pending wind (BLM and USFS 2010b) energy projects downloaded from GeoCommunicator.

c To convert acres to km^2, multiply by 0.004047.

d A dash indicates no data available.

FIGURE 11.6.22.2-1 Locations of Renewable Energy Project ROW Applications on Public Land within a 50-mi (80-km) Radius of the Proposed Gold Point SEZ

TABLE 11.6.22.2-2 Other Major Actions near the Proposed Gold Point SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Beatty Water and Sanitation District Water Treatment Plant	EA Nov. 2009	Drinking water	43 mi (69 km) southeast of the SEZ
Chemetall Foote Lithium Carbonate Facility Expansion	FEA issued Sept 2010	Terrestrial habitats, wildlife, air quality	25 mi (40 km) northwest of the SEZ
Mineral Ridge Project	Mining expected to resume 2011		28 mi (45 km) northwest of the SEZ
Caliente Rail Realignment	FEIS June 2008	Terrestrial habitats, wildlife, cultural resources	8 mi (13 km) northwest of the SEZ
120-kV Transmission Line	Operating	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes from east to west–north of the SEZ
120-kV Transmission Line	Operating	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes from north to south–north of the SEZ
Producing Geothermal Lease (NVN 8421)	Operating	Terrestrial habitats, wildlife	45 mi (72 km) northwest of the SEZ
Producing Geothermal Lease (NVN 8428)	Operating	Terrestrial habitats, wildlife	45 mi (72 km) northwest of the SEZ
Producing Geothermal Lease (NVN 9647)	Operating	Terrestrial habitats, wildlife	45 mi (72 km) northwest of the SEZ
Producing Geothermal Lease (NVN 31991)	Operating	Terrestrial habitats, wildlife	45 mi (72 km) northwest of the SEZ
Producing Geothermal Lease (NVN 31993)	Operating	Terrestrial habitats, wildlife	45 mi (72 km) northwest of the SEZ

[a] Projects ongoing or in later stages of agency environmental review and project development.

Peak, Nevada, and about 25 mi (40 km) northwest of the SEZ. The site is about 15,000 acres (61 km^2), mostly occupied by large evaporation ponds. The plant and administrative offices occupy approximately 20 acres (0.08 km^2). Existing lithium brine ponds would be expanded through recovering old ponds and rebuilding the dikes Construction of new brine production wells would require soil placement for drill pads (DOE 2010).

Mineral Ridge Project. Mineral Ridge, a formerly producing gold and silver mine, has both underground workings and open pits, with a 6-acre (0.024 km^2) deep leach operation and a high volume crusher plant. It is currently not operational but engineering work is being performed for future operations. It is anticipated that active mining will commence in 2011. The site is 3 mi (5 km) northwest of the unincorporated town of Silver Peak and approximately 28 mi (45 km) northwest of the SEZ. (Top Stock Picks 2010).

Caliente Rail Alignment. The DOE proposes to construct and operate a railroad for the shipment of spent nuclear fuel and high-level radioactive waste to the geologic repository at Yucca Mountain, Nevada. The rail line would begin near Caliente, Nevada, and extend north; then turn in a westerly direction, passing about 8 mi (13 km) northwest of the SEZ, to a location near the northwest corner of the NTTR (labeled Nellis Air Force Range in Figure 11.6.22.2-1); and then continue south–southwest to Yucca Mountain. The rail line would range in length from approximately 328 mi (528 km) to 336 mi (541 km), depending upon the exact location of the alignment and would be restricted to DOE shipments. Over a 50-year period, 9,500 casks containing spent nuclear fuel and high-level radioactive waste, and approximately 29,000 rail cars of other materials, including construction materials, would be shipped to the repository. An average of 17 one-way trains per week would travel along the rail line. Construction of support facilities—interchange yard, staging yard, maintenance-of-way facility, rail equipment maintenance yard, cask maintenance facility, and Nevada Rail Control Center and National Transportation Operation Center—would also be required. Construction would take 4 to 10 years and cost $2.57 billion. Construction activities would occur inside a 1000-ft (300-m) wide ROW for a total footprint of 40,600 acres (164 km^2) (DOE 2008).

Existing 120-kV Transmission Line. Sierra Pacific owns the two existing 120-kV transmission lines that run north to south and east to west, north of the SEZ (RETAAC 2007).

Existing Geothermal Leases. There is a small, contiguous, cluster of five producing geothermal leases located about 40 mi (64 km) northwest of the proposed SEZ, shown in Figure 11.6.22.2-1.

Grazing

There are no active grazing allotments in the immediate vicinity of the SEZ.

Mining

There are no foreseeable mining projects near the proposed SEZ.

11.6.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change for the proposed Gold Point SEZ are presented in this section. Table 11.6.22.3-1 lists the relevant impacting factors for the trends.

11.6.22.3.1 Population Growth

Over the period 2000 to 2008, the population grew annually by 3.9% in Nye County, but fell by 4.6% annually in sparsely populated Esmeralda County in Nevada, portions of which compose the ROI for the Gold Point SEZ. The annual growth rate for the State of Nevada as a whole was 3.4%. The population of the ROI in 2008 was 44,839 and is expected to increase to 78,122 by 2021 and to 80,872 by 2023 (Section 11.6.19.1.4).

11.6.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in seven SEZ areas in Nevada between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita

TABLE 11.6.22.3-1 General Trends Relevant to the Proposed SEZs in Nevada

General Trend	Impacting Factors
Population growth	Urbanization Increased use of roads and traffic Land use modification Employment Education and training Increased resource use (e.g., water and energy) Tax revenue
Energy demand	Increased resource use Energy development (including alternative energy sources) Energy transmission and distribution
Water availability	Drought conditions and water loss Conservation practices Changes in water distribution
Climate change	Water cycle changes Increased wildland fires Habitat changes Changes in farming production and costs

energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5, 0.4, and 0.1% each year, respectively (EIA 2009).

11.6.22.3.3 Water Availability

As described in Section 11.6.9.1.2, the proposed Gold Point SEZ is located in the Lida Valley groundwater basin. Estimated groundwater depth is 300 to 400 ft (91 to 122 m). Groundwater recharge estimates range up to 500 ac-ft/yr (616,700 m^3/yr) by precipitation and 200 ac-ft/yr (246,700 m^3/yr) by subsurface inflow. Groundwater discharge by outflow to the Sarcobatus Flat basin is estimated to be 700 ac-ft/yr (863,400 m^3/yr), while evapotranspiration is assumed to be negligible (Section 11.6.9.1.2).

In 2005, withdrawals from surface waters and groundwater in Esmeralda County were 46,786 million ac-ft/yr (57.7 million m^3/yr), of which 9% came from surface waters and 91% from groundwater. The largest water use categories for groundwater were irrigation and mining at 28,235 and 14,202 ac-ft/yr (34.8 million and 17.5 million m^3/yr), respectively.

Since the Lida Valley groundwater basin in not an NDWR-designated groundwater basin, there are no specified beneficial uses set by the NDWR. The perennial yield of the Lida Valley groundwater basin is set at 350 ac-ft/yr (431,700 m^3/yr), and current water rights total 76 ac-ft/yr (93,700 m^3/yr) for mining, stockwater, and municipal uses (Section 11.6.9.1.3).

11.6.22.3.4 Climate Change

Governor Jim Gibbons' Nevada Climate Change Advisory committee (NCCAC) conducted a study of climate change and its effects on Nevada (NCCAC 2008). The report summarized the present scientific understanding of climate change and its potential impacts on Nevada. A report on global climate change in the United States prepared by the U.S. Global Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from these reports follow.

- Precipitation will decrease, and a greater percentage of that precipitation will come from rain, resulting in a greater likelihood of winter and spring flooding and decreased stream flow in the summer.

- The average temperature in the Southwest has already increased by about 1.5ºF compared to a 1960 to 1979 baseline, and by the end of the century, the average annual temperature is projected to rise by 4ºF to 10ºF.

- A warming climate and a related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires.

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end.

- Much of the Southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region.

- As temperatures rise, landscape will be altered as species shift their ranges northward and upward to cooler climates.

- Temperature increases, when combined with urban heat island effects for major cities such as Las Vegas, present significant stress to health, electricity, and water supply.

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

11.6.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Gold Point SEZ on the basis of the following assumptions: (1) because of the small size of the proposed SEZ (<10,000 acres [<40.5 km^2]), only one project could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 3,848 acres (15.6 km^2) (80% of the entire proposed SEZ). For analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) per project would be disturbed annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. An additional 667 acres (2.7 km^2) would be disturbed to construct a transmission line from the SEZ to the regional grid 22 mi (35 km) away. For site access, the nearest major road is State Route 774, which lies adjacent to the SEZ. It is assumed that no new access road would be constructed to support solar development in the SEZ.

Cumulative impacts that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section in each resource area are discussed below. At this stage of development, because of the uncertain nature of the future projects in terms of size, number, location within the proposed SEZ, and types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

11.6.22.4.1 Lands and Realty

The proposed Gold Point SEZ is undeveloped and rural with only a few dirt roads present. There are no existing ROWs within the SEZ, but a designated Section 368b transmission corridor passes 6.5 mi (10 km) to the northeast, while a proposed local corridor would be located just west of the Section 368b corridor. The corridors are currently not utilized. As of February 2010, there were no ROW applications for solar energy facility development within the SEZ (Section 11.6.2.1).

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Solar energy facilities would be a new and highly discordant land use to the area. However, as of February 2010, there were no ROW applications for solar energy facility development within the SEZ.

As presented in Section 11.6.22.2, no foreseeable renewable energy or transmission projects were identified within a 50-mi (80-km) radius of the proposed SEZ. The only foreseeable action is a water treatment plant in Beatty, Nevada, designed to remove arsenic from drinking water. In addition, one potential solar facility with a pending application covering 12,800 acres (52 km^2), one pending and two authorized wind site testing applications covering 40,068 acres (162 km^2), and one authorized geothermal application covering 47,769 acres (193 km^2) lie within this distance (Figure 11.6.22.2-1). Solar development within the proposed SEZ would require construction of a 22-mi (35-km) transmission line to the nearest existing line. Existing facilities within 50 mi (80 km) of the SEZ include two 120-kV transmission lines and a cluster of five producing geothermal leases about 45 mi (72 km) northwest. The seven pending renewable energy applications indicate moderate interest in renewable energy development in the region.

Given that the approved and pending renewable energy applications are widely dispersed—all are more than 15 mi (24 km) from the proposed SEZ—and although the size of the application ROWs typically far exceeds the amount of land that would be affected for other uses, total impacts on land use within the 50-mi (80-km) geographic extent of effects would be small. Development of utility-scale solar projects in the proposed Gold Point SEZ would not be expected to contribute significantly to cumulative impacts on lands and realty.

11.6.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

There are nine specially designated areas within 25 mi (40 km) of the proposed Gold Point SEZ in Nevada and California (Section 11.6.3.1). Potential exists for cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and other projects outside the SEZ. The degree of cumulative impacts would depend on the number, type, and location of potential solar, wind, and geothermal projects with pending or approved applications within the geographic extent of effects that are actually built. Given the small number and wide geographic separation of such applications, potential cumulative impacts on wilderness characteristics would be relatively small. No cumulative impacts would be expected from currently foreseeable actions in the region, however.

11.6.22.4.3 Rangeland Resources

The one very large grazing allotment that overlaps the proposed SEZ would be reduced by 0.7% of its total size (Section 11.6.4.1.2.1). Such a small reduction would not contribute to cumulative impacts on grazing.

Solar energy development within the SEZ would not directly affect wild horses and burros that are managed by the BLM or the USFS, while indirect impacts would be negligible with implementation of programmatic design features (Section 11.6.4.2.2). Thus, the SEZ would not contribute to cumulative impacts on these species.

11.6.22.4.4 Recreation

Little or no recreation occurs on the proposed Gold Point SEZ or along the route of the assumed transmission line. Construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. However, alternate routes exist nearby for any road closures within the relatively small proposed SEZ. Foreseeable and potential future actions would similarly affect areas of low recreational use and would have minimal effects on recreation. Thus, cumulative impacts on recreation within the geographic extent of effects are not expected.

11.6.22.4.5 Military and Civilian Aviation

The proposed Gold Point SEZ is located under numerous MTRs, is located between two MOAs, and lies within a mandatory DoD Consultation Area. Nellis Air Force Base and NTTR have expressed a variety of concerns over solar energy facilities being constructed within the Gold Point SEZ (Section 11.6.6.2). Foreseeable and potential solar, wind, and geothermal facilities and transmission lines could present additional concerns and result in cumulative impacts on military aviation. No impacts on civilian aviation are expected from solar facilities in the proposed SEZ.

11.6.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of the associated transmission line and any new roads, would contribute to soil loss due to wind erosion and potential sedimentation of nearby washes and streams. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss and siltation. Programmatic design features would be employed to minimize wind erosion, soil loss, and stream sedimentation. Proposed renewable energy projects on the region with pending applications, if built, would be too far away to combine with soil impacts from the SEZ. Thus, with programmatic design features in place, cumulative impacts on soil resources near the proposed SEZ are not expected.

11.6.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 11.6.8, there are currently no active oil and gas leases within the proposed Gold Point SEZ, and there are no mining claims or proposals for geothermal energy development pending in the SEZ. Because of the generally low level of mineral production in the area and the expected low impact on mineral accessibility of other foreseeable actions within the geographic extent of effects, no cumulative impacts on mineral resources are expected.

11.6.22.4.8 Water Resources

Section 11.6.9.2 describes the water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities. The amount of water needed during the peak construction year for all evaluated solar technologies would be 1,182 to 1,707 ac-ft (1.5 million to 2.1 million m^3). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for all evaluated solar technologies would range from 22 to 11,555 ac-ft/yr (27 thousand to 14 million m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. As discussed in Section 11.6.22.2.3, water withdrawals in 2005 in Esmeralda County were 46,786 ac-ft/yr (57.7 million m^3/yr), of which 9% came from surface waters and 91% came from groundwater. The largest water use categories for groundwater were irrigation and mining at 28,235 and 14,202 ac-ft/yr (34.8 million and 17.5 million m^3/yr), respectively. Therefore, cumulatively the additional water resources needed for solar facilities in the SEZ during operations would constitute from a very small (0.05%) to a large (24%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Esmeralda County) depending on the solar technology used (PV technology at the low end and wet-cooled parabolic trough technology at the high end).

Near the SEZ, the perennial yield of the Lida Valley groundwater basin is set at 350 ac-ft/yr (431,700 m^3/yr), while current water rights total 76 ac-ft/yr (93,700 m^3/yr). Thus, solar facilities on the SEZ would have the capacity to overwhelm the specified groundwater yield in the local basin using wet-cooled technologies, while dry-cooled technologies could require three-times the specified yield. Full development with non-cooled dish engine technology would require up to 219 ac-ft/yr (0.27 million m^3/yr), or about 63%, and PV would require 22 ac-ft/yr (27 thousand m^3/yr), or about 6% of this level (Section 11.6.9.2.2).

While solar development of the proposed SEZ with water-intensive technologies would likely be infeasible because of impacts on groundwater supplies, excessive groundwater withdrawals could disrupt the existing groundwater supplies in the Lida Valley. In addition, land disturbance for solar facility construction could cause localized soil erosion and sedimentation of ephemeral washes, degrade associated habitats in Jackson Wash, and alter groundwater recharge and discharge processes. Cumulative impacts on surface and groundwater resources are not expected, however, because of the absence of foreseeable development near the SEZ. Potential solar, wind, and geothermal projects are more than 15 mi (24 km) from the SEZ and would not likely affect the same water resources (Section 11.6.22.2).

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would range from 9 to 74 ac-ft (11 to 91 thousand m^3) during the peak construction year and from 1 up to 11 ac-ft/yr (up to 14,000 m^3/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to place undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet-cooling systems, there would also be 121 to 219 ac-ft/yr (0.15 to 0.27 million m^3/yr) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

11.6.22.4.9 Vegetation

The proposed Gold Point SEZ is located within the Tonopah Basin ecoregion, which supports sparse shadscale communities. Inter-Mountain Basins Mixed Salt Desert Scrub is the predominant cover type within the proposed SEZ. Sensitive habitats on the SEZ include riparian, desert dry wash, and playa habitats. The area surrounding the SEZ consists of a mosaic of the Tonopah Basin and the Tonopah Sagebrush Foothills ecoregion. The dominant cover type in the 5-mi (8-km) area of indirect effects is Inter-Mountain Basins Mixed Salt Desert Scrub. There are no NWI-mapped wetlands within the SEZ or in the area of indirect effects. Ephemeral washes in the SEZ drain to Jackson Wash, which supports riparian communities downstream. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the SEZ over 80% of its area would result in small impacts on all cover types in the affected area (Section 11.6.10.2.1). Site-clearing and -grading could disrupt surface water flow patterns and potentially alter plant communities in riparian or playa habitats within or outside of the SEZ, while increased runoff from facilities could affect the hydrology of these areas. In addition, groundwater drawdown by solar facilities could affect wetland communities associated with springs. A further concern in disturbed areas is the establishment and spread of noxious weeds and invasive species.

The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other dust sources. The cumulative dust loading could result in reduced productivity or changes in plant community composition. Similarly, surface runoff from project areas after heavy rains could increase sedimentation and siltation in areas downstream. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

Solar facilities within the SEZ would not be expected to contribute to cumulative effects on vegetation within the 50-mi (80-km) geographic extent of effects because of the absence of foreseeable development outside the SEZ and long distances to potential renewable energy projects. Of the seven renewable energy applications, only one is for a solar facility and it lies almost 50 mi (80 km) from the SEZ. Wind and geothermal applications, which lie as close as 16 mi (26 km), would general disturb far less land than a solar facility.

11.6.22.4.10 Wildlife and Aquatic Biota

Wildlife species that could potentially be affected by the development of utility-scale solar energy facilities in the proposed SEZ include amphibians, reptiles, birds, and mammals. The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, and wildlife injury or mortality. In general, species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These design features may include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats.

As noted in Section 11.6.22.2, few foreseeable or potential future actions lie within 50 mi (80 km) of the proposed SEZ (Section 11.6.22.2). While impacts from full build-out over 80% of the proposed SEZ would result in small impacts on amphibian, reptile, bird, and mammal species (Section 11.6.11), cumulative impacts from foreseeable development within the 50-mi (80-km) geographic extent of effects are not expected. Many of the wildlife species within the proposed SEZ that could be affected by other actions would still have extensive habitat available within the region, while regional impacts from solar facilities within the proposed SEZ would be small due to its modest size.

No perennial streams or water bodies are present in the proposed Gold Point SEZ or within the area of direct effects, including the area associated with the proposed new transmission line corridor. Ephemeral streams flow primarily after rainfall and typically do not support wetland or riparian habitats or flow into perennial surface waters. No NWI-mapped wetlands are present within the SEZ or within the area of indirect effects. Within the 50-mi (80-km) geographic extent of effects, the nearest permanent surface water is more than 14 mi (22 km) from the SEZ (Section 11.6.11.4). Soil disturbance from construction of solar facilities in the SEZ could result in soil transport to surface streams via water and airborne routes, but is expected to be low with mitigations in place and is not expected to affect any perennial water body. However, groundwater drawdown by operating solar facilities within the SEZ might affect water levels on off-site streams and wetlands. Since development of the SEZ is not expected to affect aquatic habitats, it would not contribute to cumulative impacts on such habitats. Impacts from other ongoing and foreseeable development within the 50-mi (80-km) geographic extent of effects would be small, given the low level of identified development.

11.6.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

On the basis of recorded occurrences in the region or suitable habitat, as many as 21 special status species could occur within the proposed Gold Point SEZ. However, no special status species are known to occur within the affected area of the SEZ, and no groundwater-dependent species are known to occur in the vicinity of the SEZ. Special status species that could occur on or in the vicinity of the SEZ include species listed as threatened or endangered in the ESA, listed as protected or sensitive species by the State of Nevada, or listed as a sensitive species by the BLM (Section 11.6.12.1). Potential design features to be used to reduce or eliminate the potential for effects on these species from the construction and operation of utility-scale solar energy projects in the SEZ and related facilities (e.g., access roads and transmission line connections) outside the SEZ include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. Special status species are also affected by ongoing actions within the 50-mi (80-km) geographic extent of effects, including roads, transmission lines, recreation, and activities at the NTTR. Future facilities would add further effects, including those from one potential solar facility with a pending application covering 12,800 acres (52 km^2), one pending and two authorized wind site testing applications covering 40,068 acres (162 km^2), and one authorized geothermal applications covering 47,769 acres (193 km^2) (Section 11.6.22.2). Although individual facilities would cover large areas and long linear distances and because only a small number of potential actions and no foreseeable actions have been identified, cumulative impacts on special status species within the geographic extent of effects are expected to be small. Future projects would employ mitigation measures to limit effects.

11.6.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other nearby projects outside the proposed SEZ or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. The dust generated by the construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment.

Because operation of solar facilities within the proposed SEZ would produce no or minimal contributions of combustion emissions, the only air pollutant of concern is dust generated during construction of new facilities, in addition to that produced by winds. Because there are relatively few other foreseeable or potential actions that could produce fugitive dust emissions near the SEZ, it is unlikely that construction of two or more projects would overlap in both time and affected area and produce cumulative air quality effects due to dust emissions.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as coal, oil, and natural gas. As discussed in Section 11.6.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the relatively small Gold Point SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 3.6% of all emissions from current electric power systems in Nevada.

11.6.22.4.13 Visual Resources

The proposed Gold Point SEZ is located within Lida Valley in Esmeralda County in southwestern Nevada. The SEZ is flat to slightly sloping, has a strong horizon line, and is surrounded by mountain ranges. The area is rural with few cultural modifications visible; however, roads, transmission lines, and the very small community of Gold Point are visible near the SEZ (Section 11.6.14.1).

Construction of utility-scale solar facilities in the SEZ would substantially alter the natural scenic quality of the area. Other potential renewable energy projects would cumulatively affect the visual resources in the region. Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area. There currently is one wind project with an authorized application for wind testing on public land within the 25-mi (40-km) geographic extent for visual impacts (Figure 11.6.22.2-1). There are no currently foreseeable projects within this distance, however (Section 11.6.22.2). While the contribution of potential projects to cumulative visual impacts would depend on the location of facilities that are actually built, it may be concluded that small cumulative visual impacts could result from the presence of potential facilities. Because of the topography of the region such facilities, located in basin flats, would be visible at great distances from surrounding mountains, which include sensitive viewsheds, including in Death Valley National Park. Given the low number and wide separation of current proposals, few viewing locations would be affected by two or more facilities. However, facilities would be located near roads and thus would be viewable by motorists, who would also be viewing transmission lines, towns, and other infrastructure, as well as the road system itself.

As additional facilities are added, multiple projects might be viewed in succession, as viewers move through the landscape, for example, by driving on local roads. In general, however, the small number of potential new facilities would be expected to result in small cumulative visual impacts within the geographic extent of effects.

11.6.22.4.14 Acoustic Environment

The areas around the proposed Gold Point SEZ are relatively quiet. The existing noise sources around the SEZ include road traffic, aircraft flyover, cattle grazing, and recreational activities. The construction of solar energy facilities could increase the noise levels periodically for up to 3 years per facility, but there would be little or minor noise impacts during operation of solar facilities, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES, that could affect nearby residences.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZ are described in Section 11.6.22.2. Because the residences nearest to the SEZ in Gold Point are relatively far from other potential projects with respect to noise impacts, cumulative noise effects during the construction or operation of solar facilities are unlikely.

11.6.22.4.15 Paleontological Resources

The proposed Gold Point SEZ has low potential for the occurrence of significant fossil material over all its area, which is covered with thick alluvial deposits. The potential for the occurrence of paleontological resources in some portions of the route of the assumed 22-mi (35-km) long new transmission line is unknown (Section 11.6.16.1). While impacts on significant paleontological resources are unlikely to occur in the SEZ, a review of the geological deposits in the specific sites selected for future projects would be needed to determine whether a paleontological survey was warranted. Any paleontological resources encountered would be mitigated to the extent possible. No significant contributions to cumulative impacts on paleontological resources are expected.

11.6.22.4.16 Cultural Resources

The area around Gold Point is rich in cultural history, with settlements dating as far back as 12,000 years. The area covered by the proposed Gold Point SEZ has the potential to contain significant cultural resources, especially related to the mining industry. Visual impacts are possible to the NRHP-eligible Gold Point Town Site. Areas with high potential for containing archaeological sites also lie along the assumed route of the transmission line. While no surveys have been conducted within the SEZ boundaries, 18 surveys have been conducted within the 5-mi (8-km) area of indirect effects, recording 12 cultural resources (Section 11.6.17.1). It is possible that the development of utility-scale solar energy projects in the SEZ and the associated transmission line could contribute to cumulative impacts on cultural resources in the region. While any future solar projects would disturb large areas, the specific sites selected would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Nevada SHPO and appropriate Native American governments, it is likely that most adverse effects on significant resources in the region could be mitigated to some degree. It is unlikely that any sites recorded in the SEZ or along the transmission line would be of such individual significance that, if properly mitigated, development would cumulatively cause an irretrievable loss of information about a significant resource type, but this would depend on the results of the future surveys and evaluations. Visual impacts from the transmission lines are possible on the Goldfield Historic District and, depending on the actual location of the line and the importance of the visual setting for that property, solar development could result in cumulative impacts on the district.

11.6.22.4.17 Native American Concerns

To date, no specific concerns have been raised to the BLM regarding the proposed Gold Point SEZ; however the development of utility-scale solar facilities in the proposed SEZ might cumulatively affect resources important to Native Americans. In comments on the scope of this PEIS, the Big Pine Paiute Tribe of the Owens Valley recommended that the BLM preserve undisturbed lands intact and that recently disturbed lands be given primary consideration for solar energy development. Such concerns would similarly apply to other future projects outside the proposed SEZ. Potential impacts on existing water supplies and springs in the Lida Valley from groundwater drawdown by solar energy facilities would be of further concern to local Tribes, as would impacts on important game and plant species and on visual resources (Section 11.6.18.2). Continued discussions with the area Tribes through government-to-government consultation are necessary to effectively consider and address the Tribes' concern tied to solar energy development in the Gold Point SEZ.

11.6.22.4.18 Socioeconomics

Solar energy development projects in the proposed Gold Point SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZ and in the surrounding ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services in combination with temporary workers involved in other new projects in the area, including other renewable energy development. The number of workers involved in the construction of solar projects (including the transmission lines) in the peak construction year could range from about 170 to 1,600 depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 220 (solar PV) to as high as 2,300 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-year or more solar development period.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-year duration, and could combine with those from other new facilities in the area, including several potential solar, wind, and geothermal energy projects (Section 11.6.22.2). The number of workers needed at the SEZ solar facilities would range from 8 to 120 with approximately 10 to 170 total jobs created in the region, assuming full build-out of the SEZ (Section 11.6.19.2.2). Population increases would contribute to general upward trends in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

11.6.22.4.19 Environmental Justice

Any impacts from solar development could have cumulative effects on minority and low-income populations within 50 mi (80 km) of the proposed SEZ in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual degradation, noise, and exposure to fugitive dust. Actual impacts would depend on where low-income populations are located relative to solar and other proposed facilities and on the geographic range of effects. Overall, effects from facilities within the SEZ are expected to be small, while other foreseeable and potential actions could contribute additional small effects on minority and low-income populations. However, most other potential actions, mainly renewable energy projects, are more than 25 mi (40 km) from the proposed SEZ, while no minority or low-income populations are currently present within the 50-mi (80-km) ROI (Section 11.6.20.1). While future minority and low-income populations, if present, could experience small cumulative effects of some types, such as on visual resources or from fugitive dust, from all actions within the geographic extent of effects, contributions from solar development in the proposed Gold Point SEZ would be small. If needed, mitigation measures can be employed to reduce the impacts on these populations in the vicinity of the SEZ.

11.6.22.4.20 Transportation

U.S. 95 is the nearest major road and lies about 9 mi (14 km) east of the proposed Gold Point SEZ. The Las Vegas metropolitan area lies approximately 180 mi (290 km) southeast of the SEZ along U.S. 95. Access to the Gold Point SEZ would be from State Route 774, which parallels the eastern edge of the SEZ. This road intersects State Route 266 to the north, which, in turn, intersects U.S. 95 to the east. None of the local airports has scheduled commercial passenger service; the largest major airport is in Las Vegas. The closest railroad access is 160 mi (257 km) northwest of the SEZ, north of Hawthorne. During construction of utility-scale solar energy facilities, up to 1,000 workers could be commuting to the construction site at the SEZ, which could increase the AADT on these roads by 2,000 vehicle trips for each facility under construction. With a single solar facility assumed to be under construction at a given time, traffic on all affected roads could experience slowdowns at access points near the SEZ

(Section 11.6.21.2). Construction worker traffic could likewise have minor cumulative impacts on traffic flow in combination with existing traffic levels and potential increases from additional future facilities in the vicinity of the proposed SEZ should project schedules overlap. Local road improvements may be necessary on affected roads near access to the SEZ. Any impacts during construction activities would be temporary. The impacts can also be mitigated to some degree by staggered work schedules and ride-sharing programs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate the solar facilities and would have little contribution to cumulative impacts.

11.6.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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11.7 MILLERS

11.7.1 Background and Summary of Impacts

11.7.1.1 General Information

The proposed Millers SEZ is located in Esmeralda County in southern Nevada (Figure 11.7.1.1-1), 44 mi (71 km) east of the California border. The SEZ has a total area of 16,787 acres (68 km^2). In 2008, the county population was 664, while adjacent Nye County to the west had a population of 44,175. The nearest town is Tonopah, Nevada, about 15 mi (24 km) west in Nye County, with a population of approximately 1,500. The NTTR is 30 mi (48 km) northeast of the SEZ.

The nearest major road access to the proposed SEZ is via U.S. 95/U.S. 6, which runs east–west along its southern border. The nearest railroad stop is 90 mi (145 km) away in Thorne, which is the end of a spur from the main line of the UP Railroad. Tonopah Airport, a small county airport 23 mi (37 km) to the east of the SEZ, and three public airports managed by the BLM serve the area, though none have scheduled commercial passenger service or regular freight service.

A 120-kV transmission line passes through the SEZ. It is assumed that this existing transmission line could potentially provide access from the SEZ to the transmission grid (see Section 11.7.1.1.2).

Applications for ROWs that have been submitted to the BLM include one fast-track solar application, one pending solar project, one pending wind site testing application, four authorized wind site testing projects, and two authorized geothermal projects that would be located within 50 mi (80 km) of the Millers SEZ. These applications are discussed in Section 11.7.22.2.1. There are currently no solar applications within the SEZ.

The proposed Millers SEZ is undeveloped and rural, with few permanent residents in the area. The SEZ is located in the Big Smoky Valley, lying between the Lone Mountain to the south, the Monte Cristo Range to the west, and the San Antonio Mountains to the east. Land within the SEZ is undeveloped scrubland characteristic of a high-elevation, semiarid basin.

The criteria used to identify the proposed Millers SEZ as an appropriate location for solar energy development included proximity to existing transmission or designated corridors, proximity to existing roads, and a slope of generally less than 2%. In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Millers SEZ, other restrictions might be appropriate. The analyses in the following sections address the affected environment and potential impacts

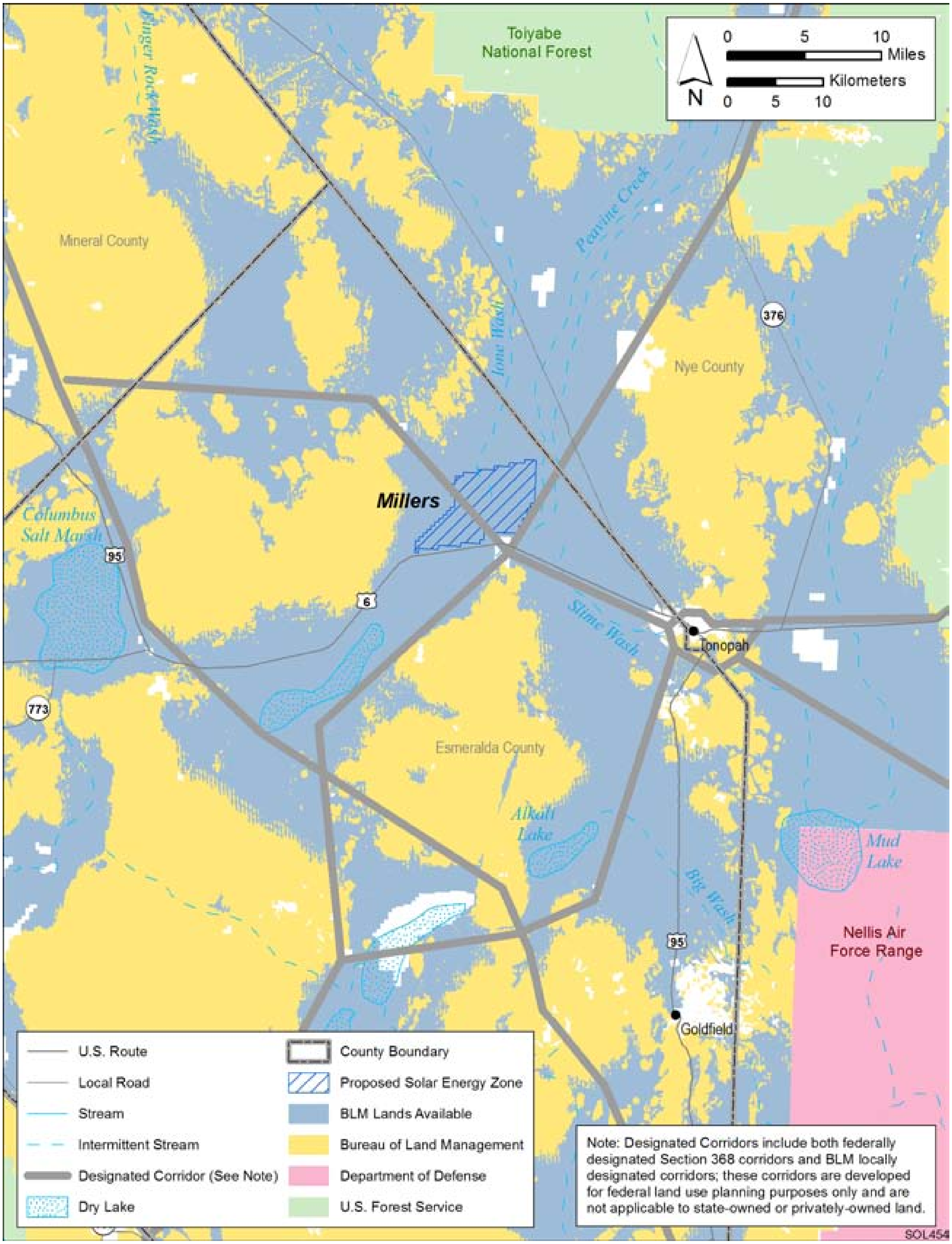

FIGURE 11.7.1.1-1 Proposed Millers SEZ

associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Millers SEZ encompassed 19,205 acres (78 km^2). Subsequent to the study area scoping period, the boundaries of the proposed Millers SEZ were altered somewhat to facilitate the BLM's administration of the SEZ area. The revised SEZ is approximately 2,418 acres (10 km^2) smaller than the original SEZ as published in June 2009.

11.7.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the Millers SEZ is assumed to be 80% of the SEZ area over a period of 20 years, a maximum of 13,430 acres (54 km^2). These values are shown in Table 11.7.1.2-1, along with other development assumptions. Full development of the Millers SEZ would allow development of facilities with an estimated total of 1,492 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required and an estimated 2,686 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 120-kV line that runs

TABLE 11.7.1.2-1 Proposed Millers SEZ—Assumed Development Acreages, Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line and Road ROWs	Distance to Nearest Designated Corridor[e]
16,787 acres and 13,430 acres[a]	1,492 MW[b] and 2,686 MW[c]	U.S. 95/U.S. 6 adjacent	0 mi and 120 kV	0 acres; NA[d]	Adjacent

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] NA = no access road construction is assumed necessary for Millers.

[e] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

through the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 120-kV capacity of that line would be inadequate for 1,492 to 2,686 MW of new capacity (note that a 500 kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Millers SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in the PEIS, it was assumed that the existing 120-kV transmission line which passes through the proposed SEZ and could provide initial access to the transmission grid. and thus, no additional acreage for transmission line access was assessed. Access to the existing transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different, off-site, grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they are needed.

Existing road access to the proposed Millers SEZ should be adequate to support construction and operation of solar facilities, because U.S. 95/U.S. 6 runs from east to west along the southern border of the SEZ. Thus, no additional road construction outside of the SEZ was assumed to be required to support solar development.

11.7.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 11.7.2 through 11.7.21 for the proposed Millers SEZ are summarized in tabular form. Table 11.7.1.3-1 is a comprehensive list of impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 11.7.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Millers SEZ are included in Sections 11.7.2 through 11.7.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 11.7.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Millers SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ could disturb up to 13,430 acres (54 km^2). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is rural and undeveloped, utility-scale solar energy development would be a new and dominant land use in the area.	None.
	The designated local transmission corridor located within the SEZ occupies a portion of the proposed SEZ and could limit future solar development within the corridor.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	None.	None.
Rangeland Resources: Livestock Grazing	Grazing on about 4% of the Monte Cristo allotment would be closed.	Development of range improvements in the Monte Cristo allotment should be considered if site-specific analysis determines there would need to be a reduction in permitted AUMs because of lost grazing capacity.
Rangeland Resources: Wild Horses and Burros	Less than 2% of the total land areas of each of two HMAs occur within the indirect impact area of the SEZ. The Paymaster HMA contained an estimated 52 wild horses in FY 2009. The Pilot Mountain HMA contained an estimated 342 wild horses. Indirect impacts on these HMAs and the wild horses in them are expected to be negligible with implementation of design features.	None.

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
Recreation	A small amount of recreational use would be eliminated from portions of the SEZ that would be developed for solar energy production.	None.
	A portion of an existing route of a competitive OHV race course that passes through the area would be closed.	Alternative routes for the race course should be considered consistent with local land use plan requirements.
Military and Civilian Aviation	The military has expressed serious concern over construction of solar energy facilities within the SEZ. Nellis Air Force Base has indicated that solar technologies requiring structures higher than 50 ft (15 m) above ground level may present unacceptable electromagnetic compatibility concerns for the NTTR test mission and could interfere with flight operations on MTRs that cross the SEZ.	None
	There are no impacts to civilian aviation.	None.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. The magnitude of impacts would depend on the types and sizes of components built for a given facility. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation). Portions of the dry lake may not be a suitable location for construction. A study may be required to evaluate the potential impacts of building a solar facility in close proximity to Crescent Dunes to the northwest of the site.	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
Water Resources	Ground-disturbance activities (affecting 36% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 3,300 ac-ft (4.1 million m^3) of water during the peak construction year. Construction activities would generate as much as 148 ac-ft (182,600 m^3) of sanitary wastewater. Assuming full development of the SEZ, operations would use the following amounts of water: • For parabolic trough facilities (2,686-MW capacity), 1,918 to 4,067 ac-ft/yr (2.4 to 5.0 million m^3/yr) for dry-cooled systems; water requirements for wet-cooled systems exceed the perennial yield of the basin. • For power tower facilities (1,492-MW capacity), 1,061 to 2,255 ac-ft/yr (1.3 to 2.8 million m^3/yr) for dry-cooled systems; water requirements for wet-cooled systems exceed the perennial yield of the basin. • For dish engine facilities (1,492-MW capacity), 763 ac-ft/yr (941,100 m^3/yr). • For PV facilities (1,492-MW capacity), 77 ac-ft/yr (95,000 m^3/yr). • Assuming full development of the SEZ, operations would generate up to 38 ac-ft/yr (46,900 m^3/yr) of sanitary wastewater and up to 763 ac-ft/yr (941,000 m^3/yr) of blowdown water.	Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures. Land disturbance activities should minimize impacts on the ephemeral stream channels of Ione Wash and Peavine Creek, as well as alluvial fan features along the western edge of the SEZ. Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters. Groundwater rights must be obtained through coordination with the NDWR and current water rights holders. Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection. Groundwater monitoring and production wells should be constructed in accordance with state standards. Water for potable uses would have to meet or be treated to meet the water quality standards of the *Nevada Administrative Code*.

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
Vegetation[b]	Up to 80% (13,430 acres [54.3 km^2]) of the SEZ would be cleared of vegetation; re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult because of the arid climate and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Sand transport processes could be altered, potentially affecting sand dune plant communities in Crescent Dunes, northeast of the SEZ, or dunes southwest of the SEZ. Vegetation communities associated with playa habitats, Ione Wash, dry washes, greasewood flats communities, or other intermittently flooded areas within or downgradient from solar projects or the access road could be affected by ground-disturbing activities. Candelaria blazingstar, a plant species on the Nevada Natural Heritage Program watch list may occur within the SEZ and may be directly affected by solar project development. The population occurring east of the SEZ may be indirectly affected by project activities within the SEZ.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. Dry washes, Ione Wash, playas, and wetlands within the SEZ should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetlands, playas, and dry washes to reduce the potential for impacts. Appropriate engineering controls should be used to minimize impacts on the playa wetland and other playas, as well as Ione Wash shrub communities, dry washes and greasewood flat habitats within the SEZ, and downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on plant communities that access groundwater, such as those in the vicinity of playas. Potential impacts on springs should be determined through hydrological studies.

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*		A qualified botanist or plant ecologist should survey for candelaria blazing star during a period when it is flowering and easily documented prior to any construction activities within the SEZ. If individuals are located, individuals or populations should be avoided through fencing and flagging of the area, including an appropriate buffer zone.
Wildlife: Amphibians and Reptiles[b]	Direct impacts from SEZ development for all representative amphibian and reptile species would be small (i.e., loss of ≤1.0% of potentially suitable habitats within the SEZ region). With implementation of design features, indirect impacts would be negligible.	Wash and playa habitats should be avoided.
Wildlife: Birds[b]	Direct impacts on representative bird species would be moderate for the killdeer (i.e., loss of 1.1% of potentially suitable habitats within the SEZ region) and small for all other bird species (i.e., loss 0.5% or less of potentially suitable habitats within the SEZ region). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act. Wash and playa habitats should be avoided.
Wildlife: Mammals[b]	Direct impacts on all representative mammal species would be small.	The fencing around the solar energy development

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
	Loss of potentially suitable habitats for cougar, mule deer, and pronghorn would be 0.3%, 0.3%, and 0.2%, respectively, of potentially suitable habitats within the SEZ region. Loss of potentially suitable habitats for the other representative mammal species would be 0.4% or less of potentially suitable habitats within the SEZ region. Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These impacts are expected to be negligible with the implementation of design features.	should not block the free movement of mammals, particularly big game species. Wash and playa habitats should be avoided.
Aquatic Biota[b]	No permanent streams or water bodies occur within the proposed Millers SEZ. The surface water features that do occur in the area are generally dry most of the time and do not support wetland or riparian habitats. Consequently, potential effects on aquatic habitats or biota from solar energy development within the proposed SEZ would be negligible.	None.
Special Status Species[b]	Potentially suitable habitat for 19 special status species occurs in the affected area of the Millers SEZ. For all special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects.	Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible for some species, translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to
Special Status Species[b]		offset the impacts of development should be

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
(Cont.)		developed in coordination with the appropriate federal and state agencies. Coordination should be conducted with the USFWS and NDOW for the Crescent Dunes aegialian scarab beetle, Crescent Dunes serican scarab beetle, and greater sage-grouse – species that are candidates or under review for ESA listing. Coordination would identify an appropriate survey protocol, and mitigation requirements, which may include avoidance, minimization, translocation, or compensation. Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.
Air Quality and Climate	*Construction*: Predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed the AAQS at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. However, concentrations would decrease quickly with distance. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area. In addition, construction emissions from the engine exhaust of heavy equipment and vehicles could somewhat affect AQRVs at nearby federal Class I areas.	None.
Air Quality and Climate	*Operations*: Positive impact due to avoided emission of air pollutants	

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
(Cont.)	from combustion-related power generation: 6.9 to 12% of total SO_2, NO_x, Hg, and CO_2 emissions from electric power systems in the State of Nevada (up to 6,639 tons/yr SO_2, 5,695 tons/yr NO_x, 0.038 tons/yr Hg, and 3,655,000 tons/yr CO_2).	
Visual Resources	The SEZ is in an area of low scenic quality, with some cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape are possible. Approximately 31 mi (50 km) of U.S. 6 is within the SEZ viewshed. Weak to strong visual contrasts could be observed within the SEZ by travelers on U.S. 6.	None.
Acoustic Environment	*Construction*. For construction activities occurring near the southeastern SEZ boundary, estimated noise levels at the nearest residences (about 11 mi [18 km] east-southeast of the SEZ) would be about 15 dBA, which is well below a typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn} at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas. *Operations*. Noise levels at the nearest residences from a parabolic trough or power tower facility would be about 21 dBA, which is much lower than the typical daytime mean rural background level of 40 dBA. For 12-hour daytime operation, about 40 dBA L_{dn} (i.e., no contribution from	None.
Acoustic Environment	facility operation) would be estimated for the nearest residences, which is	

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
(Cont.)	well below the EPA guideline of 55 dBA L_{dn} for residential areas. In the case of 6-hour TES, the estimated nighttime noise level at the nearest residences would be would be 31 dBA, which is comparable to the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level at the nearest residences, about 11 mi (18 km) from the SEZ boundary, would be about 33 dBA, which is below the typical daytime mean rural background level of 40 dBA. Assuming 12-hour daytime operation, the estimated 40 dBA L_{dn} at these residences would be well below the EPA guideline of 55 dBA L_{dn} for residential areas.	
Paleontological Resources	The potential for impacts on significant paleontological resources in 94% of the proposed Millers SEZ is unknown, but potentially high. A more detailed investigation of the lacustrine and playa deposits is needed prior to project approval. A paleontological survey would likely be needed. Few, if any, impacts on significant paleontological resources are likely in the remaining 6% of the proposed SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted.	The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations.
Cultural Resources	Direct impacts on significant cultural resources could occur in the proposed Millers SEZ; however, further investigation is needed. At least 30 sites have been recorded within the SEZ, although none have been evaluated for inclusion in the NRHP. Dune areas have considerable potential for containing significant sites on the valley floors suitable for solar development. The area within the proposed Millers SEZ associated with Lake Tonopah also has the potential to provide significant sites related to exploitation of lacustrine resources.	Avoidance of areas with a high potential for a high density of sites, such as in the vicinity of both the former Lake Tonopah and Millers town site, is recommended.

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
Cultural Resources *(Cont.)*	A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP.	Other SEZ-specific design features would be determined through consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.
Native American Concerns	While no comments specific to the proposed Millers SEZ have been received from Native American Tribes to date, as consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concern over potential visual, acoustic, and other effects of solar energy development within the SEZ on specific resources, including culturally important landscapes.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultations with the affected Tribes.
Socioeconomics	*Construction:* 346 to 4,578 total jobs; \$21 million to \$278.3 million income in ROI. *Operations:* 36 to 785 annual total jobs; \$1.2 million to \$26.3 million annual income in the ROI.	None.
Environmental Justice	Minority and low-income *individuals* live within 50 mi (80 km) of the SEZ. However, as defined in CEQ guidelines, no minority or low-income *populations* occur within that area; thus, there would be no disproportionately high and adverse human health or environmental effects on low-income or minority populations.	None.

TABLE 11.7.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Millers SEZ	SEZ-Specific Design Features
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum) or possibly 4,000 vehicle trips per day if two larger projects were to be developed at the same time. The volume of traffic on U.S. 95 along the southern edge of the Millers SEZ would represent an increase in traffic of about 100 or 200% for one or two projects, respectively, should all traffic access the SEZ in that area.	None.

Abbreviations: AAQS = ambient air quality standards; AQRV = air quality-related value; AUM = animal unit month; BLM = Bureau of Land Management; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; DoD = U.S. Department of Defense; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; FY = Fiscal Year; Hg = mercury; HMA = Herd Management Area; MTR = military training route; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NO_x = nitrogen oxides; NRHP = *National Register of Historic Places*; NTTR = Nevada Test and Training Range; OHV = off-highway vehicle; PEIS = programmatic environmental impact statement; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 μm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 μm or less; PSD = prevention of significant deterioration; PV = photovoltaic; ROI = region of influence; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; USFS = U.S. Forest Service; USFWS = U.S. Fish and Wildlife Service.

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Millers SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 11.7.10 through 11.7.12.

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11.7.2 Lands and Realty

11.7.2.1 Affected Environment

The proposed Millers SEZ is a large and very well-blocked area of BLM-administered public land. The overall character of the land in the SEZ area is rural and undeveloped, although there are numerous dirt roads that cross the SEZ. The old town site of Millers is located just south of the SEZ, and there is land disturbance all around the SEZ associated with road construction, power line construction, mining, and development of the town site. U.S. 6/U.S. 95 parallels the southern side of the SEZ and provides good access to the site. There is a highway rest stop just south of the southeastern corner of the SEZ.

There are several transmission lines within ROWs in and near the SEZ. Two lines traverse the area, one in a north–south direction and the other in a northwest–southeast direction. There are maintenance roads along these transmission lines. The latter line is located within one of the two locally designated corridors near the SEZ. The second corridor, which contains two existing transmission lines, parallels the southeastern boundary of the SEZ, and small portions of the ROW for one of the transmission lines lie within the SEZ. There is a designated Section 368 (of the Energy Policy Act of 2005) energy corridor about 15 mi (24 km) southwest of the SEZ. Small portions of the ROWs for U.S. 6/U.S. 95 and a fiber optic line paralleling the highway are within the SEZ as well.

As of February 2010, there were no ROW applications for solar energy facility development on the SEZ; however, the BLM is processing a solar energy application for a site about 3 mi (5 km) east of the proposed SEZ.

11.7.2.2 Impacts

11.7.2.2.1 Construction and Operations

Full development of the proposed Millers SEZ could disturb up to 13,430 acres (54 km^2) (Table 11.7.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is rural and undeveloped, utility-scale solar energy development would be a new and dominant land use in the area.

Existing ROW authorizations on the SEZ are prior existing rights, and facilities within the ROWs would not be affected by solar energy development. Since the small portions of three ROWs within the southern and southeastern boundaries of the SEZ were issued in aliquot parts rather than based on a survey, it is likely that there is no physical development in them within the SEZ. There is a technical issue about whether the existing ROW holders would agree to amend their existing ROWs to allow solar development to occur within the existing ROWs or if it would be necessary to make minor adjustments to the proposed SEZ boundary to avoid these ROWs. Either way, existing rights issued to the ROW holders would be protected. Should the proposed SEZ be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights issued for solar energy development. Because the area currently has so few ROWs present, and there is a large amount of potentially available BLM-administered land nearby, it is not anticipated that approval of solar energy development would have a significant impact on public land available for future ROWs in the area.

The designated local transmission corridor located within the SEZ occupies an undetermined amount of the proposed SEZ and could limit future solar development within the corridor. To avoid technical or operational interference between transmission and solar energy facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. The corridor could be relocated outside the SEZ to allow full solar development within the SEZ. This is an administrative conflict that the BLM can address through its planning process; but if the existing corridor alignment is retained, there would be implications for the amount of potential solar energy development that could be accommodated within the SEZ.

11.7.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 120-kV transmission line runs adjacent to the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed. .

U.S. 6/U.S. 95 is adjacent to the SEZ, and it is assumed that no new roads would be required to provide access to the site. Roads and transmission lines would be constructed within the SEZ as part of the development of the area.

11.7.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

There are no SEZ specific design features proposed to protect lands and realty resources. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for some identified impacts. The exceptions would be the establishment of a large industrial area that would exclude many existing and potential uses of the land and would be a new and discordant land use to the area.

11.7.3 Specially Designated Areas and Lands with Wilderness Characteristics

11.7.3.1 Affected Environment

Specially designated areas normally consist of the following:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;
- Congressionally authorized Wilderness Areas;
- Wilderness Study Areas;
- National Wild and Scenic Rivers;
- Congressionally authorized Wild and Scenic Study Rivers;
- National Scenic Trails and National Historic Trails;
- National Historic Landmarks and National Natural Landmarks;
- All-American Roads, National Scenic Byways, State Scenic Highways; and BLM- and USFS-designated scenic highways/byways;
- BLM-designated Special Recreation Management Areas;
- BLM-designated ACECs; and
- Designated state or local facilities or attractions.

In the case of the proposed Millers SEZ, none of these types of areas are present within 25 mi (40 km) of the SEZ. In addition, there are no areas within 25 mi (40 km) of the SEZ that have been identified by the BLM as possessing wilderness characteristics.

11.7.3.2 Impacts

There would be no impacts on specially designated areas in the SEZ.

11.7.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be required to protect specially designated areas.

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11.7.4 Rangeland Resources

11.7.4.1 Livestock Grazing

11.7.4.1.1 Affected Environment

The proposed Millers SEZ contains a small portion of the Monte Cristo perennial grazing allotment. The total acreage of the allotment is 496,018 acres (2,007 km^2). One permittee operates in the allotment.

11.7.4.1.2 Impacts

Construction and Operations

Should utility-scale solar development occur in the SEZ, grazing would be excluded from the areas developed as provided for in the BLM grazing regulations (43 CFR Part 4100). This would include reimbursement of the permittee for their portion of the value for any range improvements in the area removed from the grazing allotment. There are 16,787 acres (68 km^2) of public lands in this SEZ, which is less than 4% of the Monte Cristo allotment. Because of the size of the allotment, the loss of this portion of the allotment is not anticipated to have a significant impact on the overall grazing operation because there likely are opportunities to make livestock management changes and/or to provide additional livestock management facilities to mitigate the loss of forage within the SEZ. No loss of AUMs is anticipated.

Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of a major transmission line in the SEZ, and U.S. 6/U.S. 95 near the SEZ, and assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of such activities outside of the SEZ was conducted (see Section 11.7.1.2).

11.7.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exception may be the loss of 4% of the Monte Cristo grazing allotment.

A proposed design features specific to the Millers SEZ is:

- Development of range improvements in the Monte Cristo allotment should be considered if site-specific analysis determines there would need to be a reduction in permitted AUMs because of lost grazing capacity.

11.7.4.2 Wild Horses and Burros

11.7.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nearly 100 wild horse and burro herd management areas (HMAs) occur within Nevada (BLM 2009d). A number of HMAs occur within the 50-mi (80-m) SEZ region for the proposed Millers SEZ (Figure 11.7.4.2-1). A portion of the Paymaster and Pilot Mountain HMAs occurs within the indirect impact area of the SEZ. The Paymaster HMA contained an estimated population of 52 wild horses in FY 2009, although the appropriate management level is only 38 wild horses. The Pilot Mountain HMA contained an estimated population of 342 wild horses, which is less than the appropriate management level of 415 wild horses (BLM 2010c).

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah; and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territories to the Millers SEZ are the Toiyabe and Monitor territories located about 21 and 23 mi (34 and 37 km), respectively, from the SEZ (Figure 11.7.4.2-1). No wild horses occupy the Toiyabe Territory; wild horses occur in the Monitor Territory, but the number present is not reported (USFS 2005a,b).

11.7.4.2.2 Impacts

The Paymaster HMA totals 100,591 acres (407.1 km^2), of which 99,919 acres (404.4 km^2) are BLM acres. About 998 acres (4 km^2), or 1.0%, of the HMA would be in the area of indirect impact for the proposed Millers SEZ. The Pilot Mountain HMA totals 477,136 acres (1,930.9 km^2), of which 475,499 acres (1,924.3 km^2) are BLM acres. About 29,219 acres (118.2 km^2), or 1.6%, of the HMA would be in the area of indirect impact for the SEZ. Indirect impacts on wild horses could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, and harassment. These indirect impacts are expected to be negligible with the implementation of programmatic design features. USFS wild horse territories are located well outside of the indirect impact area for the proposed Millers SEZ; thus, no direct or indirect impacts on any wild horses in USFS wild horse territories would occur from the construction or operations of solar facilities in the SEZ.

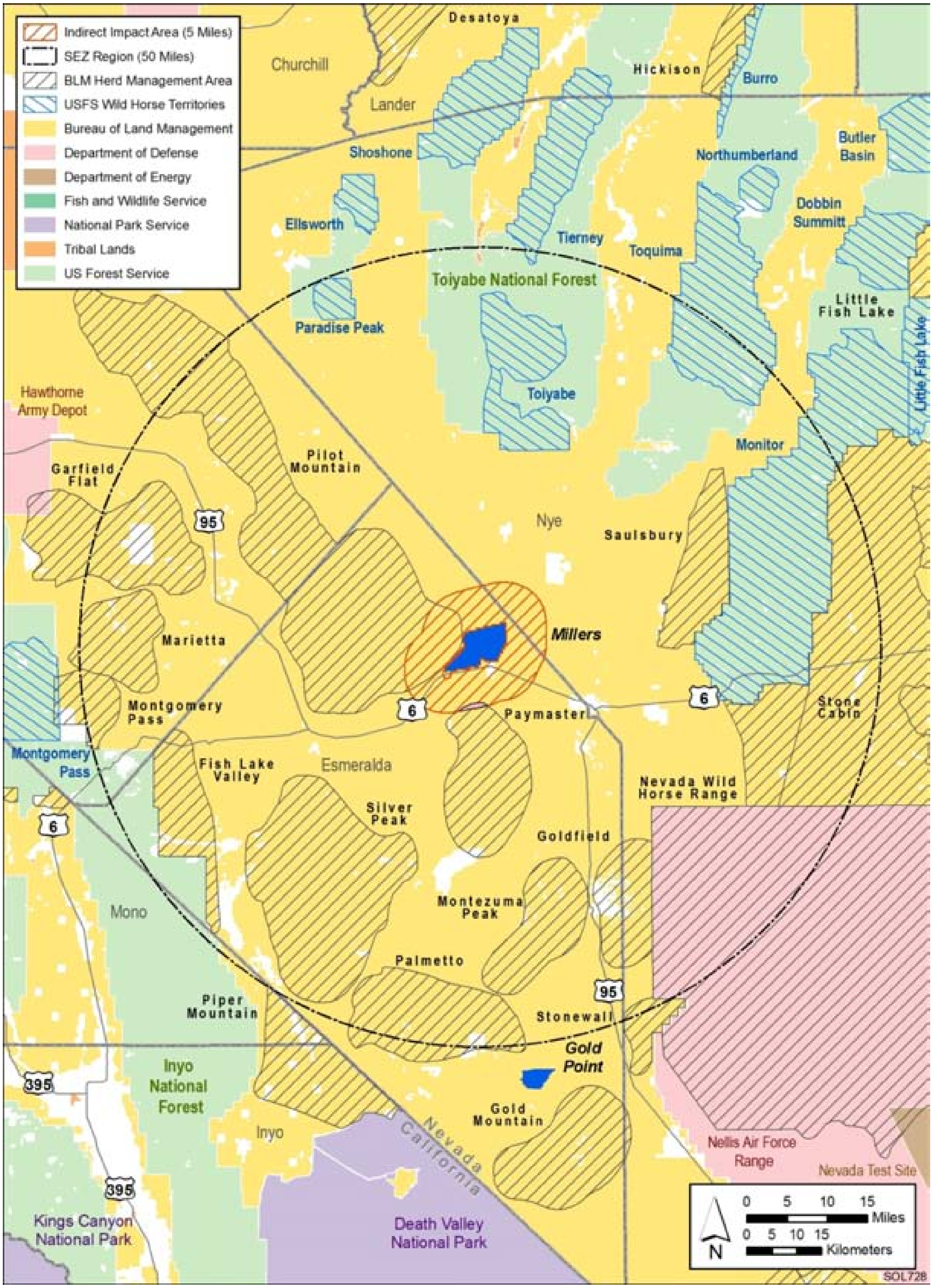

FIGURE 11.7.4.2-1 Wild Horse and Burro Herd Management Areas and Territories within the Analysis Area for the Proposed Millers SEZ (Sources: BLM 2010b; USFS 2007)

11.7.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features for solar development within the proposed Millers SEZ would be necessary to protect or minimize direct impacts on wild horses and burros. Indirect impacts should be reduced to negligible levels by implementing programmatic design features and engineering controls that reduce noise lighting, spills, and fugitive dust.

11.7.5 Recreation

11.7.5.1 Affected Environment

The site of the proposed Millers SEZ is located adjacent to U.S. 6/U.S. 95 and is about 15 mi (24 km) from Tonopah. The area is flat and generally unremarkable, with numerous roads and trails that provide access through the area. While there are no recreational use data for the area, backcountry driving, OHV use of the roads and trails, and hunting are likely to be the major recreational activities in the area. A portion of the route for the annual Las Vegas to Reno OHV race passes through the area.

11.7.5.2 Impacts

11.7.5.2.1 Construction and Operations

Recreational use would be eliminated from portions of the SEZ developed for solar energy production. Although there are no recreational use figures for the area, the nature of the area does not encourage recreational use. The area contains numerous roads and trails that are available for travel that would be closed if solar energy development would occur, and the route of the Las Vegas to Reno OHV race within the SEZ would be closed. The potential loss of recreational use that would accompany solar development of the SEZ is anticipated to be small.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If open OHV routes within the SEZ were identified during project-specific analyses, they would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

11.7.5.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and U.S. 6/U.S. 95 near the SEZ, no additional construction of transmission or road facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional recreation impacts. See Section 11.7.1.2 for the development assumptions underlying this analysis.

11.7.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide some mitigation for some identified impacts. The exceptions may be recreational use of the area developed for solar energy production would be lost and would not be mitigatable.

Proposed design features specific to the Millers SEZ include the following:

- Alternative routes for the Las Vegas to Reno race should be considered consistent with local land use plan requirements.

11.7.6 Military and Civilian Aviation

11.7.6.1 Affected Environment

Approximately the eastern two-thirds of the proposed Millers SEZ is covered by MTRs, with 50- and 100-ft (15- and 30-m) AGL operating limits. The area is located about 26 mi (42 km) northwest of the boundary of the NTTR and the Nellis Air Force Base.

The closest civilian municipal aviation facility is the Tonopah Municipal Airport, which is located about 20 mi (32 km) southeast of the SEZ. The airport does not have scheduled commercial passenger service or regular freight service.

11.7.6.2 Impacts

The military has expressed serious concern over solar energy facilities being constructed within the proposed Millers SEZ and at the solar energy site currently being evaluated just east of the SEZ. The military is especially concerned over the potential use of power tower facilities that would obstruct existing military airspace. Nellis Air Force Base has indicated that it has concerns for its use of the MTRs because of potential overflight restrictions above a solar energy facility, the height of solar facilities, possible restrictions on hydrocarbon or residue from fuel burn by aircraft, possible glare from reflective surfaces, and any potential restrictions on supersonic operations over solar facilities. The NTTR has indicated that solar technologies requiring structures higher than 50 ft (15 m) AGL may present unacceptable electromagnetic compatibility concerns for its test mission at the NTTR. The NTTR maintains that a pristine testing environment is required for the unique national security missions conducted on the NTTR. The potential electromagnetic interference impacts from solar facilities on testing activities at the NTTR, coupled with potential training route obstructions created by taller structures, make it likely that solar facilities exceeding 50 ft (15 m) could significantly affect military operations.

The Air Force states that the NTTR complex is unique in the world in its ability to provide realistic training of air crews. In addition to the effect of individual solar energy facilities, there is a more general concern over the potential for cumulative effects from multiple solar energy projects around the NTTR to eventually have a serious adverse effect on the training environment of the NTTR.

The Tonopah Airport is located far enough away from the proposed SEZ that there would be no effect on airport operations.

11.7.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features are required to protect either military airspace or civilian aviation operations. The programmatic design features described in Appendix A, Section A.2.2, would require early coordination with the DoD to identify and mitigate, if possible, potential impacts on the use of MTRs.

11.7.7 Geologic Setting and Soil Resources

11.7.7.1 Affected Environment

11.7.7.1.1 Geologic Setting

Regional Setting

The proposed Millers SEZ is located in the Big Smoky Valley, a north-trending basin within the Basin and Range physiographic province in south-central Nevada. In the Millers SEZ region, the valley is bounded on the northwest by the Monte Cristo Range and Royston Hills and on the east by the San Antonio Mountains. The Lone Mountain lies to the south (Figure 11.7.7.1-1). The Big Smoky Valley is one of many structural basins (graben) typical of the Basin and Range province.

Exposed sediments in the Big Smoky Valley consist mainly of modern alluvial (Qa) and playa (Qp) sediments. Alluvial sediments at the Millers SEZ cover or partially cover lacustrine deposits (Ql) associated with Lake Tonopah, an ancient lake that covered the valley during the Pleistocene (Figure 11.7.7.1-2). These fine-grained sediments—sandy silts, silts, sandy clays, and clays—are found in the valley center and are abundant within the SEZ. Sand dunes and dune complexes also occur throughout the valley; the Crescent Dunes are located about 6 mi (10 km) to the northwest of the SEZ. In the surrounding mountains, exposures are predominantly Tertiary volcanics. The oldest rocks in the region are the Late Proterozoic to Cambrian metamorphic rocks (CZq) that occur in Lone Mountain south of the SEZ. These rocks have been intruded by Mesozoic granites and granodiorites.

Semiconsolidated to unconsolidated basin-fill deposits are estimated to be about 5,000 ft (1,530 m) thick in the northern part of the Big Smoky Valley; estimates for the southern part of the valley, where the proposed Millers SEZ is located, have not been reported. Basin-fill sediments constitute the most important aquifers in the Big Smoky Valley (Handman and Kilroy 1997).

Topography

The Big Smoky Valley covers an area of about 567,700 acres (2,300 km^2) (USDA 1980) and stretches 115 mi (185 km) across three counties in south-central Nevada (Figure 11.7.7.1-1). Elevations along the valley axis range from about 6,200 ft (1,890 m) at its northern end (Lander County) and along the valley sides to about 4,750 ft (1,450 m) at its southern end (Esmeralda County). Alluvial fan deposits occur along the mountain fronts on both sides of the valley; near the SEZ, they enter the valley from the west. The valley is drained by several unnamed ephemeral streams. Other topographic features include sand dunes, playas, and the many

FIGURE 11.7.7.1-1 Physiographic Features of the Big Smoky Valley Region

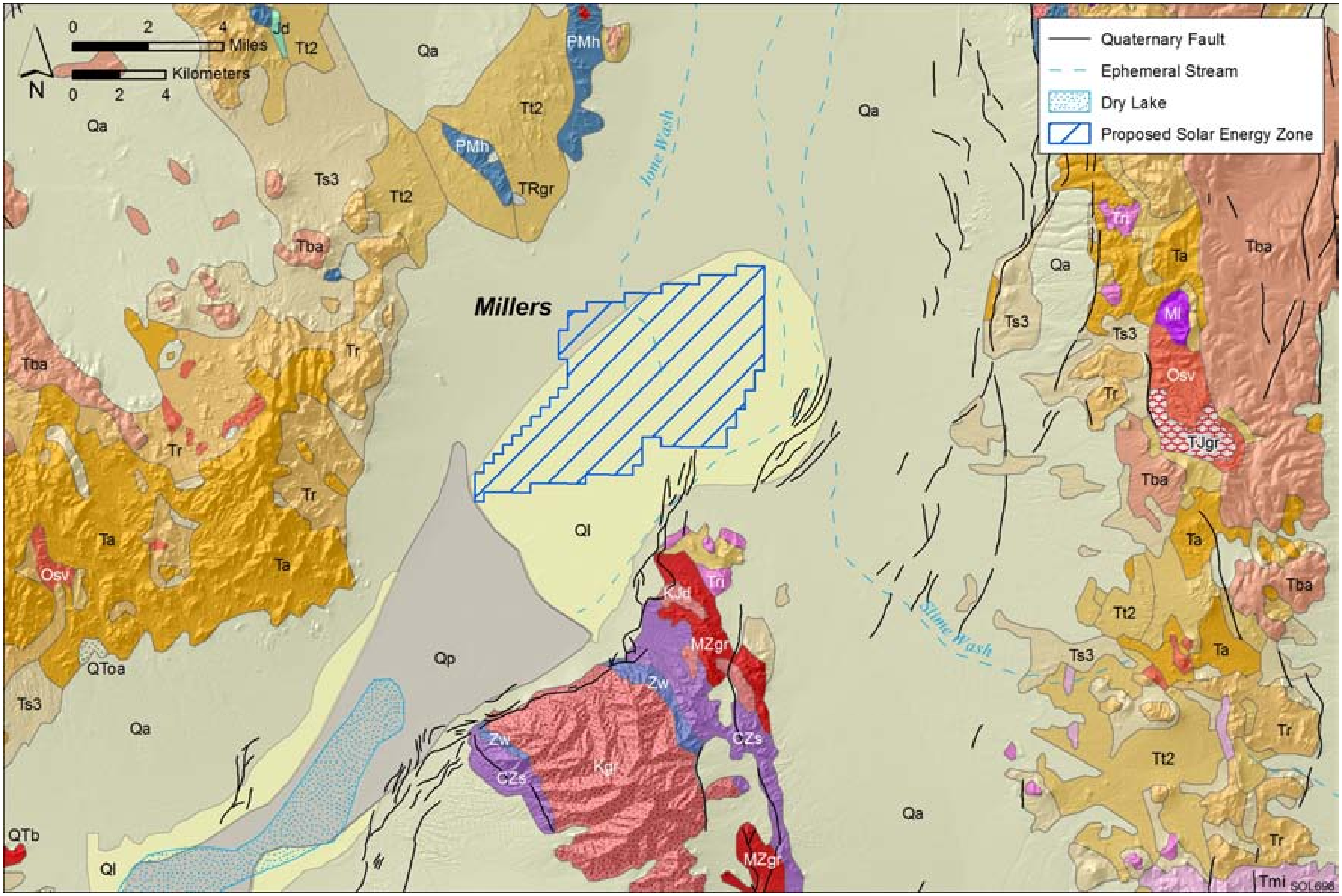

FIGURE 11.7.7.1-2 Geologic Map of the Big Smoky Valley Region (Sources: Ludington et al. 2007; Stewart and Carlson 1978; Soller et al. 2009)

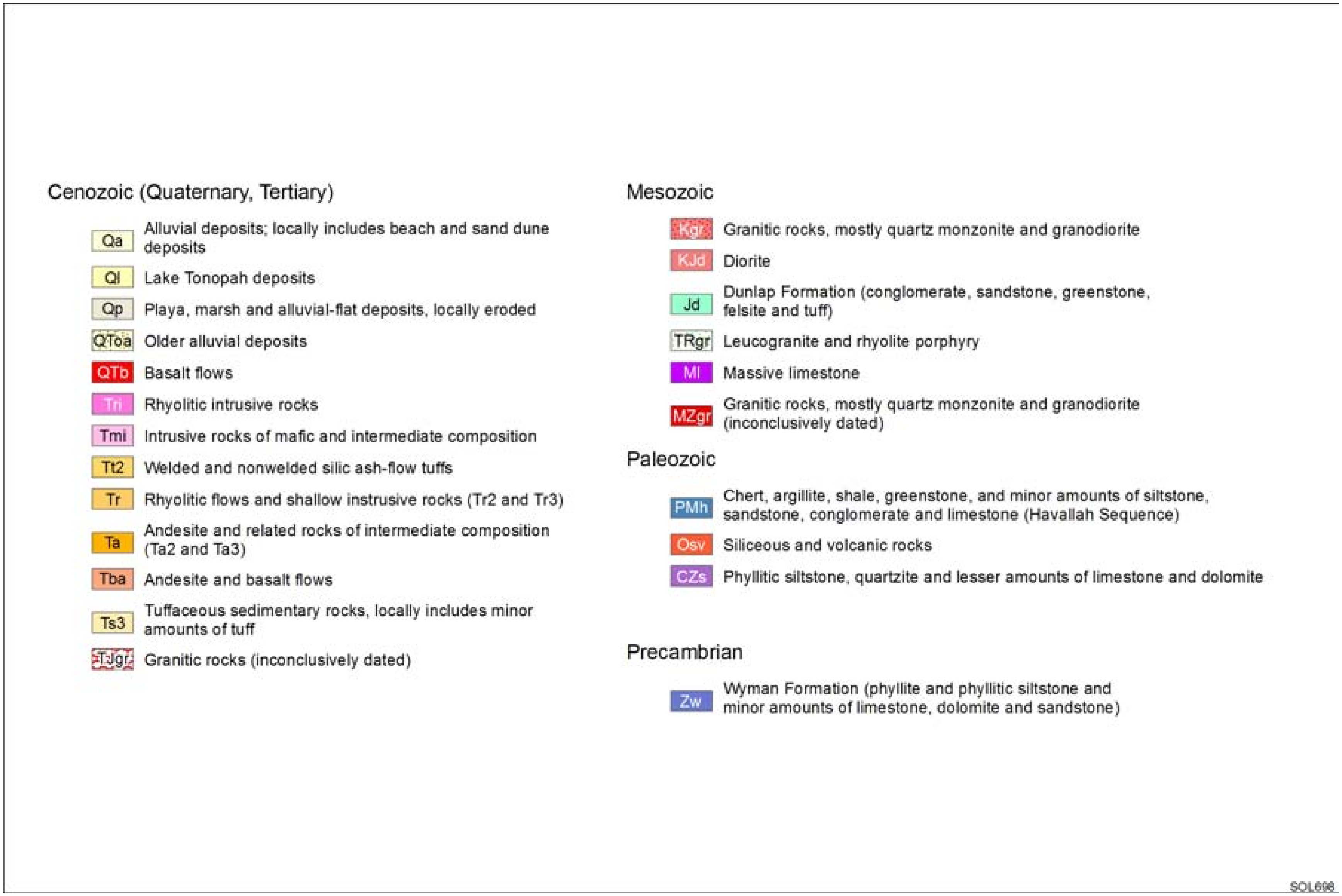

FIGURE 11.7.7.1-2 (Cont.)

unnamed washes that drain the surrounding mountains and feed the central streams in the valley center.

The proposed Millers SEZ is located in the southern part of the Big Smoky Valley, between the Monte Cristo Range and Royston Hills to the northwest, the Lone Mountain to the south, and the San Antonio Mountains to the east. Its terrain is relatively flat, with elevations ranging from about 4,850 ft (1,480 m) along the northern border to 4,780 ft (1,460 m) near the southwest end (Figure 11.7.7.1-3). Several drainages enter the SEZ from the north and drain to a large playa southwest of the site. A series of unnamed sand dunes occupy the northeast corner of the site.

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Section 5.7.3. The following sections provide a preliminary assessment of these hazards at the proposed Millers SEZ. Solar project developers may need to conduct a geotechnical investigation to identify and assess geologic hazards locally to better identify facility design criteria and site-specific design features to minimize their risk.

Seismicity. The Big Smoky Valley is located within the Walker Lane Belt, a northwest-trending seismic region along the Nevada–California border that accommodates (right-lateral shear) strain from movement between the Pacific and North American plates. The proposed Millers SEZ lies within a zone of north–northeast trending extensional (normal) faults that run parallel to the valley axis and border the mountains to the southeast. These include the Lone Mountain and Paymaster Ridge faults, which extend from the SEZ to the southwest, and the Crescent Dune fault, which extends from the SEZ to the northeast (Figure 11.7.7.1-4).

The Lone Mountain fault extends from the southeast corner of the Millers SEZ near the Nye-Esmeralda county border to the southwest, along the northwest front of Lone Mountain and the Weepah Hills and the southeast side of the Big Smoky Valley sand dunes (Figure 11.7.7.1-4). Well-defined scarps along the fault trace in these areas show down-to-the-northwest displacement of as much as 16 ft (5 m). With the estimated age of offset sediments, the most recent movement along the fault is estimated at less than 15,000 years ago. The slip rate along this fault is estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Anderson and Sawyer 1999).

The north-trending Paymaster Ridge fault is located about 4 mi (6.4 km) south of the Millers SEZ (Figure 11.7.7.1-4). It extends to the south, along the eastern front of Lone Mountain, and continues for the length of Paymaster Ridge to the south. The fault is thought to be the major block-bounding fault separating Paymaster Ridge from the basin (graben) beneath Clayton Valley to the west. The fault plane likely dips gently to the west, and displacement is down to the west. With the age of offset sediments (Late Pleistocene), the most recent movement along the fault is estimated at less than 130,000 years ago. The slip rate along this fault is

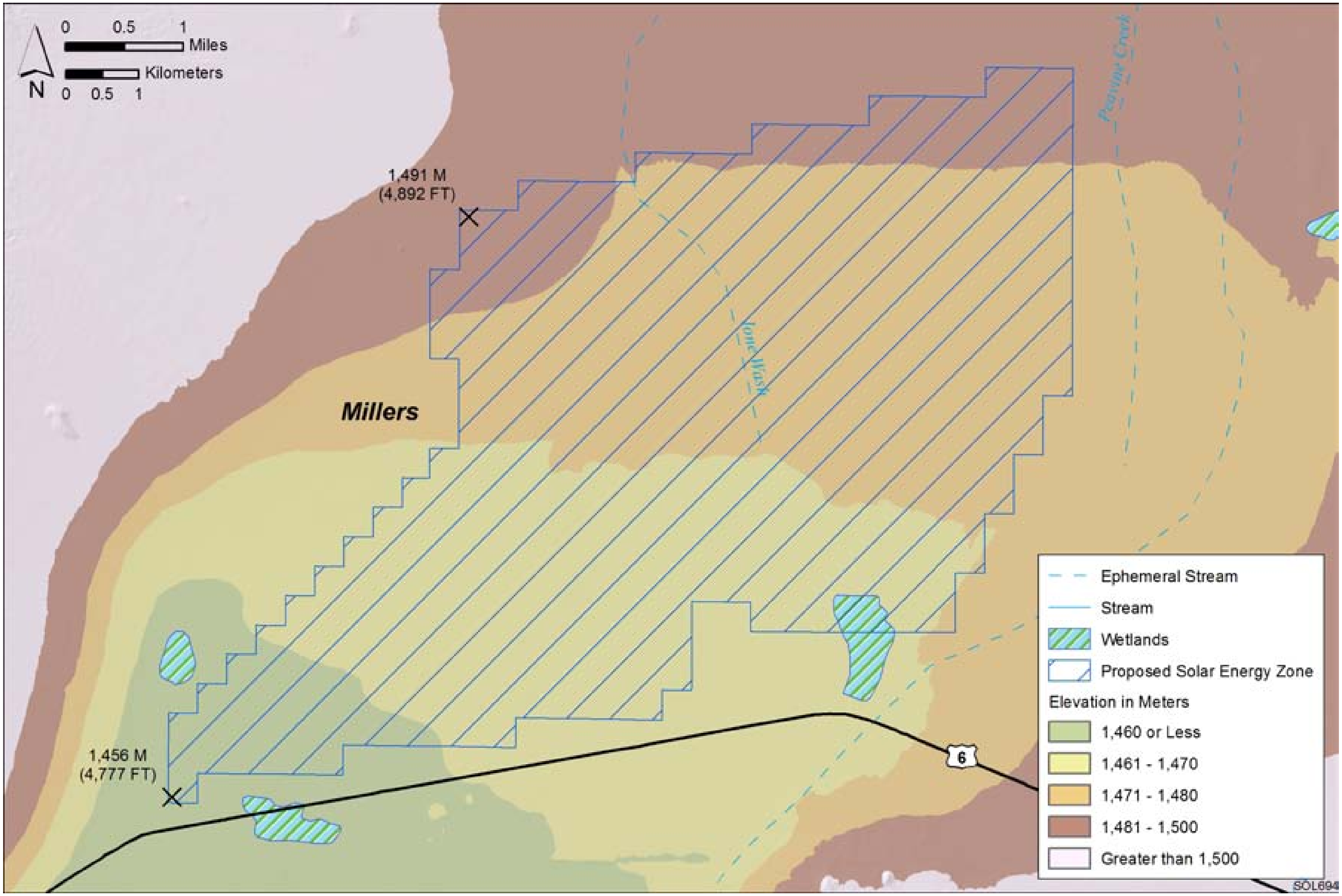

FIGURE 11.7.7.1-3 General Terrain of the Proposed Millers SEZ

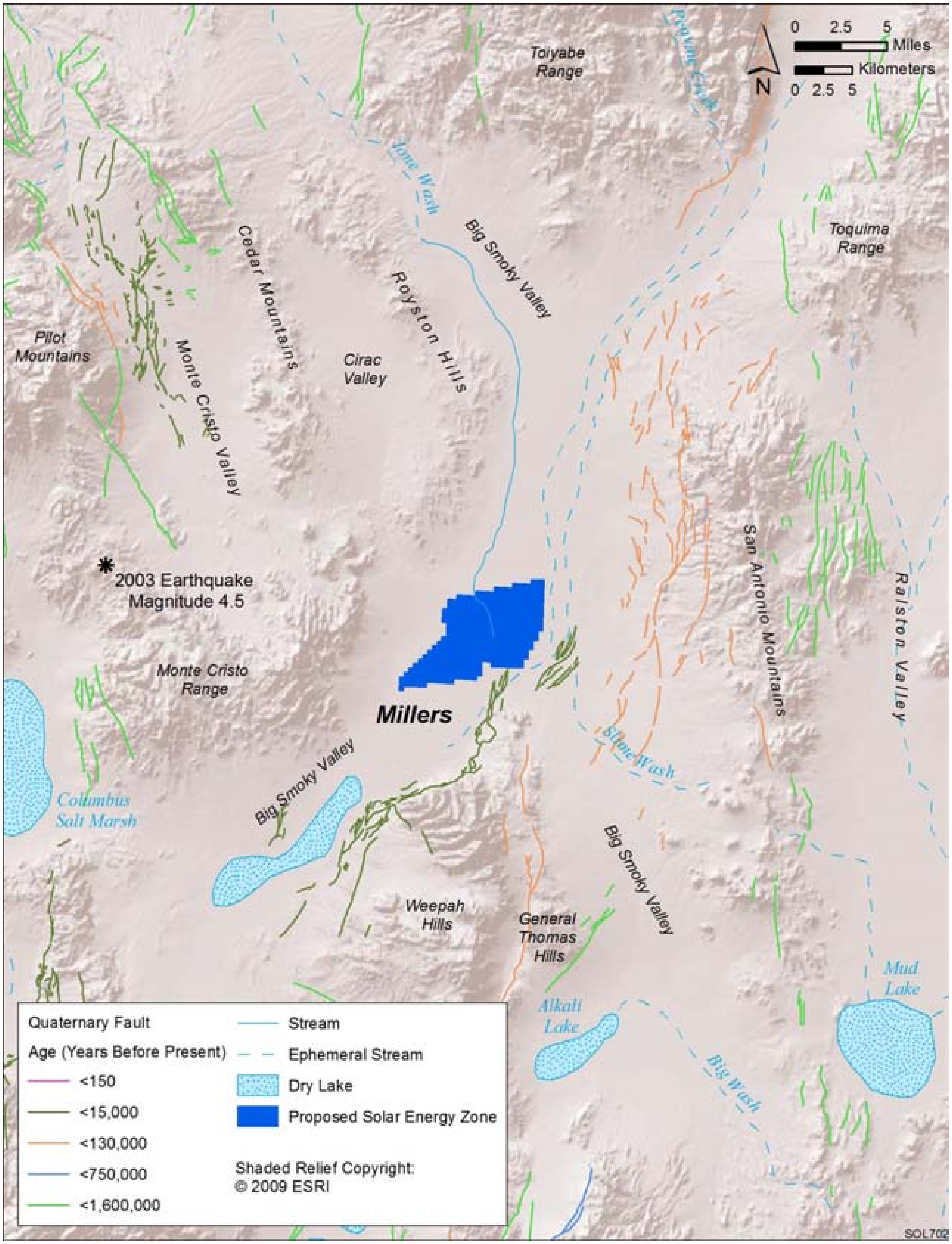

FIGURE 11.7.7.1-4 Quaternary Faults in the Big Smoky Valley Region (Sources: USGS and NBMG 2010)

estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Anderson and Ernest 1999).

The Crescent Dune fault is located about 4 mi (6.4 km) east of the Millers SEZ (Figure 11.7.7.1-4). It comprises a series of normal faults that extend to the north, along the western front of the San Antonio Mountains and across the piedmont slopes in the eastern part of the Big Smoky Valley. Scarps at the northwest end of the San Antonio Mountains and piedmont slope surfaces indicate displacement of as much as 13 ft (4 m). With the age of offsets of Early Pleistocene sediments and Tertiary volcanic rocks, the most recent movement along these faults is estimated at less than 130,000 years ago. Slip rates along these faults are estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Sawyer 1999).

From June 1, 2000 to May 31, 2010, 123 earthquakes were recorded within a 61-mi (100-km) radius of the proposed Millers SEZ. The largest earthquake during that period occurred on November 15, 2003. It was located about 19 mi (30 km) west of the SEZ in the Monte Cristo Mountains (north of the Columbus Salt Marsh) and registered a Richter scale magnitude (ML[1]of 4.5 (Figure 11.7.7.1-4). During this period, 63 (51 %) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0; none were greater than 4.5 (USGS 2010c).

Liquefaction. The proposed Millers SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.15 and 0.20 g. Shaking associated with this level of acceleration is generally perceived as strong to very strong; however, potential damage to structures is light to moderate (USGS 2008). Given the deep water table (from 8 to 78 ft [2 to 24 m] below the surface [USGS 2010b]) and the low intensity of ground shaking estimated for the Big Smoky Valley, the potential for liquefaction in valley sediments is likely to be low.

Volcanic Hazards. The Millers SEZ is located about 80 mi (130 km) northwest of the southwestern Nevada volcanic field, which consists of volcanic rocks (tuffs and lavas) of the Timber Mountain-Oasis Valley caldera complex and Silent Canyon and Black Mountain calderas. The area has been studied extensively because of its proximity to the NTS and Yucca Mountain repository. Two types of fields are present in the region: (1) large-volume, long-lived fields with a range of basalt types associated with more silicic volcanic rocks produced by melting of the lower crust, and (2) small-volume fields formed by scattered basaltic scoria cones during brief cycles of activity, called rift basalts because of their association with extensional structural features. The basalts of the region typically belong to the second group; examples include the basalts of Silent Canyon and Sleeping Butte (Byers et al. 1989; Crowe et al. 1983).

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[1] Richter scale magnitude (ML) was the original magnitude defined by Richter and Gutenberg for local earthquakes in 1935. It was based on the maximum amplitude recorded on a Wood-Anderson torsion seismograph but is currently calculated for earthquakes with magnitudes ranging from 2 to 6, using modern instruments with adjustments (USGS 2010d).

The oldest basalts in the region were erupted during the waning stages of silicic volcanism in the southern Great Basin in the Late Miocene and are associated with silicic volcanic centers like Dome Mountain (the first group). Rates of basaltic volcanic activity in the region have been relatively constant but generally low. Basaltic eruptions occurred 1.7 million to 700,000 years ago, creating the cinder cones within Crater Flat (Stuckless and O'Leary 2007). The most recent episode of basaltic eruptions occurred at the Lathrop Wells Cone complex about 80,000 years ago (Stuckless and O'Leary 2007). There has been no silicic volcanism in the region in the past 5 million years. Current silicic volcanic activity occurs entirely along the margins of the Great Basin (Crowe et al. 1983).

Crowe et al. (1983) determined that the annual probability of a volcanic event for the region is very low (3.3×10^{-10} to 4.7×10^{-8}); similar to the probability of 1.7×10^{-8} calculated for the proposed Yucca Mountain repository (Cline et al. 2005). The volcanic risk in the region is associated only with basaltic eruptions; the risk of silicic volcanism is negligible. Perry (2002) cites geologic data that could indicate an increase in the recurrence rate (and thus the probability of disruption). These data include hypothesized episodes of an anomalously high strain rate, the hypothesized presence of a regional mantle hot spot, and new aeromagnetic data that suggest that previously unrecognized volcanoes may be buried in the alluvial-filled basins in the region.

The Long Valley Caldera of eastern California, is located about 70 mi (113 km) southeast. The Long Valley Caldera is part of the Mono-Inyo Craters volcanic chain, which extends from Mammoth Mountain (on the caldera rim) northward about 25 mi (40 km) to Mono Lake. Small to moderate eruptions have occurred at various sites along the volcanic chain in the past 5,000 years, at intervals ranging from 250 to 700 years. Windblown ash from some of these eruptions is known to have drifted as far east as Nebraska. Since 1980, when Long Valley experienced a swarm of strong earthquakes, the central part of the caldera has been rising, indicating the rise of magma below the caldera. Although the probability of an eruption within the volcanic chain in any given year is small (less than 1%), serious hazards could result from an eruption. Depending on the location, size, timing (season), and type of eruption, hazards could include mudflows and flooding, pyroclastic flows, small to moderate volumes of tephra, and falling ash (Hill et al. 1998, 2000; Miller 1989).

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to facilities on the relatively flat terrain of valley floors like the Big Smoky Valley, if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

There has been no land subsidence monitoring within the Big Smoky Valley to date; the potential for subsidence is not currently known.

Other Hazards. Other potential hazards at the proposed Millers SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactible or collapsible soil (settlement).

Disturbance of soil crusts and desert pavement on soil surfaces may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those found in the Big Smoky Valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) will depend on specific morphology of the fan (National Research Council 1996). Section 11.7.9.1.1 provides further discussion of flood risks within the Millers SEZ.

11.7.7.1.2 Soil Resources

Soils within the proposed Millers SEZ are gravelly sands, gravelly fine sandy loams, fine sands, silt loams, silty clay loams (playas), and gravelly loams of the Yomba, Youngston, Belcher, Kawich, Wardenot, and Izo series, which together make up about 98% of the soil coverage at the site (Figure 11.1.7.1-5). Soil map units within the Millers SEZ are described in Table 11.7.7.1-1. These level to sloping soils are derived from mixed alluvium, typical of soils on alluvial fans, alluvial flats, and playas. They are characterized as very deep and well to excessively drained (except for playa soils, which are very poorly drained). Most soils on the site have low to moderate surface runoff potential and slow to rapid permeability. The natural soil surface is suitable for roads (except for playa soils which have a severe rutting hazard) with a slight erosion hazard when used as roads or trails. The water erosion potential is low for most soils. The susceptibility to wind erosion is moderate to high, with as much as 220 tons (200 metric tons) of soil eroded by wind per acre (4,000 m^2) each year (NRCS 2010). Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

All of the soils within the proposed Millers SEZ are rated as partially hydric.[2] Flooding is rare for most soils at the site except for the Youngston-Playas and Slaw-Playas associations, which cover about 319 ac (1 km^2) and have an occasional flooding rating (with a 5 to 50% chance in any year). None of the soils is classified as prime or unique farmland (NRCS 2010).

11.7.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy facilities in varying degrees and are described in more detail for the four phases of development in Section 5.7 1.

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2 A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding (NRCS 2010).

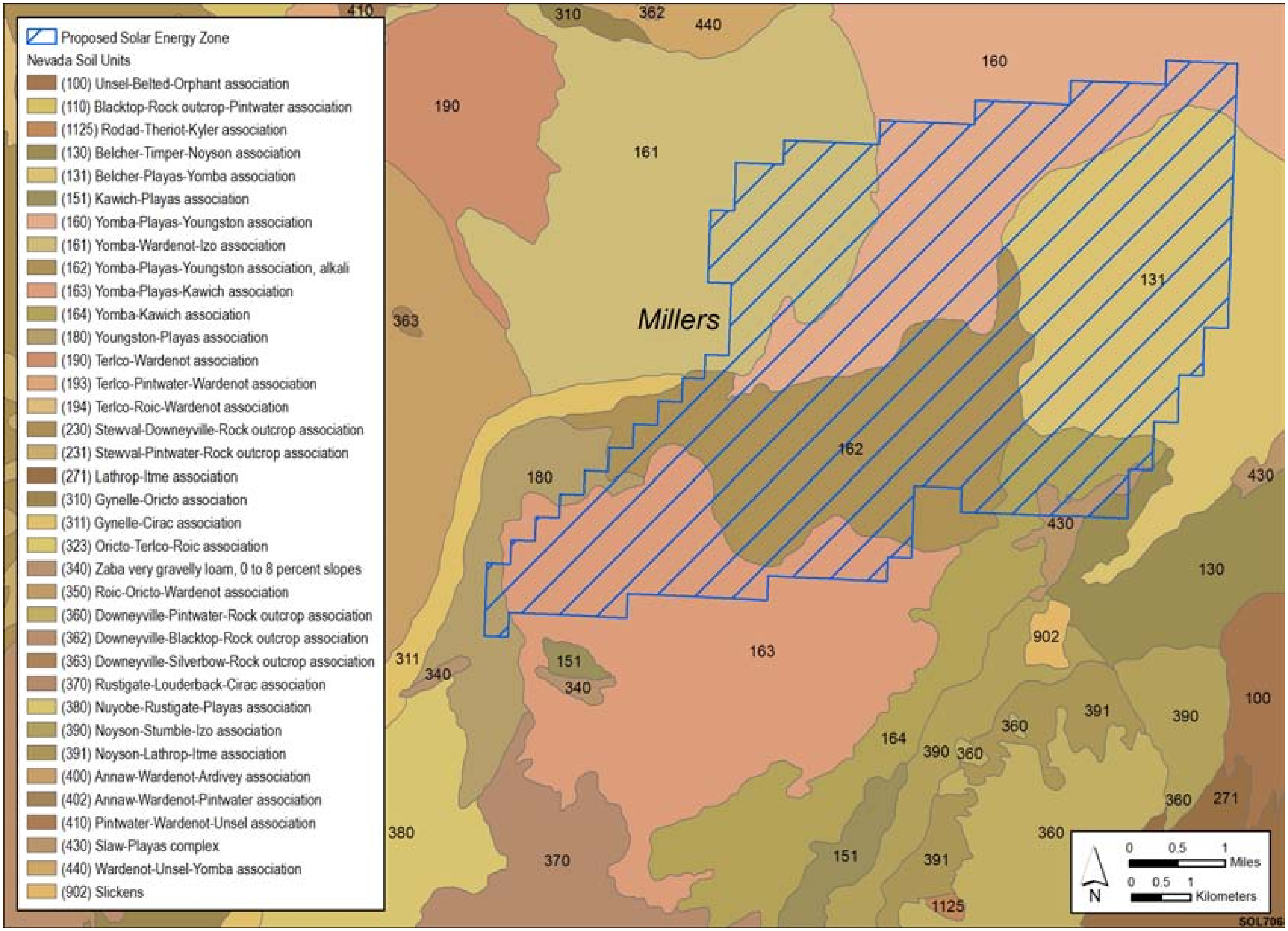

FIGURE 11.7.7.1-5 Soil Map for the Proposed Millers SEZ (NRCS 2008)

TABLE 11.7.7.1-1 Summary of Soil Map Units within the Proposed Millers SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
162	Yomba-Playas-Youngston association, alkali	Low	Moderate (WEG 4L)[d]	Consists of about 40% Yomba gravelly sand and 25% Playas (silty clay loam). Level to moderately sloping soils on alluvial flats, playas, and drainageways. Parent material is alluvium from mixed sources. Very deep and very poorly (Playas) to somewhat excessively drained, with moderate surface runoff potential and moderately slow to slow permeability. Available water capacity is very low (Playas) to low. Severe rutting hazard. Used mainly for livestock grazing and wildlife habitat.	4,068 (24)
131	Belcher-Playas-Yomba association	Low	High (WEG 2)	Consists of 45% Belcher gravelly sand, 20% Yomba gravelly fine sandy loam, and 20% Playas (silty clay loam). Level to nearly level soils on alluvial flats and playas. Parent material is alluvium from mixed sources. Shallow to a duripan (Belcher) and very deep and very poorly (Playas) to somewhat excessively drained, with high surface runoff potential (very slow infiltration rate) and moderate to moderately rapid permeability. Available water capacity is very low to low. Moderate rutting hazard. Used mainly for wildlife grazing, wildlife habitat, and irrigated cropland (alfalfa, corn silage, and small grains).	4,030 (24)
160	Yomba-Playas-Youngston association	Low	Moderate (WEG 4L)	Consists of 40% Yomba gravelly sand, 25% Playas (silty clay loam), and 20% Youngston silt loam. Level to moderately sloping soils on alluvial flats, playas, and drainageways. Parent material is alluvium from mixed sources. Very deep and very poorly (Playas) to somewhat excessively drained, with moderate surface runoff potential and moderately slow to slow permeability. Available water capacity is very low (Playas) to high. Severe rutting hazard. Used mainly for livestock grazing and wildlife habitat.	3,654 (22)

TABLE 11.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
163	Yomba-Playas-Kawich association	Moderate	High (WEG 1)	Consists of 30% Yomba gravelly sand, 30% Playas (silty clay loam), and 30% Kawich fine sand. Level to sloping soils on sand sheets (Kawich on stabilized sand dunes), alluvial flats, and playas. Parent material is alluvium from mixed sources and eolian sand. Very deep and very poorly (Playas) to excessively drained, with low surface runoff potential (high infiltration rate) and moderate to very rapid permeability. Available water capacity is very low (Playas) to low. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat.	2,262 (13)
161	Yomba-Wardenot-Izo association	Low	High (WEG 2)	Consists of 45% Yomba gravelly sand, 25% Wardenot gravelly fine sandy loam, and 15% Izo very gravelly sand. Level to sloping soils formed on alluvial flats and fan skirts. Parent material is alluvium from mixed sources. Very deep and somewhat excessively to excessively drained, with moderate surface runoff potential and moderate to rapid permeability. Available water capacity is very low to low. Moderate rutting hazard. Used mainly for grazing and wildlife habitat.	1,803 (11)
164	Yomba-Kawich association	Low	High (WEG 2)	Consists of 50% Yomba gravelly sand and 35% Kawich fine sand. Level to sloping soils on alluvial flats and fan skirts (Kawich on stabilized sand dunes). Parent material is alluvium from mixed sources. Very deep and somewhat excessively to excessively drained, with low surface runoff potential (high infiltration rate) and moderate to very rapid permeability. Available water capacity is very low to low. Moderate rutting hazard. Used mainly as livestock grazing and wildlife habitat.	602 (4)

TABLE 11.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
180	Youngston-Playas association	Moderate	Moderate (WEG 4L)	Consists of 60% Youngston silt loam and 25% Playas (silty clay loam). Level to nearly level soils on alluvial flats and playas. Parent material is alluvium from mixed sources. Very deep and very poorly (Playas) to well drained, with moderate surface runoff potential and moderately slow permeability. Available water capacity is very low (Playas) to high. Severe rutting hazard. Used mainly for livestock grazing, wildlife habitat, and irrigated cropland (alfalfa, corn silage, and small grains).	182 (1)
430	Slaw-Playas complex	Moderate	Moderate (WEG 4L)	Consists of 45% Slaw loam and 40% Playas (silty clay loam). Level to nearly level soils on alluvial flats and playas. Parent material is alluvium from mixed sources. Very deep and very poorly (Playas) to well drained, with high surface runoff potential (slow infiltration rate) and slow permeability. Available water capacity is very low (Playas) to high. Severe rutting hazard. Used mainly for livestock grazing and wildlife habitat.	137 (1)

[a] Water erosion potential rates based on soil erosion factor K, which indicates the susceptibility of soil to sheet and rill erosion by water. Values range from 0.02 to 0.69 and are provided in parentheses under the general rating; a higher value indicates a higher susceptibility to erosion. Estimates based on the percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8 low (see footnote d for further explanation).

[c] To convert from acres to km^2, multiply by 0.004047.

[d] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEG 1, 220 tons (200 metric tons) per acre (4,000 m^2) per year; WEG 2, 134 tons (122 metric tons) per acre (4,000 m^2) per year; and WEG 4L, 86 tons (78 metric tons) per acre (4,000 m^2) per year.

Source: NRCS (2010).

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility since some components would involve greater disturbance and would take place over a longer timeframe.

It is not known whether construction within the proposed Millers SEZ would affect the eolian processes that maintain the Crescent Dunes to the northwest of the site. A study may be required to evaluate the impacts of constructing and operating a solar facility in close proximity to the landform and to develop specific mitigation measures to avoid or minimize them.

11.7.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Millers SEZ. Implementing the programmatic design features described under both Soils and Air Quality in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for soil impacts during all project phases.

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11.7.8 Minerals (Fluids, Solids, and Geothermal Resources)

11.7.8.1 Affected Environment

As of July 19, 2010, there are no locatable mining claims within the SEZ (BLM and USFS 2010a), and the public land within the SEZ has been closed to locatable mineral entry since June 2009 pending the outcome of this solar energy PEIS. There are no active oil and gas leases in the area, and the area has not been leased in the past (BLM and USFS 2010b). The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals, and for disposal of salable minerals. There is no active geothermal leasing or development in or near the SEZ, nor has the area been leased previously (BLM and USFS 2010b).

11.7.8.2 Impacts

If the area is identified as a solar energy development zone, it would continue to be closed to all incompatible forms of mineral development. For the purpose of this analysis, it is assumed that future development of oil and gas resources, should any be found, would continue to be possible, since such development could occur with directional drilling from outside the SEZ. Since the SEZ does not contain existing mining claims, it was also assumed that there would be no future loss of locatable mineral production. The production of common minerals, such as sand and gravel and mineral materials used for road construction or other purposes, might take place in areas not directly developed for solar energy production.

The SEZ has had no history of development of geothermal resources. For that reason, it is not anticipated that solar development would adversely affect development of geothermal resources.

11.7.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features are required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for mineral resource impacts.

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11.7.9 Water Resources

11.7.9.1 Affected Environment

The proposed Millers SEZ is located within the Central Nevada Desert subbasin of the Great Basin hydrologic region (USGS 2010a) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). Big Smoky Valley is an elongated valley with a northeast–southwest orientation that covers an area of 2,926 mi^2 (7,578 km^2), and the proposed Millers SEZ is located in the southern half of the valley known as the "Tonopah Flat." The northern part of Big Smoky Valley is internally drained with a shallow surface divide between the northern part and the Tonopah Flat, which connects with Ione Valley to the north through a narrow mountain pass (Meinzer 1917). The Tonopah Flat region covers an area of 1,603 mi^2 (4,512 km^2) and has a general slope from northeast to southwest. Surface elevations within the vicinity of the proposed SEZ range from 4,775 to 4,865 ft (1,455 to 1,483 m), and surface elevations in the surrounding Monte Cristo Range and San Antonio Mountains reach greater than 7,500 ft (2,286 m) (Figure 11.7.9.1-1). The climate in this region of Nevada is characterized as having low humidity and precipitation, with mild winters and hot summers (Planert and Williams 1995; WRCC 2010a). The average annual precipitation is 5 in. (13 cm), and the average annual snowfall is 13 in. (33 cm) near the town of Tonopah, located at a slightly higher elevation than the proposed SEZ at 5,395 ft (1,644 m) (WRCC 2010b). In the mountain regions, the average annual precipitation is on the order of 7 in. (18 cm), with annual snowfalls of 50 in. (127 cm) (WRCC 2010c). Pan evaporation rates are estimated to be 94 in./yr (239 cm/yr) (Cowherd et al. 1988; WRCC 2010d), and reference crop evapotranspiration has been estimated at 58 in./yr (147 cm) (Huntington and Allen 2010) in the Big Smoky Valley.

11.7.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

There are no perennial surface water features in the proposed Millers SEZ. Three intermittent streams form braided stream channels and flow from north to south into the proposed Millers SEZ. The Ione Wash drains the Ione Valley to the north of Big Smoky Valley, and Peavine Creek and an unnamed wash flow out of the Toiyabe Range near the boundary of the northern part of Big Smoky Valley and Tonopah Flat (Figure 11.7.9.1-1). The Ione Wash contributes approximately 300 ac-ft/yr (370,000 m^3/yr), and together Peavine Creek and the unnamed wash contribute approximately 2,800 ac-ft/yr (3.5 million m^3/yr) of surface runoff to the Tonopah Flat (Rush and Schroer 1971). In the vicinity of the proposed SEZ is Slime Wash, an intermittent stream that flows from east to west out of the town of Tonopah and ends approximately 3 mi (5 km) east of the proposed SEZ. An elongated dry lake is located between 5 and 15 mi (8 and 24 km) southwest of the proposed SEZ and covers an area of 8,960 acres along the axis of the valley.

Approximately 2,200 acres (9 km^2) of the northwestern portion of the proposed Millers SEZ is located at the base of an alluvial fan coming out of the pass between the Monte Cristo Range and Royston Hills with several ephemeral washes present along the fan

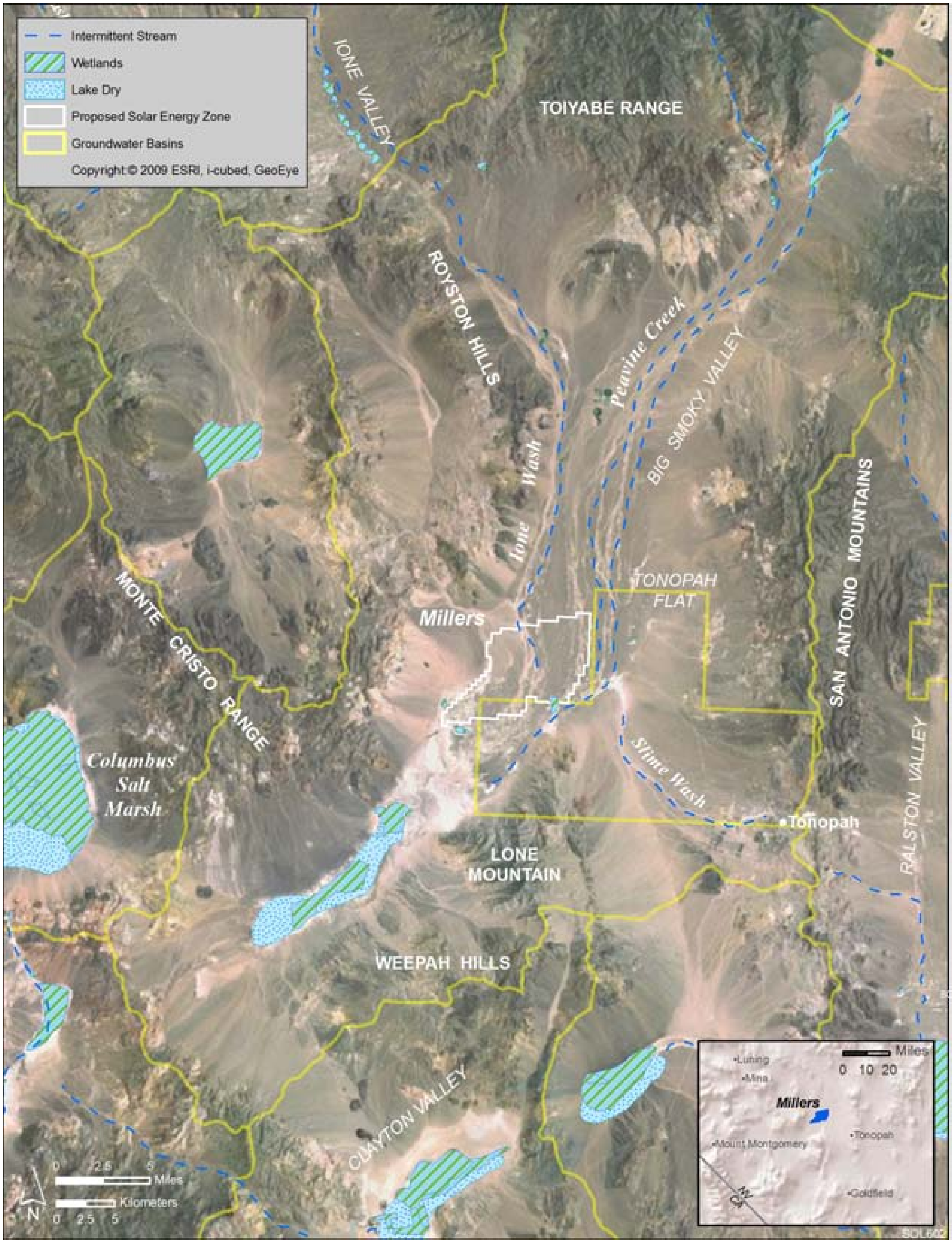

FIGURE 11.7.9.1-1 Surface Water Features near the Proposed Millers SEZ

(Figure 11.7.9.1-1). Smaller alluvial fans southwest of the proposed SEZ are generated by several ephemeral washes originating in the Monte Cristo Range. Peak discharges in these mountain washes can range from 2 to 460 ft^3/s (0.06 to 13 m^3/s) (USGS 2010b; stream gauge 10249680).

Several lacustrine wetlands in the Tonopah Flat area range in size from 43 to 2,770 acres (0.2 to 11 km^2), according to the NWI (USFWS 2009). Wetlands near the proposed Millers SEZ are typically small, less than 200 acres (0.8 km^2), and have sparse vegetation with water levels below the land surface for most of the year. Two larger wetland areas are located within the large dry lake bed southeast of the SEZ, and the Columbus Salt Marsh is located in the adjacent valley west of Big Smoky Valley. These playa features can contain a high amount of dissolved salts in certain areas (Meinzer 1917). Further information on wetlands within the region of the proposed SEZ is presented in Section 11.7.10.1.

Flood hazards have not been identified in Esmeralda County but have been mapped for Nye County just 1 mi (1.6 km) north and east of the proposed Millers SEZ (FEMA 2009). In Nye County, the braided stream channels of the intermittent Ione Wash, Peavine Creek, and the unnamed wash are all identified as being within a 100-year floodplain. It is very likely that these 100-year floodplains extend into Esmeralda County, and preliminary estimates using aerial photography suggest that approximately 2,000 acres (8 km^2) of the proposed Millers SEZ would potentially be classified as within a 100-year floodplain. Additionally, erosion and sedimentation along the alluvial fan in the northwestern corner of the proposed SEZ, as well as temporary flooding in low-lying areas, may occur during large rainfall events.

11.7.9.1.2 Groundwater

The proposed Millers SEZ is located within the Big Smoky Valley-Tonopah Flat groundwater basin (simply referred to as Tonopah Flat groundwater basin), which covers an area of 1,025,900 acres (4,152 km^2) (NDWR 2010a). The mountains surrounding the Tonopah Flat area are principally composed of volcanic and sedimentary rocks. Groundwater in the Tonopah Flat groundwater basin is primarily within the basin-fill aquifer, which comprises lenses of gravels, sands, and clays of Quaternary and late Tertiary age sediments (Rush and Schroer 1971; Whitebread and John 1992). The basin-fill deposits are typically 1,500 to 2,500 ft (457 to 762 m) in thickness near the proposed SEZ and reach a maximum thickness of 5,000 ft (1,524 m) toward the southern portion of the valley; transmissivity values range from 3,300 to 6,600 ft^2/day (307 to 613 m^2/day) (Rush and Schroer 1971).

The bedrock that contains the basin-fill deposits in the Big Smoky Valley is highly impervious, thus groundwater recharge is principally derived from precipitation and snow runoff to the valley (Meinzer 1917). Groundwater recharge from precipitation and snowfall, both on the valley surface and as runoff from the surrounding mountains, has been estimated to be 12,000 ac-ft/yr (14.8 million m^3/yr) in the Tonopah Flat basin (Rush and Schroer 1971); however, more recent estimates of recharge range from 2,807 to 4,060 ac-ft/yr (3.5 million to 5.0 million m^3/yr) (Flint et al. 2004). Subsurface inflow from the northern part of the Big Smoky Valley was estimated to be 2,000 ac-ft/yr (2.5 million m^3/yr) (Rush and Schroer 1971), and subsurface inflow from Ralston Valley to the east was estimated to be less than 500 ac-ft/yr (616,700 m^3/yr) (NDWR 1971). Groundwater discharge processes in the Big Smoky Valley include evapotranspiration, discharge to springs, groundwater withdrawals, and subsurface outflow. Evapotranspiration by phreatic vegetation was estimated at 6,000 ac-ft/yr (7.4 million m^3/yr); discharge to springs was estimated at 230 ac-ft/yr (283,700 m^3/yr); and groundwater extractions totaled 260 ac-ft/yr (320,700 m^3/yr) in 1968 (Rush and Schroer 1971). Subsurface outflow is primarily to the Clayton Valley directly south of the Tonopah Flat basin, with an estimated annual discharge of 8,000 ac-ft/yr (9.9 million m^3/yr) (NDWR 1971).

The general groundwater flow pattern in the Tonopah Flat basin is from northeast to southwest along the axis of the valley. Depth to groundwater ranges from 8 to 78 ft (2 to 24 m) below the land surface within a 5-mi (8-km) radius of the proposed SEZ (USGS 2010b; well numbers 380645117315801, 38083011727200, 381345117230501). In general, depth to groundwater is greater in the northern portion of the Tonopah Flat basin and is near surface levels in the vicinity of the dry lake playas in the southern portion of the basin (Meinzer 1917; Rush and Schroer 1971). Groundwater surface elevations range from 4,695 to 5,233 ft (1,431 to 1,595 m) along the axis of the valley, resulting in an approximate slope of 0.3% in groundwater surface elevations (USGS 2010b; well numbers 375821117440201, 381906117232001). Groundwater quality generally meets drinking water standards, except for the dry lake playa regions in the southern portion of the Tonopah Flat basin, where there are elevated sulfate, chloride, and dissolved solids concentrations (Rush and Schroer 1971).

11.7.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Esmeralda County were 46,786 ac-ft/yr (57.7 million m^3/yr), of which 9% came from surface waters and 91% came from groundwater. The largest water use categories for groundwater were irrigation and mining at 28,235 and 14,202 ac-ft/yr (34.8 million and 17.5 million m^3/yr), respectively. The remaining groundwater withdrawals were used for domestic and livestock (Kenny et al. 2009). In the Tonopah Flat basin, groundwater extractions totaled 260 ac-ft/yr (320,700 m^3/yr) in 1968 and were used primarily for irrigation purposes (Rush and Schroer 1971).

All waters in Nevada are the property of the public in the state of Nevada and subject to the laws described in Nevada Revised Statutes, Chapters 532 through 538 (available at http://leg.state.nv.us/nrs). The NDWR, led by the Office of the State Engineer, is the agency responsible for managing both the surface water and groundwater resources, and this responsibility includes overseeing water right applications, appropriations, and interbasin transfers (NDWR 2010b). The two principal ideas behind water rights in Nevada are the prior appropriations doctrine and the concept of beneficial use. A water right establishes an appropriation amount and date such that more senior water rights have priority over newer water rights. Additionally, water rights are treated as both real and personal property, such that water rights can be transferred without affecting the land ownership (NDWR 2010b). Water rights applications (new or transfer of existing) are approved if the water is available to be appropriated, if existing water rights will not be affected, and if the proposed use is not deemed to be harmful to the public interest. If these conditions are satisfied according to the Nevada

State Engineer, a proof of beneficial use of the approved water must be provided within a certain time period, and following that a certificate of appropriation is issued (BLM 2001).

Both the northern part and the Tonopah Flat basins within the Big Smoky Valley are designated groundwater basins according to Orders 725 and 827 (NDWR 1979, 1983a). Additionally, approximately 1,300 acres (5.3 km^2) of the proposed SEZ in T.3N-R.40E falls under Order 828 (NDWR 1983b), which designates municipal and domestic water uses as the preferred beneficial use. The perennial yield of the Tonopah Flat groundwater basin is set at 6,000 ac-ft/yr (7.4 million m^3/yr), and water rights in the basin are over-appropriated with a total of 19,588 ac-ft/yr (24.2 million m^3/yr) being allotted for irrigation, mining; municipal, and stockwater uses (95% of allotments used for irrigation and mining, NDWR 2010a). As mentioned previously, groundwater extractions totaled 260 ac-ft/yr (320,700 m^3/yr) in 1968 (Rush and Schroer 1971) in the Tonopah Flat basin. However, a current groundwater extraction inventory is not available (NDWR 2010a), so it is not known how much of the allotted groundwater rights are in use. Solar energy developers would have to purchase and transfer existing water rights through coordination of the NDWR and current water rights holders.

11.7.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, as well as off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water–wetland–groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by excessive withdrawal from aquifers).

11.7.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy facilities, which are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. Land disturbance activities should be minimized in the vicinity of the ephemeral stream channels of Ione Wash located through the middle of the proposed SEZ, as well as in the vicinity of Peavine Creek just east of the proposed SEZ. During large storm events, these intermittent streams have the potential to flood and cause sedimentation and erosion issues (it is suspected that these intermittent streams are within the 100-year floodplain, which will have to be determined during the site characterization phase).

Approximately 2,200 acres (9 km^2) of the northwestern corner of the proposed SEZ is located on the base of an alluvial fan containing several ephemeral washes. Disturbances to these ephemeral washes could cause erosion impacts and disrupt groundwater recharge. Additionally, site design and land disturbance activities could potentially alter surface water drainage and sedimentation off the proposed SEZ to the southwest of the Tonopah Flat basin, which would potentially impair the dry lake playa regions at the southern edge of Big Smoky Valley.

11.7.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Millers SEZ are as follows:

- On the basis of a total area of 16,787 acres (68 km^2), it is assumed that two solar projects would be constructed during the peak construction year;
- Water needed for making concrete would come from an off-site source;
- The maximum land disturbance for an individual solar facility during the peak construction year is 3,000 acres (12 km^2);
- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, result in the potential to disturb up to 36% of the SEZ total area during the peak construction year; and
- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those for dry-cooling systems (see Section 5.9.2.1).

Site Characterization

During site characterization, water would be used mainly for fugitive dust suppression and the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible, since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for controlling fugitive dust and the workforce potable water supply. Because there are no significant surface water bodies on the proposed Millers SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources.

Water requirements for dust suppression and potable water supply during construction, shown in Table 11.7.9.2-1, could be as high as 3,300 ac-ft (4.1 million m^3). The assumptions underlying these estimates for each solar energy technology are described in Appendix M. Groundwater wells would have to yield an estimated 1,418 to 2,045 gpm (5,368 to 7,741 L/min) to meet the estimated construction water requirements. These yields are on the same order of magnitude as large municipal and agricultural production wells (Harter 2003), so multiple wells may be needed in order to meet the water requirements. In addition, the up to 148 ac-ft (186,600 m^3) of sanitary wastewater that would be generated would need to be treated either on-site or sent to an off-site facility.

The total water use requirements for the peak construction year, listed in Table 11.7.9.2-1, are approximately one-third to one-half of the perennial yield for the Tonopah Flat groundwater basin. The potential impacts associated with groundwater withdrawals of this magnitude would have to be assessed during the site characterization phase. Significant declines in groundwater surface elevations as the result of groundwater extractions could potentially affect phreatic vegetation within the Big Smoky Valley and impair other groundwater users in the region.

TABLE 11.7.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Millers SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	Photovoltaic
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	2,140	3,210	3,210	3,210
Potable supply for workforce (ac-ft)	148	90	37	19
Total water use requirements (ac-ft)	2,288	3,300	3,247	3,229
Wastewater generated				
Sanitary wastewater (ac-ft)	148	90	37	19

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Table M.9-1 (Appendix M).

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 94 in./yr (239 cm/yr) (Cowherd et al. 1988; WRCC 2010d).

[c] To convert ac-ft to m^3, multiply by 1,234.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 11.7.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, hybrid, wet). Further refinements to water requirements for cooling would result from the percentage of time that the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 11.7.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 75 to 1,343 ac-ft/yr (92,500 to 1.7 million m^3/yr), and the workforce potable water supply, from 2 to 38 ac-ft/yr (2,500 to 46,900 m^3/yr). The maximum total water usage during normal operation at full build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 40,327 ac-ft/yr (49.7 million m^3/yr). Water usage for dry-cooling systems would be as high as 4,067 ac-ft/yr (5.0 million m^3/yr), approximately a factor of 10 times less than the wet-cooling option. Non-cooled technologies, dish engine and PV systems, require substantially less water at full build-out capacity at 763 ac-ft/yr (941,100 m^3/yr) for dish engine and 77 ac-ft/yr (95,000 m^3/yr) for PV (Table 11.7.9.2-2). Operations would produce up to 38 ac-ft/yr (46,900 m^3/yr) of sanitary wastewater; in addition, for wet-cooled technologies, 424 to 763 ac-ft/yr (523,000 to 941,100 m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed Millers SEZ. The NDWR has set the perennial yield for the Tonopah Flat groundwater basin at 6,000 ac-ft/yr (7.4 million m^3/yr), which is less than half of the amount of water needed to support wet-cooled parabolic trough operations under the full build-out scenario. Water use requirements for wet-cooled power tower operations are also greater than the perennial yield, so wet cooling is not feasible for the proposed Millers SEZ. Water use requirements for dry-cooled parabolic trough and power tower technologies, as well as dish engine and PV, could be supported by groundwater resources in the Tonopah Flats groundwater basin, assuming that groundwater rights could be transferred.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its preconstruction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and might also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because

TABLE 11.7.9.2-2 Estimated Water Requirements during Operations at the Proposed Millers SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	2,686	1,492	1,492	1,492
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	1,343	746	746	75
Potable supply for workforce (ac-ft/yr)	38	17	17	2
Dry cooling (ac-ft/yr)[e]	537–2,686	298–1,492	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	12,087–38,946	6,715–21,637	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	763	77
Dry-cooled technologies (ac-ft/yr)	1,918–4,067	1,061–2,255	NA	NA
Wet-cooled technologies (ac-ft/yr)	13,468–40,327	7,478–22,400	NA	NA
Wastewater Generated				
Blowdown (ac-ft/yr)[g]	763	424	NA	NA
Sanitary wastewater (ac-ft/yr)	38	17	17	2

[a] Land area for parabolic trough was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

[b] Water needs are linearly related to power. Water usage for any other size project can be estimated by using multipliers provided in Table M.9-2 (Appendix M).

[c] Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

[d] To convert ac-ft to m^3, multiply by 1,234.

[e] Dry-cooling value assumes 0.2 to 1.0 ac-ft/yr/MW, and wet-cooling value assumes 4.5 to 14.5 ac-ft/yr/MW (range in these values represents 30 and 60% operating times) (DOE 2009).

[f] NA = not applicable.

[g] Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

quantities of water needed during the decommissioning/reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

11.7.9.2.3 Off-Site Impacts: Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. The extent of the impacts on water resources is proportional to the amount and location of land disturbance needed to connect the proposed SEZ to major roads and existing transmission lines. The proposed Millers SEZ is located adjacent to existing roads and transmission lines, as described in Section 11.7.1.2, so it is assumed that impacts would be negligible.

11.7.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy at the proposed Millers SEZ are related to land disturbance effects on the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation issues, as well as alter groundwater recharge and discharge processes. The ephemeral stream channels of Ione Wash, Peavine Creek, and an unnamed wash are likely located within a 100-year floodplain, according to FEMA maps, in the adjacent Nye County (FEMA 2009). The 100-year floodplain would be identified during the site characterization phase, and areas of the proposed SEZ within the 100-year floodplain should be avoided. Additionally, alteration of the surface water drainage pattern off the proposed SEZ toward the southwest could impair the dry lake playa areas through sedimentation and erosion, as well as divert water from these natural drainage lows of the Big Smoky Valley.

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater is the primary water resource available to solar energy facilities in the proposed Millers SEZ. The water use requirements for technologies using wet cooling are greater than the perennial yield for the Tonopah Flats groundwater basin, so wet cooling would not be feasible for the full build-out scenario. For evaluating wet-cooling technologies for the proposed Millers SEZ, an analysis of the maximum power production was done assuming that the water use was limited to the perennial yield of the basin, 6,000 ac-ft/yr (7.4 million m^3/yr). This analysis suggests that between 15 and 27% of the full build-out power production potential is possible for wet-cooled parabolic trough and power tower technologies (assuming a 60% operating time) if the water supply is limited to the perennial yield of the basin.

Dry-cooling, dish engine, and PV technologies all have full build-out water use requirements that are lower than the perennial yield of the basin, suggesting that groundwater resources in the Tonopah Flats basin could support their development. However, facilities using these technologies should also implement water conservation practices to limit water needs. Water conservation plans will help solar energy developers in purchasing and transferring needed water rights within the overappropriated Tonopah Flats basin.

11.7.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands would require the programmatic design features presented in Appendix A, Section A.2.2, to be implemented, thus mitigating some impacts on water resources. Programmatic design features would focus on coordination with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and on the performance of hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Design features specific to the proposed Millers SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures;

- Land disturbance activities should minimize impacts on the ephemeral stream channels of Ione Wash and Peavine Creek, as well as alluvial fan features along the western edge of the SEZ;

- Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters

- Groundwater rights must be obtained through coordination with the NDWR and current water rights holders;

- Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection (NDEP 2010);

- Groundwater monitoring and production wells should be constructed in accordance with state standards (NDWR 2006); and

- Water for potable uses would have to meet or be treated to meet the water quality standards of the *Nevada Administrative Code* (445A.453-445A.455).

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11.7.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Millers SEZ. The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects is defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included only the SEZ. No new access roads or transmission projects are expected to be needed to serve development on the SEZ because of the proximity of existing infrastructure (refer to Section 11.7.1.2 for development assumptions). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but did not include ground-disturbing activities, because these would not take place outside of the SEZ. The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

11.7.10.1 Affected Environment

The proposed Millers SEZ is located primarily within the Tonopah Basin Level IV ecoregion, which primarily supports sparse shadscale (*Atriplex confertifolia*) communities on broad valleys, hills, bajadas, and alluvial fans (Bryce et al. 2003). Additional commonly occurring shrubs in this ecoregion include bud sagebrush (*Picrothamnus desertorum*), spiny hopsage (*Grayia spinosa*), seepweed (*Suaeda* sp.), fourwing saltbush (*Atriplex canescens*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedra nevadensis*), littleleaf horsebrush (*Tetradymia glabrata*), Douglas rabbitbrush (*Chrysothamnus viscidiflorus*), and winterfat (*Krascheninnikovia lanata*), which, along with shadscale, often codominate in highly diverse mosaics. Warm season grasses, such as Indian rice grass (*Achnatherum hymenoides*) and galleta grass (*Pleuraphis jamesii*), occur in the understory. Stands of inland saltgrass (*Distichlis spicata*) and alkali sacaton (*Sporobolus airoides*) also occur. Bailey greasewood (*Sarcobatus baileyi*) and Shockley wolfberry (*Lycium* sp.) are widespread and often codominate on lower alluvial slopes in this ecoregion. Black greasewood occurs in saline bottoms. Springs and sporadic precipitation in foothills provide surface water sources. The southwestern portion of the Millers SEZ is located within the Lahontan and Tonopah Playas. This Level IV ecoregion is nearly level and contains mud flats, alkali flats, intermittent saline lakes, and low sand dunes. Marshes, remnant lakes, and playas occur within this ecoregion. Rivers terminate in the playas, which during winter fill with seasonal runoff from nearby mountains. Only scattered, highly salt-tolerant plants, such as alkali sacaton, inland saltgrass, and seepweed, occur in this mostly barren ecoregion. Bordering the playas, black greasewood (*Sarcobatus vermiculatus*) or fourwing saltbush may form a transition to the salt shrub community. Playas may be sources of wind-generated salt dust. Annual precipitation in the vicinity of the SEZ is very low, averaging 5.1 in. (12.9 cm) at Tonopah airport (see Section 11.7.13).

The Tonopah Basin and Lahontan and Tonopah Playas lie within the Central Basin and Range Level III ecoregion, described in Appendix I, and are part of the Great Basin desertscrub biome.

The area surrounding the SEZ consists of a mosaic of the Tonopah Basin, Lahontan and Tonopah Playas, and the Tonopah Sagebrush Foothills Level IV ecoregions. This area supports black sagebrush (*Artemisia nova*) and Mojave species, such as blackbrush (*Coleogyne ramosissima*), Joshua tree (*Yucca brevifolia*), and cholla (*Cylindropuntia* sp.), on rocky substrates.

Land cover types described and mapped under SWReGAP (USGS 2005a) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Millers SEZ are shown in Figure 11.7.10.1-1. Table 11.7.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the proposed Millers SEZ are classified primarily as Inter-Mountain Basins Mixed Salt Desert Scrub. Additional cover types within the SEZ are given in Table 11.7.10.1-1. Dominant species in the sparse low salt scrub communities observed in most portions of the SEZ in August 2009 include shadscale, Nevada ephedra, Bailey's greasewood, and spiny hopsage, with rabbitbrush (*Chrysothamnus/Ericameria* sp.) in disturbed areas. The SEZ includes many low playa areas, predominantly in the southern portion, containing widely scattered low hummocks of black greasewood, occasionally with Indian ricegrass. The playas are bordered by a predominantly black greasewood community. Much of the SEZ consists of north to south trending broad, barren, gravel-covered washes, with small scattered playa areas, with shadscale and fourwing saltbush along the margins or in isolated stands. Sensitive habitats on the SEZ include desert dry washes, playas, and wetlands. A population of candelaria blazingstar (*Mentzelia candelariae*) occurs approximately 3 mi (4.8 km) east of the SEZ. This species is on the NNHP watch list and may potentially occur on the SEZ.

The area of indirect effects, including the area surrounding the SEZ within 5 mi (8 km), contains 15 cover types, which are listed in Table 11.7.10.1-1. The predominant cover type is Inter-Mountain Basins Mixed Salt Desert Scrub. Crescent Dunes, mapped as Inter-Mountain Basins Active and Stabilized Dune, are located about 5 mi (8 km) northeast of the SEZ. Sand dunes are also located about 5 mi (8 km) southwest of the SEZ.

One wetland mapped by the NWI is located within the southeastern portion of the SEZ (USFWS 2009) (Figure 11.7.10.1-2). This sparsely vegetated lacustrine wetland is mapped primarily as Inter-Mountain Basins Playa, with small areas of Inter-Mountain Basins Greasewood Flat and Inter-Mountain Basins Mixed Salt Desert Scrub. Approximately 84 acres (0.3 km^2) of this 192.9-acre (0.8-km^2) wetland is located within the SEZ. The remaining portion is located entirely within the area of indirect effects. Smaller playa areas not mapped by the NWI

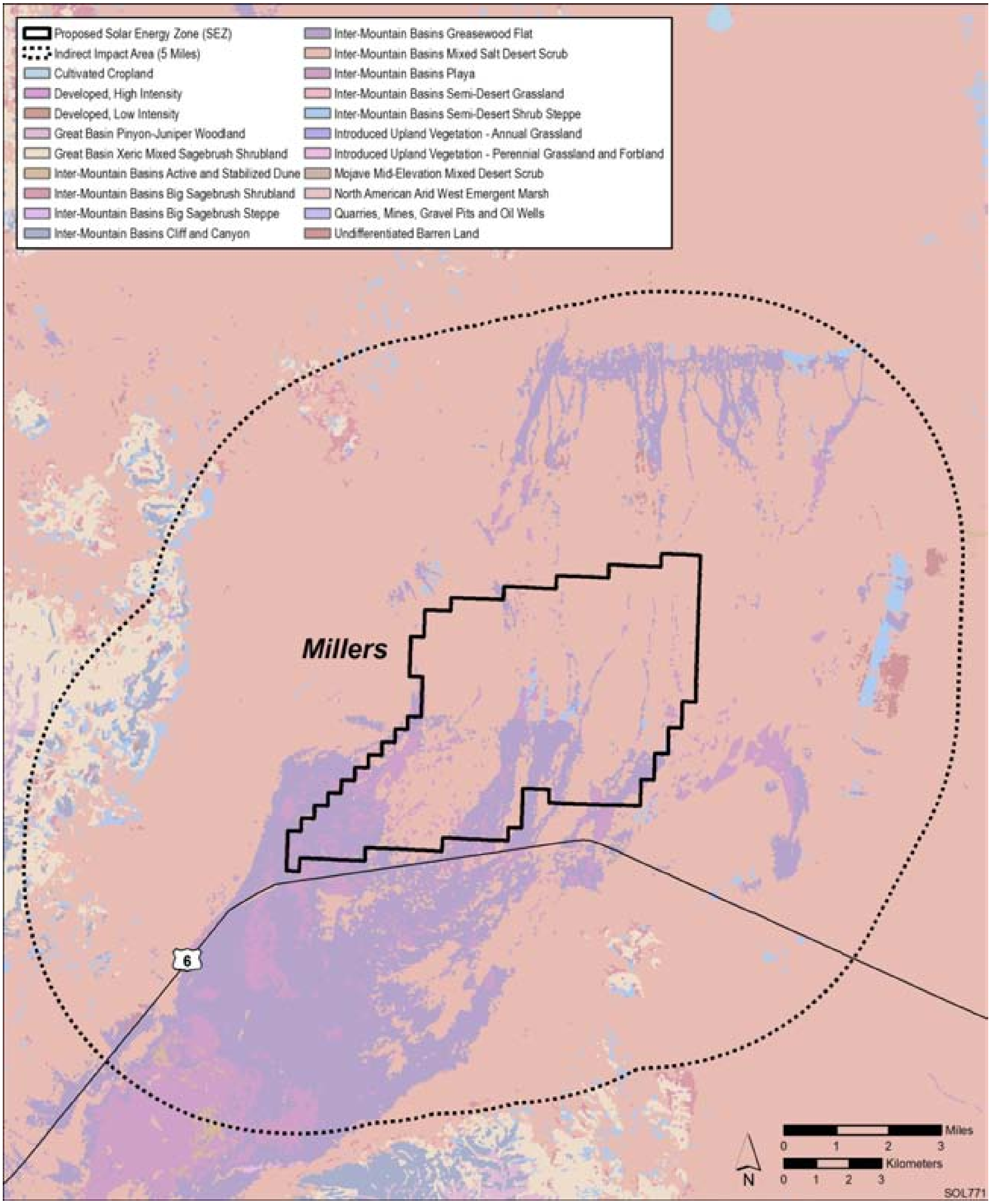

FIGURE 11.7.10.1-1 Land Cover Types within the Proposed Millers SEZ (Source: USGS 2004)

TABLE 11.7.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Millers SEZ and Potential Impacts

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
Inter-Mountain Basins Mixed Salt Desert Scrub: Generally consists of open shrublands that include at least one species of *Atriplex*, along with other shrubs. Perennial grasses dominate a sparse to moderately dense herbaceous layer.	12,211 acres[f] (0.5%, 0.5%)	93,460 acres (3.6%)	Small
Inter-Mountain Basins Greasewood Flat: Dominated or codominated by greasewood (*Sarcobatus vermiculatus*) and generally occurring in areas with saline soils, a shallow water table, and intermittent flooding, although remaining dry for most growing seasons. This community type generally occurs near drainages or around playas. These areas may include, or may be codominated by, other shrubs, and may include a graminoid herbaceous layer.	3,149 acres (3.4%, 3.7%)	19,074 acres (20.4%)	Moderate
Inter-Mountain Basins Playa: Playa habitats are intermittently flooded and generally barren or sparsely vegetated. Depressions may contain small patches of grass, and sparse shrubs may occur around playa margins.	1,290 acres (1.4%, 1.7%)	5,307 acres (5.6%)	Moderate
Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	137 acres (0.1%, 0.1%)	2,240 acres (0.3%)	Small
Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs and grasses and may include *Yucca* spp.	4 acres (0.2%, 0.5%)	37 acres (2.3%)	Small
Great Basin Xeric Mixed Sagebrush Shrubland: Generally occurs on level plains, slopes, and ridges. The dominant shrub species are black sagebrush (*Artemisia nova*) or, at higher elevations, little sagebrush (*Artemisia arbuscula*), and codominants may be Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) or yellow rabbitbrush (*Chrysothamnus viscidiflorus*). Other shrub species, as well as sparse perennial bunchgrasses, may also be present.	0 acres	3,788 acres (0.6%)	Small

TABLE 11.7.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
Inter-Mountain Basins Cliff and Canyon: Includes barren and sparsely vegetated (generally <10% plant cover) steep cliff faces, narrow canyons, small rock outcrops, and scree and talus slopes. Composed of widely scattered coniferous trees and a variety of shrubs.	0 acres	720 acres (1.8%)	Small
Undifferentiated Barren Land: Includes a variety of barren areas, generally with less than 15% cover of vegetation.	0 acres	683 acres (13.5%)	Small
Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	0 acres	541 acres (0.1%)	Small
Inter-Mountain Basins Active and Stabilized Dune: Includes Dune and sandsheet areas that are unvegetated or sparsely vegetated, with up to 30% plant cover, but generally less than 10%. Plant communities consist of patchy or open grassland, shrubland, or shrub steppe, with species often adapted to the shifting sandy substrate.	0 acres	149 acres (6.5%)	Small
Great Basin Pinyon-Juniper Woodland: Occurs on low-elevation slopes and ridges. Singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), or both are the dominant species, generally associating with curl-leaf mountain mahogany (*Cercocarpus ledifolius*). Understory species include shrubs and grasses.	0 acres	54 acres (<0.1%)	Small
Introduced Upland Vegetation–Annual Grassland: Dominated by non-native annual grass species.	0 acres	33 acres (1.4%)	Small
Inter-Mountain Basins Semi-Desert Grassland: Consists of perennial bunchgrasses as dominants or codominants. Scattered shrubs or dwarf shrubs may also be present.	0 acres	5 acres (0.1%)	Small

TABLE 11.7.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
Inter-Mountain Basins Big Sagebrush Steppe: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial grasses are often abundant.	0 acres	4 acres (0.2%)	Small
North American Arid West Emergent Marsh: Occurs in natural depressions, such as ponds, or bordering lakes, or slow-moving streams or rivers. Alkalinity is highly variable. The plant community is characterized by herbaceous emergent, submergent, and floating leaved species.	0 acres	2 acres (1.1%)	Small

[a] Land cover descriptions are from USGS (2005a). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from USGS (2004).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from projects. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the indirect effects area and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Overall impact magnitude categories were based on professional judgment and were (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

[f] To convert acres to km^2, multiply by 0.004047.

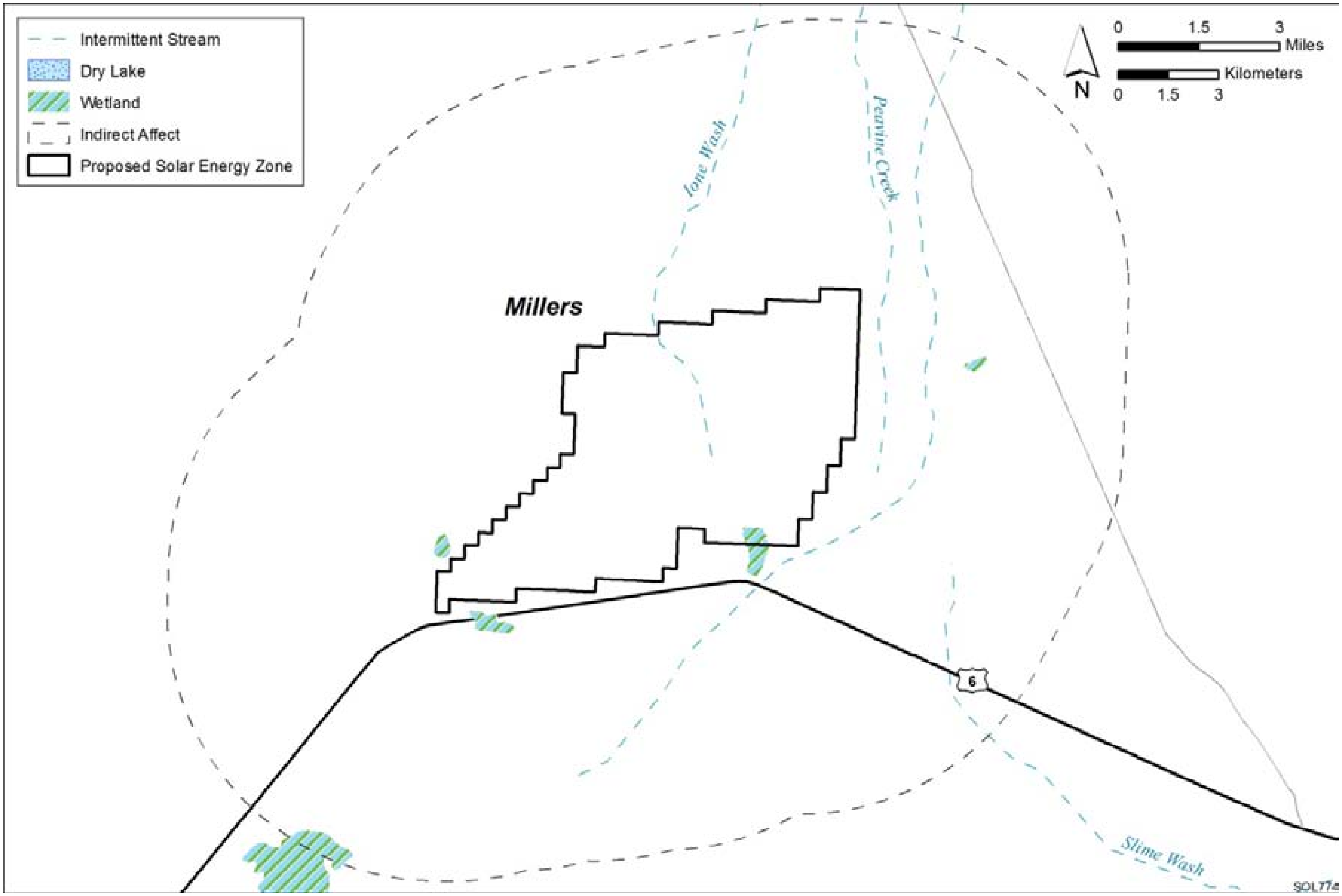

FIGURE 11.7.10.1-2 Wetlands within the Proposed Millers SEZ (Source: USFWS 2009)

occur within the SEZ. Numerous dry washes occur within the SEZ, generally flowing to the south and terminating in the playa areas. These washes do not support wetland or riparian habitats. Ione Wash, an intermittent stream, flows south into the SEZ. Two additional intermittent streams, Peavine Creek and an unnamed wash, are located immediately east of the SEZ. These streams generally carry surface flows during spring months. The dry washes and playas typically contain water for short periods during or following precipitation events.

Four additional wetlands occur within the area of indirect effects. All of these are sparsely vegetated lacustrine wetlands, which are mapped primarily as Inter-Mountain Basins Playa, with small areas of Inter-Mountain Basins Greasewood Flat and Inter-Mountain Basins Mixed Salt Desert Scrub. Large areas of these playa habitats are located southwest of the SEZ. Groundwater is relatively shallow in the vicinity of the playas in the southern portion of the Tonopah Flat basin, which includes the Millers SEZ (see Section 11.7.9), and supports plant communities when surface water is absent. Several springs also occur in the vicinity of the SEZ.

The State of Nevada maintains an official list of weed species designated as noxious species (NDA 2010). Table 11.7.10.1-2 provides a summary of the noxious weed species regulated in Nevada that are known to occur in Esmeralda County (USDA 2010), which includes the proposed Millers SEZ. According to Creech et al. (2010), none of the weed species from the Nevada state list occurs in the county. No species included in Table 11.7.10.1-2 were observed on the SEZ in August 2009.

The NDA classifies noxious weeds into one of three categories (NDA 2010):

- "Category A: Weeds not found or limited in distribution throughout the state; actively excluded from the state and actively eradicated wherever found; actively eradicated from nursery stock dealer premises; control required by the state in all infestations."

TABLE 11.7.10.1-2 Designated Noxious Weeds of Nevada Occurring in Esmeralda County

Common Name	Scientific Name	Category
Musk thistle	*Carduus nutans*	B
Puncture vine	*Tribulus terrestris*	C
Saltcedar	*Tamarix* spp.	C

Sources: NDA (2010); USDA (2010).

- "Category B: Weeds established in scattered populations in some counties of the state; actively excluded where possible, actively eradicated from nursery stock dealer premises; control required by the state in areas where populations are not well established or previously unknown to occur."

- "Category C: Weeds currently established and generally widespread in many counties of the state; actively eradicated from nursery stock dealer premises; abatement at the discretion of the state quarantine officer."

11.7.10.2 Impacts

The construction of solar energy facilities within the proposed Millers SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (13,430 acres [54.3 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (caused, e.g., by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation within the SEZ are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required design features described in Appendix A, Section A.2.2, and from any additional mitigation applied. Section 11.7.10.2.3, below, identifies design features of particular relevance to the proposed Millers SEZ.

11.7.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (<1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); moderate (>1 but <10%) if the impact could affect an intermediate proportion of cover type; and large if the impact could affect more than 10% of a cover type.

Solar facility construction and operation in the proposed Millers SEZ would primarily affect communities of the Inter-Mountain Basins Mixed Salt Desert Scrub cover type. Additional cover types that would be affected within the SEZ include Inter-Mountain Basins Greasewood Flat, Inter-Mountain Basins Playa, Inter-Mountain Basins Semi-Desert Shrub Steppe, and Mojave Mid-Elevation Mixed Desert Scrub. Table 11.7.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed Millers SEZ. Most of these cover types are relatively common in the SEZ region; however, Mojave Mid-Elevation Mixed Desert Scrub is relatively uncommon, representing 0.03% of the land area within the SEZ region. Desert dry washes, playas, and wetlands are important sensitive habitats on the SEZ.

The construction, operation, and decommissioning of solar projects within the proposed Millers Valley SEZ would result in moderate impacts on the Inter-Mountain Basins Greasewood Flat and Inter-Mountain Basins Playa cover types. Solar project development within the SEZ would result in small impacts on the remaining cover types in the affected area.

Because of the arid conditions, re-establishment of shrub or shrub steppe communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region. Damage to these crusts, by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability and affect plant community characteristics (Lovich and Bainbridge 1999).

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the area of indirect effects identified in Table 11.7.10.1-1. Solar project development within the SEZ could alter sand transport processes, potentially affecting sand dune plant communities in Crescent Dunes, northeast of the SEZ, or dunes southwest of the SEZ.

Communities associated with playa habitats, Ione Wash, greasewood flats communities, or other intermittently flooded areas within and downgradient from solar projects could be affected by ground-disturbing activities. Extensive playa habitats southwest of the SEZ could be affected. Site-clearing and-grading could disrupt surface water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation and could potentially alter playa or greasewood flats plant communities and affect community function. Increases in surface runoff from a solar energy project site could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect dry wash habitats within the SEZ. Alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation. Disturbance of the dry washes within the SEZ could affect groundwater recharge.

Potential impacts on wetlands as a result of solar energy development are described in Section 5.6.1. Approximately 84 acres (0.3 km^2) of wetland habitat have been identified within the Millers SEZ, associated with playa habitat, and could be affected by project development. Direct impacts on the wetland would occur if fill material is placed within the playa for solar facility construction. Indirect impacts, as described above, could occur if project construction occurs near or upgradient from the playa.

Although the use of groundwater within the Millers SEZ for technologies with high water requirements, such as wet-cooling systems, may be unlikely, groundwater withdrawals for such systems could reduce groundwater elevations in the Tonopah Flat groundwater basin, or other hydrologically-connected basins. Plant communities that access groundwater, such as those in the vicinity of playas, or habitats associated with springs, could become degraded or lost as a result of lowered groundwater levels. The potential for impacts on springs would need to be evaluated by project-specific hydrological studies.

Candelaria blazingstar, a plant species on the NNHP watch list, may occur within the SEZ and may be directly affected by solar project development. The population occurring east of the SEZ may be indirectly affected by project activities within the SEZ.

11.7.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

Executive Order (E.O.) 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential effects of noxious weeds and invasive plant species that could result from solar energy facilities are described in Section 5.10.1. Noxious weeds and invasive species could inadvertently be brought to a project site by equipment previously used in infested areas, or they may be present on or near a project site. Despite required programmatic design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Millers SEZ, and increase the probability that weeds could be transported into areas that previously were relatively weed-free. This could result in reduced restoration success and possible widespread habitat degradation.

Invasive species potentially occur on the SEZ. Species designated as noxious weeds in Nevada, and known to occur in Esmeralda County, are given in Table 11.7.10.1-2. No cover types of introduced species occur within the SEZ. Within the area of indirect effects, 33 acres (0.13 km^2) of Introduced Upland Vegetation–Annual Grassland are mapped. Disturbance associated with solar project development may promote the establishment and spread of invasive species associated with this cover type. Past or present land uses, such as OHV activity, may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Disturbance associated with existing roads and transmission lines within the SEZ area of potential impacts also likely contributes to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

11.7.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to the programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While the specific practices are best established when project details are being considered, the following SEZ-specific design features can be identified at this time:

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- Dry washes, Ione Wash, playas, and wetlands within the SEZ should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetlands, playas, and dry washes to reduce the potential for impacts.

- Appropriate engineering controls should be used to minimize impacts on the playa wetland and other playas, as well as Ione Wash shrub communities, dry washes, and greasewood flat habitats within the SEZ, and downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on plant communities that access groundwater, such as those in the vicinity of playas. Potential impacts on springs associated with the Tonopah Flat basin or other hydrologically connected basins should be determined through hydrological studies.

- A qualified botanist or plant ecologist should survey for candelaria blazing star during a period when it is flowering and easily documented prior to any construction activities within the SEZ. If individuals are located, individuals or populations should be avoided through fencing and flagging of the area, including an appropriate buffer zone.

If these SEZ-specific design features are implemented in addition to other programmatic design features, it is anticipated that a high potential for impacts from invasive species and impacts on dry washes, playas, wetlands, and springs would be reduced to a minimal potential for impact.

11.7.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Millers SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ by using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) within the SEZ. The maximum developed area within the SEZ would be 13,430 acres (54.3 km^2). No areas of direct effects would occur for either a new transmission line or a new access road, because existing transmission line and road corridors are adjacent to or pass through the SEZ.

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills in the SEZ). Potentially suitable habitat within the SEZ greater than the maximum of 13,430 acres (54.3 km^2) of direct effects was also included as part of the area of indirect effects. The potential degree of indirect effects would decrease with increasing distance from the SEZ. The area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. These areas of direct and indirect effects are defined and the impact assessment approach is described in Appendix M.

The primary land cover habitat type within the affected area is Inter-Mountain Basins mixed salt desert scrub (see Section 11.7.10). Potentially unique habitats in the affected area include wash and playa habitats. Aquatic habitats that occur in the SEZ and the area of indirect effects include Ione Wash, Peavine Wash, and several small unnamed dry lakes (see Figure 11.7.9.1-1).

11.7.11.1 Amphibians and Reptiles

11.7.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Millers SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from SWReGAP

(USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). Appendix M provides additional information on the approach used.

Based on species distributions within the area of the SEZ and habitat preferences of the amphibian species, the Great Basin spadefoot (*Spea intermontana*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). They would most likely occur in or near the wash and playa habitats within the SEZ.

More than 25 reptile species occur within the area that encompasses the proposed Millers SEZ (USGS 2007; Stebbins 2003). The desert tortoise (*Gopherus agassizii*) is a federal and state-listed threatened species. This species is discussed in Section 11.7.12. Lizard species expected to occur within the SEZ include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), western fence lizard (Sceloporus occidentalis), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*). Snake species expected to occur within the SEZ are the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and nightsnake (*Hypsiglena torquata*).

Table 11.7.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Millers SEZ. Special status amphibian and reptile species are addressed in Section 11.7.12.

11.7.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation measures applied. Section 11.7.11.1.3 identifies SEZ-specific design features of particular relevance to the proposed Millers SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area, as presented in Section 11.7.11.1.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 11.7.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of the impacts on amphibians and reptiles summarized in Table 11.7.11.1-1, direct impacts on representative

TABLE 11.7.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Millers SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Amphibians				
Great Basin spadefoot (*Spea intermontana*)	Sagebrush flats, semidesert shrublands, pinyon-juniper woodlands, and spruce-fir forests. Breeds in temporary and permanent waters including rain pools, pools in intermittent streams, and flooded areas along streams. About 4,548,700 acres[g] of potentially suitable habitat occurs within the SEZ region.	12,211 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	97,831 acres of potentially suitable habitat (2.2% of available suitable habitat)	Small overall impact. Wash and playa habitats should be avoided.
Red-spotted toad (*Bufo punctatus*)	Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos; desert streams and oases; open grassland; scrubland oaks; and dry woodlands. About 3,274,500 acres of potentially suitable habitat occurs within the SEZ region.	12,215 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	93,581 acres of potentially suitable habitat (2.9% of available suitable habitat)	Small overall impact. Wash and playa habitats, should be avoided.
Lizards				
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. About 4,114,900 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,467 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Great Basin collared lizard (*Crotaphytus bicinctores*)	Usually inhabits alluvia, lava flows, mountain slopes, canyons, buttes, rock outcrops, washes, and rocky plains. Limiting factors are presence of large boulders and open/sparse vegetation. About 3,498,200 acres of potentially suitable habitat occurs in the SEZ region.	12,352 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	100,237 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Lizards (Cont.)				
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows, which they occupy when inactive. About 3,757,800 acres of potentially suitable habitat occurs in the SEZ region.	12,215 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	97,818 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Western fence lizard (*Sceloporus occidentalis*)	Disturbed areas, roadsides, gravel beds, rock quarries, lava flows, outcrops, talus slopes, shrublands, riparian areas, and coniferous woodlands. About 4,764,000 acres of potentially suitable habitat occurs within the SEZ region.	12,348 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	100,795 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Western whiptail (*Cnemidophorus tigris*)	Arid and semiarid habitats with sparse plant cover. About 4,216,400 acres of potentially suitable habitat occurs within the SEZ region.	13.430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	120,400 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Zebra-tailed lizard (*Callisaurus draconoides*)	Open, warm-desert habitats, especially dry washes and canyons with fine gravel and sand. About 3,288,900 acres of potentially suitable habitat occurs in the SEZ region.	12,215 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	97,426 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Avoid wash habitat, otherwise no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Snakes				
Coachwhip (*Masticophis flagellum*)	Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 2,237,800 acres of potentially suitable habitat occurs within the SEZ region.	3,286 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	26,254 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Small overall impact.
Glossy snake (*Arizona elegans*)	Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 846,400 acres of potentially suitable habitat occurs within the SEZ region.	1,427 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	7,936 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	Small overall impact.
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 1,974,800 acres of potentially suitable habitat occurs in the SEZ region.	1,294 acres of potentially suitable habitat lost (0.07% of available potentially suitable habitat) during construction and operations	9,575 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	Small overall impact. Wash and playa habitats should be avoided.
Groundsnake (*Sonora semiannulata*)	Arid and semiarid regions with rocky to sandy soils. River bottoms, desert flats, sand hummocks, and rocky hillsides. About 1,996,600 acres of potentially suitable habitat occurs within the SEZ region.	141 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat) during construction and operations	6,669 acres of potentially suitable habitat (0.3% of available potentially suitable habitat)	Small overall impact.
Nightsnake *(Hypsiglena torquata)*	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, seeks refuge underground, in crevices, or under rocks. About 3,569,900 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	101,974 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

1 **Footnotes continued on next page.**

TABLE 11.7.11.1-1 (Cont.)

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 13,430 acres of direct effects within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 13,430 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

[e] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: $\leq$1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but $\leq$10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[f] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[g] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

amphibian and reptile species would be small, because 0.4% or less of potentially suitable habitats identified for the species in the SEZ region would be lost. Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects. Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.7.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of required programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., washes and playas). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features are best established when considering specific project details, one design feature can be identified at this time:

- Wash and playa habitats should be avoided.

If this SEZ-specific design feature is implemented in addition to the programmatic design features, impacts on amphibian and reptile species could be reduced. However, because potentially suitable habitats for a number of the representative amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.7.11.2 Birds

11.7.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Millers SEZ. The list of bird species potentially present in the SEZ area was determined from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). Appendix M provides additional information on the approach used.

Five bird species that could occur on or in the affected area of the SEZ are considered focal species in the *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), ladder-backed woodpecker (*Picoides scalaris*), and Le Conte's thrasher (*Toxostoma lecontei*). Habitats for most of these species are described in Table 11.7.11.2-1. Because of its special species status, the burrowing owl is discussed in Section 11.7.12.

Waterfowl, Wading Birds, and Shorebirds

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state solar study area. However, within the proposed Millers SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Playa and wash habitats within the SEZ may attract shorebird species, but the larger dry lake habitats within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) is the shorebird species most likely to occur within the SEZ.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state study area. Species expected to occur within the proposed Millers SEZ include the ash-throated flycatcher, Bewick's wren (*Thryomanes bewickii*), common poorwill (*Phalaenoptilus nuttallii*), common raven, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker, Le Conte's thrasher, lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), northern mockingbird (*Mimus polyglottos*), rock wren (*Salpinctes obsoletus*), sage sparrow (*Amphispiza belli*), Say's phoebe (*Sayornis saya*), and western kingbird (*Tyrannus verticalis*) (USGS 2007).

Birds of Prey

Section 4.10.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state study area. Raptor species that could occur within the proposed Millers SEZ

TABLE 11.7.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Millers SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b] Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Shorebirds				
Killdeer (*Charadrius vociferus*)	Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 122,100 acres[g] of potentially suitable habitat occurs within the SEZ region.	1,290 acres of potentially suitable habitat lost (1.1% of available potentially suitable habitat) during construction and operations	5,147 acres of potentially suitable habitat (4.2% of potentially suitable habitat)	Moderate overall impact. Wash and playa habitats should be avoided. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Neotropical Migrants				
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 4,517,100 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	118,559 acres of potentially suitable habitat (2.6% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Bewick's wren (*Thryomanes bewickii*)	Generally associated with dense, brushy habitats. A permanent resident of lowland deserts and pinyon-juniper forests of southern Utah. Breeding occurs in brushy areas of open woodlands and other open habitats. A cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 2,356,400 acres of potentially suitable habitat occurs within the SEZ region.	4,576 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	31,246 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semi-arid habitats. Nests in open areas on a bare site. About 4,627,100 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	118,518 acres of potentially suitable habitat (2.6% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation also provided by the requirements of the Migratory Bird Treaty Act.
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 4,908,100 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	121,695 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Fairly common in all desert habitats. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,474,400 acres of potentially suitable habitat occurs in the SEZ region.	12,215 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	98,592 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 4,225,100 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,323 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in Mojave and Colorado Deserts. Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 3,307,300 acres of potentially suitable habitat occurs within the SEZ region.	12,215 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	94,412 acres of potentially suitable habitat (2.9% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 2,600,100 acres of potentially suitable habitat occurs in the SEZ region.	12,215 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	93,489 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 3,760,100 acres of potentially suitable habitat occurs within the SEZ region.	12,215 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	97,967 acres of potentially suitable habitat (2.6% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally, open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 4,848,700 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	121,661 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Northern mockingbird (*Mimus polyglottos*)	Parkland, cultivated lands, second-growth habitats, desert scrub, and riparian areas at low elevations. Forages on ground in short, grassy to nearly barren substrates. About 4,932,900 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	128,098 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Rock wren (*Salpinctes obsoletus*)	Arid and semi-arid habitats. Breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices and the nest entrance is paved with small rocks and stones. About 4,593,300 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	128,780 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Neotropical Migrants (Cont.)				
Sage sparrow (*Amphispiza belli*)	Prefers shrubland, grassland, and desert habitats. The nest, constructed of twigs and grasses, is located either low in a shrub or on the ground. About 4,856,300 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	121,765 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 1,428,800 acres of potentially suitable habitat occurs within the SEZ region.	3,153 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	23,843 acres of potentially suitable habitat (1.7% of potentially suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Western kingbird (*Tyrannus verticalis*)	Occurs in a variety of habitats including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. Migrates to Central America or the southeastern United States for the winter. About 4,074,900 acres of potentially suitable habitat occurs within the SEZ region.	12,352 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	100,778 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Birds of Prey				
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 4,875,200 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	121,657 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,862,700 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	121,661 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Great horned owl (*Bubo virginianus*)	Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 5,024,300 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	128,963 acres of potentially suitable habitat (2.6% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Birds of Prey (Cont.)				
Long-eared owl (*Asio otus*)	Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush-bursage flats, desert scrub, grasslands, and agricultural fields). About 4,809,500 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	121,090 acres of potentially suitable habitat (2.5% of potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 3,305,900 acres of potentially suitable habitat occurs in the SEZ region.	12,352 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	96,991 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Roosts communally in trees, exposed boulders, and occasionally transmission line support towers. About 3,321,700 acres of potentially suitable habitat occurs in the SEZ region.	12,215 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	94,263 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Upland Game Birds				
Chukar (*Alectoris chukar*)	Steep, semi-arid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds during the brooding period found within 0.25 mi (0.4 km) of water. About 4,727,900 acres of potentially suitable habitat occurs in the SEZ region.	12,352 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	100,150 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. Avoid wash and playa habitats; otherwise no species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. However, avoidance of Ione Wash and an unnamed dry lake would protect potential occasional sources of water.
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 1,467,600 acres of potentially suitable habitat occurs within the SEZ region.	3,290 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	26,088 acres of potentially suitable habitat (1.8% of potentially suitable habitat)	Small overall impact. Avoid wash and playa habitats.
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,219,700 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	123,622 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Upland Game Bird (Cont.)				
Wild turkey (*Meleagris gallopavo*)	Lowland riparian forests, foothill shrubs, pinyon-juniper woodlands, foothill riparian forests, and agricultural areas. About 2,259,300 acres of potentially suitable habitat occurs within the SEZ region.	1,427 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	12,494 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 13,430 acres of direct effects within the SEZ was assumed.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 13,340 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

[e] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[f] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[g] To convert to acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*) (USGS 2007). Several other special status birds of prey are discussed in Section 11.7.12.1, including the burrowing owl, ferruginous hawk (*Buteo regalis*), prairie falcon (*Falco mexicanus*), and Swainson's hawk (*B. swainsoni*).

Upland Game Birds

Section 4.10.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state study area. Upland game species that could occur within the proposed Millers SEZ include the chukar (*Alectoris chukar*), Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), and wild turkey (*Meleagris gallopavo*) (USGS 2007).

Table 11.7.11.2-1 provides habitat information for representative bird species that could occur within the proposed Millers SEZ. Special status bird species are discussed in Section 11.7.12.

11.7.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the applications of any additional mitigation measures. Section 11.7.11.2.3, below, identifies design features of particular relevance to the proposed Millers SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area, as presented in Section 11.7.11.2.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 11.7.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual birds. Table 11.7.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed Millers SEZ. Direct impacts on representative bird species would be moderate for the killdeer (loss of 1.1% of potentially suitable habitat) and small for all other bird species (ranging from 0.06% for the wild turkey to 0.5% for Le Conte's thrasher (Table 11.7.11.2-1). Larger areas of potentially suitable habitat for bird species occur within the area of potential indirect effects (e.g., up to 4.2% of potentially suitable habitat for the killdeer). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

11.7.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds, especially for those species that depend on habitat types that can be avoided (e.g., washes and playas). Indirect impacts could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important to reducing impacts on birds are best established when project details are considered, some design features can be identified at this time:

- The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed.

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NDOW. A permit may be required under the Bald and Golden Eagle Protection Act.

- Wash and playa habitats should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on bird species could be reduced. However, because potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.7.11.3 Mammals

11.7.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Millers SEZ. The list of mammal species potentially present in the SEZ area was determined from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). Appendix M provides additional information on the approach used.

More than 55 species of mammals have ranges that encompass the area of the proposed Millers SEZ (NDCNR 2002; USGS 2007); however, suitable habitats for a number of these species are limited or nonexistent within the SEZ (USGS 2007). Similar to the overview of mammals provided for the six-state study area (Section 4.6.2.3), the following discussion emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share important habitats.

Big Game

The big game species that could occur within the area of the proposed Millers SEZ include cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), Nelson's bighorn sheep (*Ovis canadensis nelsoni*), and pronghorn (*Antilocapra americana*) (USGS 2007). Because of its special species status, the Nelson's bighorn sheep is addressed in Section 11.7.12.1. Among the other big game species, potentially suitable habitat for the cougar, mule deer, and pronghorn occurs within the SEZ (Table 11.7.11.3-1). No potentially suitable habitat for elk occurs within the SEZ. Figures 11.7.11.3-1 and 11.7.11.3-2 show the location of the SEZ relative to mapped ranges of mule deer and pronghorn, respectively.

Other Mammals

A number of mid-size mammal species (e.g., carnivores and rabbits) occur within the area of the proposed Millers SEZ. Species that could occur within the area of the SEZ include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*, common), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and red fox (*Vulpes vulpes*) (USGS 2007).

The nongame (small) mammals include bats, rodents, and shrews. Representative species for which potentially suitable habitat occurs within the proposed Millers SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), deer mouse

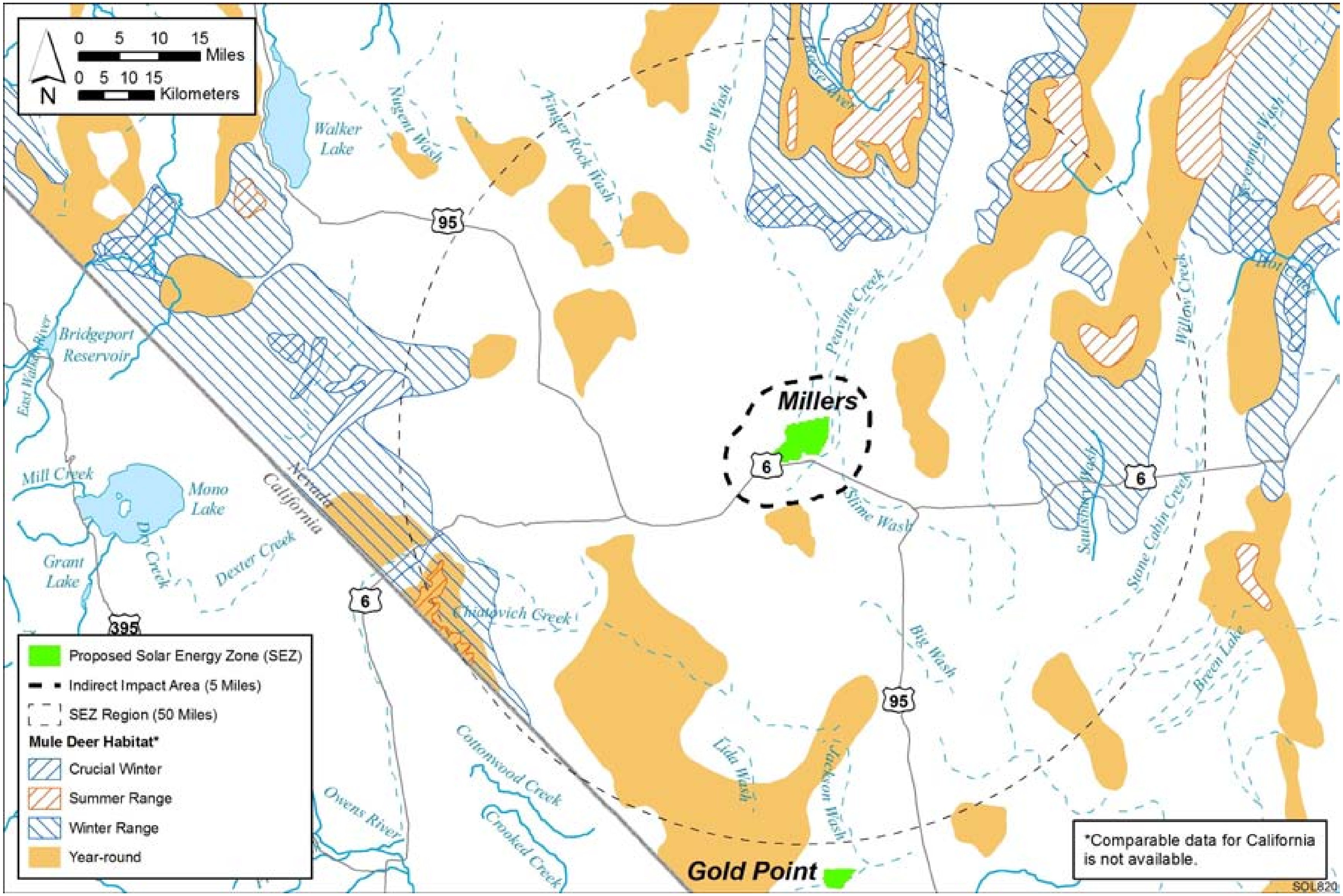

FIGURE 11.7.11.3-1 Location of the Proposed Millers SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)

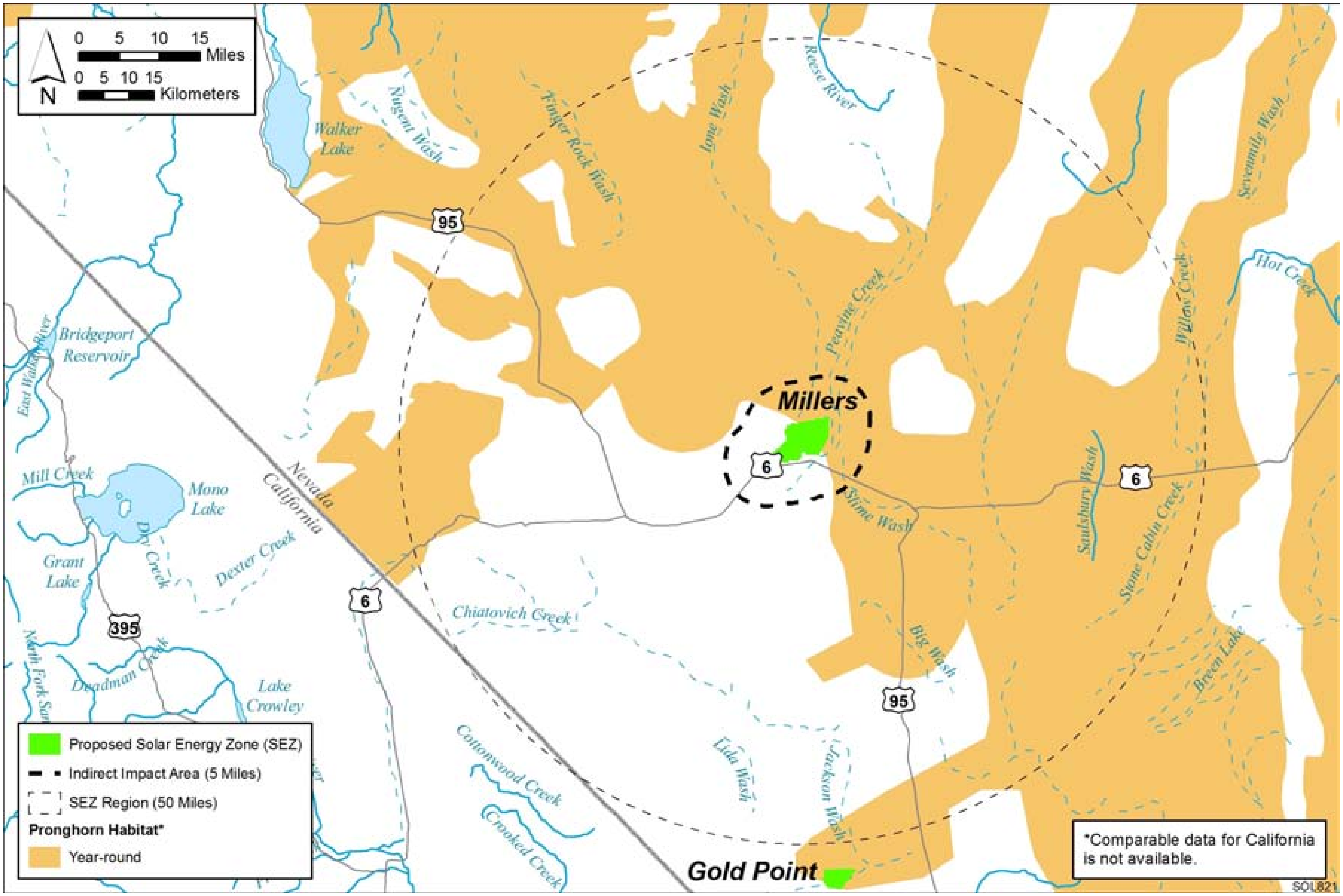

FIGURE 11.7.11.3-2 Location of the Proposed Millers SEZ Relative to the Mapped Range of Pronghorn (Source: NDOW 2010)

(*P. maniculatus*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's pocket mouse (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), southern grasshopper mouse (*O. torridus*), western harvest mouse (*Reithrodontomys megalotis*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), little brown myotis (*M. lucifugus*), long-legged myotis (*M. volans*), silver-haired bat (*Lasionycteris noctivagans*), and western pipistrelle (*Parastrellus hesperus*) (USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ. Several other special status bat species that could occur within the SEZ area are described in Section 11.7.12.1.

Table 11.7.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Millers SEZ. Special status mammal species are discussed in Section 11.7.12.

11.7.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.7.11.3.3, below, identifies design features of particular relevance to mammals for the proposed Millers SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area, as presented in Section 11.7.11.3.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional actions required to avoid or mitigate impacts on mammals (see Section 11.7.11.3.3). Table 11.7.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of required programmatic design features) in the proposed Millers SEZ.

Cougar

Up to 12,352 acres (50 km^2) of potentially suitable cougar habitat could be lost by solar energy development within the proposed Millers SEZ. This represents about 0.3% of potentially suitable cougar habitat within the SEZ region. About 100,800 acres (408 km^2) of potentially suitable cougar habitat occurs within the area of indirect effects. Overall, impacts on cougar from solar energy development in the SEZ would be small.

TABLE 11.7.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Millers SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Big Game				
Cougar (*Puma concolor*)	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,795,400 acres[g] of potentially suitable habitat occurs in the SEZ region.	12,352 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	100,837 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Mule deer (*Odocoileus hemionus*)	Most habitats including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provides abundant browse and cover. About 4,168,200 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	120,888 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Pronghorn (*Antilocapra americana*)	Grasslands and semidesert shrublands on rolling topography that affords good visibility. Most abundant in shortgrass or midgrass prairies and least common in xeric habitats. About 1,542,600 acres of potentially suitable habitat occurs in the SEZ region.	3,286 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	25,327 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	Small overall impact.
Small Game and Furbearers				
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 4,950,600 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	128,098 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

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TABLE 11.7.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Small Game and Furbearers (Cont.)				
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,952,700 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	128,780 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Bobcat (*Lynx rufus*)	Most habitats except subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 2,237,500 acres of potentially suitable habitat occurs in the SEZ region.	4,580 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	30,718 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	Small overall impact.
Coyote (*Canis latrans*)	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 5,023,900 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	128,963 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 4,812,200 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	121,583 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Small Game and Furbearers (Cont.)				
Gray fox (*Urocyon cinereoargenteus*)	Deserts, open forests and brush. Prefers wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 3,716,700 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,877 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Kit fox (*Vulpes macrotis*)	Desert and semidesert areas with relatively open vegetative cover and soft soils. Seeks shelter in underground burrows. About 4,127,100 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	105,416 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Red fox (*Vulpes vulpes*)	Most common in open woodlands, pasturelands, riparian areas, and agricultural lands. About 2,267,400 acres of potentially suitable habitat occurs in the SEZ region.	1,427 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	12,499 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact.
Nongame (small) Mammals				
Big brown bat (*Eptesicus fuscus*)	Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 3,700,800 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,876 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Nongame (small) Mammals (Cont.)				
Botta's pocket gopher (*Thomomys bottae*)	Variety of habitats including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 3,559,800 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,494 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 4,260,900 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	124,380 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Cactus mouse (*Peromyscus eremicus*)	Variety of areas including desert scrub, semidesert chaparral, desert wash, semidesert grassland, and cliff and canyon habitats. About 982,800 acres of potentially suitable habitat occurs in the SEZ region.	3,290 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	21,963 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact. Avoid wash habitats.
California myotis (*Myotis californicus*)	Desertscrub, semidesert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 3,541,200 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,644 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Deer mouse (*Peromyscus maniculatus*)	Tundra; alpine and subalpine grasslands; plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran Desert scrub habitats. About 4,785,100 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	121,811 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Desert shrew (*Notiosorex crawfordi*)	Usually in arid areas with adequate cover such as semiarid grasslands, shortgrass plains, desert scrub, chaparral slopes, shortgrass plains, oak savannas and woodlands, and alluvial fans. About 3,079,400 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	122,995 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,863,900 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	121,661 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Hoary bat (*Lasiurus cinereus*)	Chaparral, shortgrass plains, scrub-grassland, desertscrub, forests and woodlands. Usually roosts in trees, also in caves, rock crevices, and houses. About 1,092,500 acres of potentially suitable habitat occurs in the SEZ region.	4,576 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	27,071 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact.

TABLE 11.7.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Little pocket mouse (*Perognathus longimembris*)	Mostly sandy and gravelly soils, but also stony soils and rarely rocky sites. About 3,927,500 acres of potentially suitable habitat occurs in the SEZ region.	12,352 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	100,207 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Long-legged myotis (*Myotis volans*)	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 3,794,200 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,728 acres of potentially suitable habitat (3,3% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Long-tailed pocket mouse (*Chaetodipus formosus*)	Common in sagebrush, desert scrub, and desert succulent shrub habitats with rocky or stony groundcover. About 3,964,100 acres of potentially suitable habitat occurs in the SEZ region.	12,352 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	100,778 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Merriam's kangaroo rat (*Dipodomys merriami*)	Plains grasslands, scrub-grasslands, desertscrub, shortgrass plains, oak and juniper savannahs, mesquite dunes, and creosote flats. About 4,120,300 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	127,472 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Northern grasshopper mouse (*Onychomys leucogaster*)	Occurs in grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 2,107,800 acres of potentially suitable habitat occurs within the SEZ region.	141 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat) during construction and operations	6,818 acres of potentially suitable habitat (0.3% of available potentially suitable habitat)	Small overall impact.
Silver-haired bat (*Lasionycteris noctivagans*)	Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savannah and desertscrub habitats. Roosts under bark, in hollow trees, caves and mines. Forages over clearings and open water. About 4,167,600 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	102,362 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Southern grasshopper mouse (*Onychomys torridus*)	Low, arid, shrub and semiscrub vegetation of deserts. About 2,774,100 acres of potentially suitable habitat occurs within the SEZ region.	12,352 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	95,883 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Western harvest mouse (*Reithrodontomys megalotis*)	Various habitats, including scrub-grasslands, temperate swamps and riparian forests, salt marshes, shortgrass plains, oak savannah, dry fields, agricultural areas, deserts, and desertscrub. Grasses are the preferred cover. About 3,658,700 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	123,691 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 11.7.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes in mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 3,550,400 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	124,177 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends nights and other periods of inactivity in underground burrows. About 3,646,800 acres of potentially suitable habitat occurs within the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	126,782 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Yuma myotis (*Myotis yumanensis*)	Riparian areas, grasslands, semidesert shrubland, mountain brush, woodlands, and deserts. Occurs where there is open water, regardless of the habitat. Roosts in caves, mines, cliffs, crevices, buildings, and swallow nests. About 3,463,900 acres of potentially suitable habitat occurs in the SEZ region.	13,430 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	101,742 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 13,430 acres of direct effects within the SEZ was assumed.

1 **Footnotes continued on next page**

TABLE 11.7.11.3-1 (Cont.)

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 13,430 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[f] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[g] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

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Elk

Potentially suitable elk habitat does not occur within the proposed Millers SEZ. Thus, solar energy development would not directly affect elk habitat. About 4,330 acres (17.5 km^2) of potentially suitable elk habitat occurs within the area of indirect effects. This is only about 0.3% of potentially suitable elk habitat within the SEZ region. No mapped elk ranges occur within 23 mi (37 km) of the SEZ (NDOW 2010). Overall, impacts on elk from solar energy development in the SEZ would be small.

Mule Deer

Based on land cover analyses, up to 13,430 acres (54.3 km^2) of potentially suitable mule deer habitat could be lost by solar energy development within the proposed Millers SEZ. This represents about 0.3% of potentially suitable mule deer habitat within the SEZ region. About 120,900 acres (489.3 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effects. No mapped mule deer ranges occur within the SEZ. The closest year-round habitat is about 5 mi (8 km) from the SEZ. The closest summer, winter, and crucial winter ranges are over 20 mi (324 km) from the SEZ (Figure 11.7.11.3-1). Thus, no direct or indirect effect to these mule deer ranges would occur. Overall, impacts on mule deer from solar energy development in the SEZ would be small.

Pronghorn

Based on land cover analyses, up to 3,286 acres (13.3 km^2) of potentially suitable pronghorn habitat could be lost by solar energy development within the proposed Millers SEZ. This represents about 0.2% of potentially suitable mule deer habitat within the SEZ region. About 25,325 acres (102.5 km^2) of potentially suitable pronghorn habitat occurs within the area of indirect effects. Based on mapped range, year-round pronghorn habitat occurs within the SEZ (Figure 11.7.11.3-2). About 5,215 acres (21.1 km^2) of year-round habitat occurs within the SEZ. Loss of this range would total about 0.2% of the year-round pronghorn range within the SEZ region. About 60,445 acres (244.6 km^2) of year-round pronghorn habitat occurs within the area of indirect effect. This is about 2.3% of the year-round pronghorn habitat within the SEZ region. Overall, impacts on pronghorn from solar energy development in the SEZ would be small.

Other Mammals

Direct impacts on all other representative mammal species would be small, because 0.4% or less of their potentially suitable habitat within the proposed Millers SEZ region would be lost (Table 11.7.11.3-1). Larger areas of potentially suitable habitat for these species occur within the area of potential indirect effects (e.g., up to 4.0% of potentially suitable habitat for the desert shrew).

Summary of Impacts

Overall, direct impacts on mammal species from habitat loss would be small (Table 11.7.11.3-1). Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) would be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with semi-arid shrublands.

11.7.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. Indirect impacts would be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important for reducing impacts on mammals are best established when considering specific project details, design features that can be identified at this time are:

- The fencing around the solar energy development should not block the free movement of mammals, particularly big game species.

- Wash and playa habitats should be avoided.

If these SEZ-specific design features are implemented in addition to the programmatic design features, impacts on mammals could be reduced. However, potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ; therefore, species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.7.11.4 Aquatic Biota

11.7.11.4.1 Affected Environment

This section addresses aquatic habitats and biota known to occur on the proposed Millers SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. There are no permanent streams or water bodies within the proposed Millers SEZ. There is one intermittent/ephemeral wash (Ione Wash), which runs for approximately 3 mi (5 km) through the center of the proposed SEZ. Several other ephemeral washes also cross the Millers SEZ, but based on site visits these drainages contain water only for brief periods following rainfall and do not support wetland or riparian habitats. Ione Wash does not drain into any permanent surface waters and therefore does not provide habitat for fish populations from perennial waters. There are also wetlands along the southern edge of the SEZ. However, wetlands in the southwest rarely have surface water or contain water for only brief periods and typically do not support aquatic communities. The assumed access road corridor does not intersect any intermittent or permanent surface water features. Overall, aquatic habitat and communities are not likely to be present in ephemeral and intermittent desert wetland and surface water features. However, opportunistic crustaceans and aquatic insect larvae adapted to desert conditions may be present even under dry conditions. More detailed site survey data is needed to characterize the aquatic biota, if present, in Millers SEZ.

Six miles (10 km) of Ione Wash and 29 mi (47 km) of additional unnamed intermittent washes are located within the area of indirect effects, as are wetlands along the southern border of the proposed SEZ. The washes are typically dry and are not expected to contain permanent aquatic habitat or communities. Like Ione Wash, the intermittent washes in the area of indirect effects do not connect to any permanent water bodies but rather terminate in dry lakes.

Outside of the area of indirect effects, but within 50 mi (80 km) of the proposed Millers SEZ, are 63,486 acres (257 km^2) of dry lakes, 43 mi (69 km) of perennial streams, and 434 mi (698 km) of intermittent streams. Intermittent streams are the only surface water feature present in the area of direct and indirect effects and account for about 8% of the total amount of intermittent stream present in the SEZ region.

11.7.11.4.2 Impacts

Because surface water habitats are a unique feature in the arid landscape in the vicinity of the proposed Millers SEZ, the maintenance and protection of such habitats is important to the survival of aquatic and terrestrial organisms. The types of impacts that aquatic habitats and biota could incur from the development of utility-scale solar energy facilities are described in detail in Section 5.10.3. Aquatic habitats present on or near the locations selected for construction of solar energy facilities could be affected in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality.

The intermittent Ione Wash is present in the proposed Millers SEZ, and direct effects such as ground disturbance are possible. However, Ione Wash is typically dry and impacts on aquatic habitat and communities are not likely. Sediment deposition into intermittent/ephemeral washes in the area of direct and indirect effects is possible via runoff and airborne particulate deposition, especially if ground disturbance occurs near Ione Wash and the intermittent streams and wetlands. However, no aquatic habitats or aquatic communities are present. Although ephemeral and intermittent surface waters are not likely to contain aquatic habitat, more detailed site surveys for biota in would be necessary to determine whether solar energy development activities would result in direct or indirect impacts to aquatic biota. The streams and wetlands in the SEZ and area of indirect effects are not connected to any permanent surface water features, and the nearest perennial surface water feature is greater than 35 mi (56 km) from the Millers SEZ. Therefore, impacts from runoff on aquatic habitat and communities outside of the area of direct and indirect effects are not likely.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). Obtaining cooling water from other perennial surface water features in the region could affect water levels and, as a consequence, aquatic organisms in those water bodies located outside the SEZ. Additional details on the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

As identified in Section 5.10.3, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning for a solar energy facility. There is the potential for contaminants to enter intermittent streams and wetlands, especially if heavy machinery is used in or nearby these surface water features. Thus, the introduction of contaminants can be minimized by avoiding construction near intermittent streams like Ione Wash. The intermittent streams within the SEZ region are typically dry, do not support aquatic communities, and are not connected to any permanent surface water features. Therefore contaminant effects on aquatic habitat and biota inside and outside of the area of direct and indirect effects are not likely.

11.7.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are identified at this time. If programmatic project design features described in Appendix A, Section A.2.2, are implemented as needed and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the proposed Millers SEZ would be negligible.

11.7.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, within the potentially affected area of the proposed Millers SEZ. Special status species include the following types of species:[3]

- Species listed as threatened or endangered under the ESA;
- Species that are proposed for listing, under review, or are candidates for listing under the ESA;
- Species that are listed by the BLM as sensitive;
- Species that are listed by the State of Nevada;[4] and
- Species that have been ranked by the State of Nevada as S1 or S2, or species of concern by the State of Nevada or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the center of the proposed Millers SEZ (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the NDOW, the NNHP (Miskow 2009; NDCNR 2004, 2005, 2009a,b), SWReGAP (USGS 2004, 2005a, 2007), and the USFWS Environmental Conservation Online System (ECOS) (USFWS 2010). Information reviewed consisted of county-level occurrences as determined from Nature Serve, element occurrences provided by the NNHP, as well as modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from SWReGAP. The 50-mi (80-km) SEZ region intersects Esmeralda, Mineral, and Nye Counties, Nevada. However, the SEZ occurs only in Esmeralda County, Nevada. The affected area occurs within Esmeralda and Nye Counties, Nevada. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

11.7.12.1 Affected Environment

The affected area considered in this assessment included the areas of direct and indirect effects for solar development within the proposed SEZ. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the proposed Millers SEZ, the area of direct effect was limited to the SEZ itself. Due to the proximity of existing infrastructure, the impacts of

[3] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008b). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[4] State listed species for the state of Nevada are those protected under NRS 501.110 (animals) or NRS 527 (plants).

construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ due to the proximity of an existing federal highway (see Section 11.7.1.2 for a discussion of development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi [8 km] of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but do not include ground disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects.

The primary land cover habitat type within the affected area is inter-mountain basins mixed salt desert scrub (see Section 11.7.10). Potentially unique habitats in the affected area in which special status species may reside include desert dune, cliff and rock outcrop, wash, and playa habitats. Aquatic habitats that occur on the SEZ and the area of indirect effects include unnamed playa habitats and the Ione Wash, Peavine Creek, Slime Wash, and an unnamed intermittent stream (Figure 11.7.12.1-1).

All special status species that are known to occur within the proposed Millers SEZ region (i.e., the area within 50 mi [80 km] of the center of the SEZ) are listed, along with their status, nearest recorded occurrence, and habitats in Appendix J. Nineteen of those species could be affected by solar energy development on the SEZ, based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 11.7.12.1-1. The predicted potential occurrence in the affected area of many of the species listed in the table (especially plants and invertebrates), is based only on a general correspondence between mapped SWReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species potentially present in the affected area probably overestimates the number of species that actually occur there. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known actual occurrence is more than 20 mi (32 m) away from the SEZ.

Based on NNHP records, two special status species are known to occur within the affected area of the proposed Millers SEZ: Tonopah milkvetch and western small-footed bat. The Tonopah milkvetch is considered a rare species (state rank S2 in Nevada); the western small-footed bat is a BLM-designated sensitive species (the USFWS considers it a species of concern). There are no groundwater-dependent species in the vicinity of the SEZ based upon NNHP records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Millers SEZ region (Section 11.7.9).

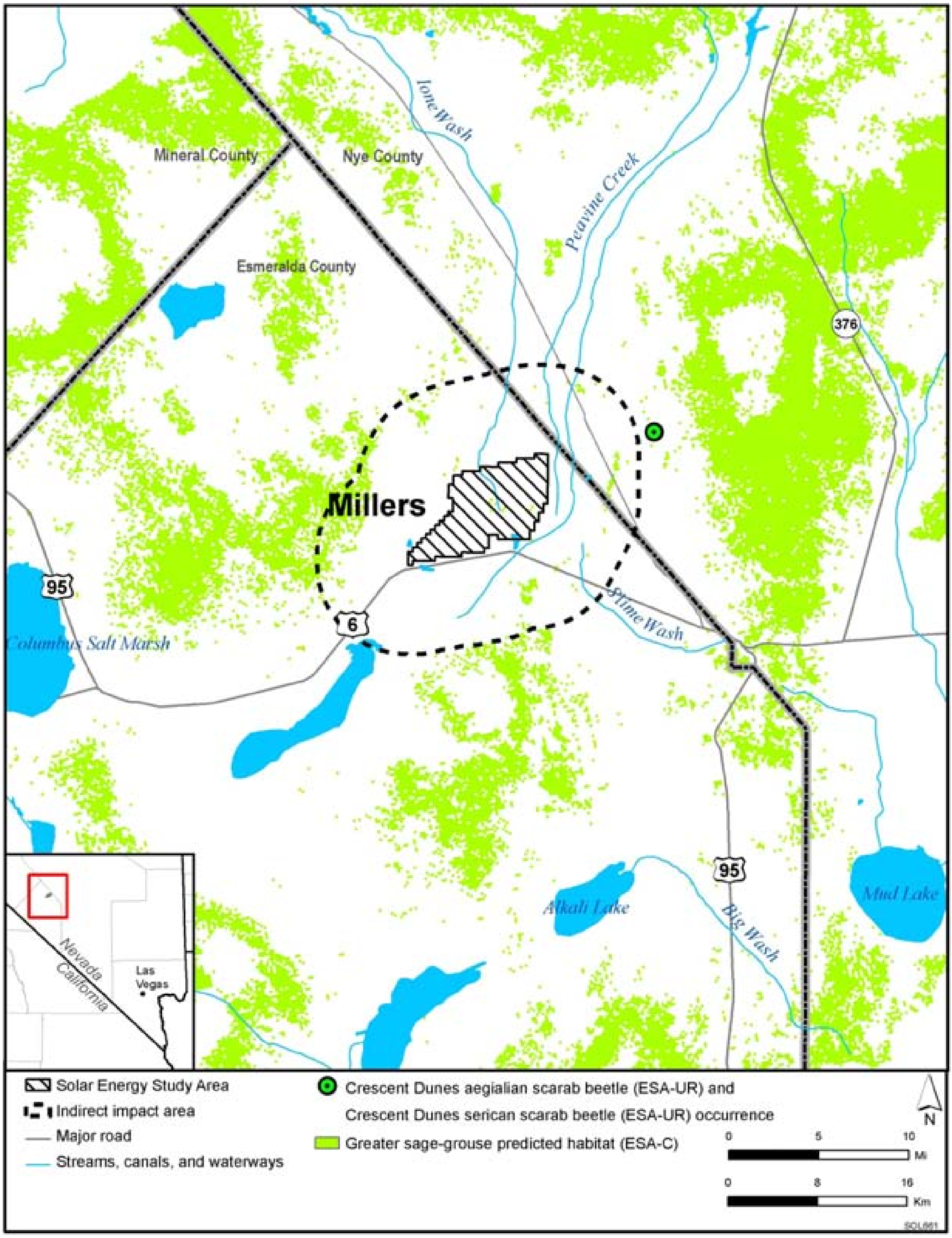

FIGURE 11.7.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA, Candidate for Listing under the ESA, or Species under Review for ESA Listing in the Affected Area of the Proposed Millers SEZ (Sources: Miskow 2009; NDCNR 2005; USFWS 2010; USGS 2007)

TABLE 11.7.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could be Affected by Solar Energy Development on the Proposed Millers SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants						
Eastwood milkweed	*Asclepias eastwoodiana*	BLM-S; FWS-SC; NV-S2	Endemic to Nevada from public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, or shale outcrops, generally barren and lacking competition. Frequently in small washes or other moisture-accumulating microsites at elevations between 4,700 and 7,100 ft[h]. Nearest recorded occurrence is 12 mi[i] southeast of the SEZ. About 379,398 acres[j] of potentially suitable habitat occurs within the SEZ region.	3,300 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat)	22,000 acres of potentially suitable habitat (5.8% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance or minimization of disturbance to occupied habitats in the areas of direct effect; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.
Nevada dune beardtongue	*Penstemon arenarius*	BLM-S; FWS-SC; NV-S2	Endemic to western Nevada on sand dunes or deep sand occurring on deep, loose, sandy soils of valley bottoms, aeolian deposits, and dune skirts, often in alkaline areas, sometimes on road banks and other recovering disturbances crossing such soils, in shadscale communities. Nearest recorded occurrence is along Peavine Creek, approximately 17 mi northeast of the SEZ. About 97,638 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	150 acres of potentially suitable habitat (6.5% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.

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TABLE 11.7.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Ripley biscuitroot	*Cymopterus ripleyi* var. *ripleyi*	FWS-SC; NV-S2	Restricted to southeastern California and western Nevada in deep loose, sandy soils of stabilized dunes, dune skirt areas, aeolian deposits, and alluvial drainage areas at elevations between 4,400 and 6,000 ft. Nearest recorded occurrence is 14 mi northeast of the SEZ. About 2,281acres of potentially suitable habitat occurs within the SEZ region.	0 acres	150 acres of potentially suitable habitat (6.5% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.
Sanicle biscuitroot	*Cymopterus ripleyi* var. *saniculoides*	BLM-S; FWS-SC	Endemic to Nevada on loose, sandy to gravelly, often somewhat alkaline soils on volcanic tuff deposits and mixed valley alluvium within blackbrush, mixed-shrub, sagebrush, and lower pinyon-juniper communities. Elevation ranges between 3,150 and 6,700 ft. Nearest recorded occurrence is 12 mi northeast of the SEZ. About 4,039,523 acres of potentially suitable habitat occurs within the SEZ region.	13,475 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	102,500 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. See Eastwood milkweed for a list of other potential mitigations.

TABLE 11.7.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Squalid milkvetch	*Astragalus serenoi* var. *sordescens*	NV-S2	Endemic to Nevada on dry, open, gravelly or sandy soils along gentle slopes of alluvial fans or light-colored clay hills, within mixed-shrub, sagebrush, and lower pinyon-juniper communities at elevations between 5,000 and 6,800 ft. Nearest recorded occurrence is from the Toiyabe National Forest, about 17 mi northeast of the SEZ. About 4,416,115 acres of potentially suitable habitat occurs within the SEZ region.	12,175 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	97,800 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact. See Eastwood milkweed for a list of other potential mitigations.
Tonopah milkvetch[k]	***Astragalus pseudiodanthus***	NV-S2	Restricted to southeastern California and western Nevada in deep, loose, sandy soils of stabilized and active dune margins, old beaches, valley floors, or drainages at elevations between 4,500 and 6,000 ft. Nearest recorded occurrence is 4 mi southeast of the SEZ. About 2,281 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	150 acres of potentially suitable habitat (6.5% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.
Toquima milkvetch	*Astragalus toquimanus*	BLM-S; NV-S2	Endemic to Nevada on dry, stiff, sandy to gravelly, basic or calcareous soils along gentle slopes or flats at elevations between 6,500 and 7,500 ft. Nearest recorded occurrence is 21 mi east of the SEZ. About 1,156,759 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	4,320 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact; no direct effect. No species-specific mitigation is warranted.

TABLE 11.7.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates						
Crescent Dunes aegialian scarab beetle	*Aegialia crescenta*	ESA-UR; BLM-S; NV-S1	Sand dune obligate species endemic to Nevada on the Crescent Dunes and possibly also to the San Antonio and Game Range Dunes. Nearest recorded occurrence is from the Crescent Dunes SRMA, about 6 mi east of the SEZ. About 2,281 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	150 acres of potentially suitable habitat (6.5% of available potentially suitable habitat)	Small overall impact; no direct effect. A review of mitigation effectiveness to avoid indirect effects (e.g., site runoff and erosion, disruption of sand transport systems) on this species should be conducted during the project design phase and in coordination with the USFWS and NDOW. Coordination would identify the need for mitigation, which may include avoidance, minimization, translocation, or compensation.
Crescent Dunes serican scarab beetle	*Serica ammomenisco*	ESA-UR; BLM-S; NV-S1	Sand dune obligate species endemic to Nevada on the Crescent Dunes. Nearest recorded occurrence is from the Crescent Dunes SRMA, approximately 6 mi east of the SEZ. About 2,281 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	150 acres of potentially suitable habitat (6.5% of available potentially suitable habitat)	Small overall impact; no direct effect. A review of mitigation effectiveness to avoid indirect effects (e.g., site runoff and erosion, disruption of sand transport systems) on this species should be conducted during the project design phase and in coordination with the USFWS and NDOW. Coordination would identify the need for mitigation, which may include avoidance, minimization, translocation, or compensation.

TABLE 11.7.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds						
Ferruginous hawk	*Buteo regalis*	BLM-S; NV-P; FWS-SC	Year-round resident in the SEZ region. Grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodland. Nests in tall trees or on rock outcrops along cliff faces. Known to occur in Esmeralda County, Nevada. About 1,403,676 acres of potentially suitable habitat occurs within the SEZ region.	3,125 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	24,000 acres of potentially suitable foraging and nesting habitat (1.7% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Greater sage-grouse	*Centrocercus urophasianus*	ESA-C; BLM-S	Plains, foothills, and mountain valleys dominated by sagebrush. Lek sites are located in relatively open areas surrounded by sagebrush or in areas where sagebrush density is low. Nesting usually occurs on the ground where sagebrush density is higher. Some populations may travel up to 60 mi between summer and winter habitats. Known to occur in Esmeralda County, Nevada. About 1,264,279 acres of potentially suitable habitat occurs within the SEZ region.	125 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	6,450 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance or minimization of disturbance to occupied and/or suitable leks and nesting sites in the areas of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in coordination with the USFWS and NDOW.

TABLE 11.7.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Prairie falcon	*Falco mexicanus*	BLM-S	Year-round resident in open habitats in mountainous areas, steppe, grasslands, or cultivated areas. Nests in well-sheltered ledges of rocky cliffs and outcrops. Known to occur in Esmeralda County, Nevada. About 3,612,314 acres of potentially suitable habitat occurs within the SEZ region.	12,050 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	100,300 acres of potentially suitable foraging and nesting habitat (2.8% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Swainson's hawk	*Buteo swainsoni*	BLM-S; NV-P; NV-S2	Summer breeding resident in the SEZ region. Savanna, open pine-oak woodlands, grasslands, and cultivated lands. Nests in solitary trees, bushes, or small groves. Known to occur in Esmeralda County, Nevada. About 847,596 acres of potentially suitable habitat occurs within the SEZ region.	125 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	2,225 acres of potentially suitable foraging and nesting habitat (0.3% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; FWS-SC	Summer breeding resident in SEZ region in open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Known to occur in Esmeralda County, Nevada. About 4,035,785 acres of potentially suitable habitat occurs within the SEZ region.	13,600 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	105,600 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoidance or minimization of disturbance to occupied burrows in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 11.7.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals						
Fringed myotis	*Myotis thysanodes*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in SEZ region in wide range of habitats, including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roosts in buildings and caves. Known to occur in Esmeralda County, Nevada. About 4,549,929 acres of potentially suitable habitat occurs within the SEZ region.	15,200 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	119,600 acres of potentially suitable foraging and roosting habitat (2.6% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Uses desert lowland as corridors for travel between mountain ranges. Known to occur in Esmeralda County, Nevada. About 1,866,606 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	17,250 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	Small overall impact; no direct effect. Pre-disturbance surveys and avoidance or minimization of disturbance of habitats within the area of direct effects that serve as movement corridors could further reduce impacts.
Spotted bat	*Euderma maculatum*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in SEZ region near forests and shrubland habitats. Roosts and hibernates in caves and rock crevices. Nearest recorded occurrence is 30 mi south of the SEZ. About 3,863,972 acres of potentially suitable habitat occurs within the SEZ region.	15,075 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	114,000 acres of potentially suitable foraging and roosting habitat (2.9% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 11.7.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; NV-P; NV-S2	Year-round resident in SEZ region near forests and shrubland habitats below 9,000 ft elevation. Roosts and hibernates in caves, mines, and buildings. Nearest recorded occurrence is 7 mi south of the SEZ. About 3,580,069 acres of potentially suitable habitat occurs within the SEZ region.	13,600 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	102,100 acres of potentially suitable foraging and roosting habitat (2.9% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.
Western small-footed bat	***Myotis ciliolabrum***	BLM-S; FWS-SC	Year-round resident in woodlands and riparian habitats at elevations below 9,000 ft (2,750 m). Roosts in caves, buildings, mines, and crevices of cliff faces. Nearest recorded occurrence is 4 mi north of the SEZ. About 4,949,592 acres of potentially suitable habitat occurs within the SEZ region	16,725 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	125,275 acres of potentially suitable foraging and roosting habitat (2.5% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

a BLM-S = listed as a sensitive species by the BLM; ESA-E = listed as endangered under the ESA; ESA-T = listed as threatened under the ESA; ESA-UR = under review for listing under the ESA; FWS-SC = USFWS species of concern; NV-P = protected in the state of Nevada under NRS 501.110 (animals) or NRS 527 (plants); NV-S1 = ranked as S1 in the state of Nevada; NV-S2 = ranked as S2 in the state of Nevada.

b For plant species, potentially suitable habitat was determined by using SWReGAP land cover types. For terrestrial vertebrate species, potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

c Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Footnotes continued on next page.

TABLE 11.7.12.1-1 (Cont.)

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portions of the road and transmission corridors where ground disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, etc. from projects. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Indirect effects on groundwater-dependent species were considered outside these defined areas.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert ft to m, multiply by 0.3048.

[i] To convert mi to km, multiply by 1.609.

[j] To convert acres to km^2, multiply by 0.004047.

[k] Species in bold text have been recorded or have designated critical habitat within 5 mi (8 km) of the SEZ boundary.

11.7.12.1.1 Species Listed under the Endangered Species Act That Could Occur in the Affected Area

In their scoping comments on the proposed Millers SEZ, the USFWS (Stout 2009) did not express concern for impacts of project development within the SEZ on any species listed as threatened or endangered under the ESA. There are no NNHP records of or potentially suitable habitats for any ESA-listed species within the affected area. According to SWReGAP and USGS habitat suitability models, potentially suitable habitat for the desert tortoise, a species listed as threatened under the ESA, does not occur within the affected area of the proposed Millers SEZ.

11.7.12.1.2 Species That Are Candidates for Listing under the ESA

In their scoping comments on the proposed Millers SEZ, the USFWS did not identify any candidate species for listing under the ESA that may be directly or indirectly affected by solar energy development on the SEZ (Stout 2009). However, one candidate species, the greater sage-grouse, may occur within the affected area. This species inhabits primarily sagebrush habitats in plains, foothills, and mountain valley regions. This species occurs in Esmeralda County, Nevada, and potentially suitable year-round sagebrush habitat is expected to occur within the SEZ and other portions of the affected area (Figure 11.7.12.1-1). According to the SWReGAP habitat suitability model, about 125 acres (0.5 km^2) of potentially suitable habitat for this species occurs on the SEZ; about 6,450 acres (26 km^2) of potentially suitable habitat occurs in the area of indirect effects (Table 11.7.12.1-1). Additional basic information on life history, habitat needs, and threats to populations of the greater sage-grouse is provided in Appendix J.

11.7.12.1.3 Species That Are under Review for Listing under the ESA

In their scoping comments on the proposed Millers SEZ, the USFWS did not identify any species under ESA review that may be directly or indirectly affected by solar energy development on the SEZ (Stout 2009). However, on the basis of occurrence records, two such species, the Crescent Dunes aegialian scarab beetle and the Crescent Dunes serican scarab beetle, may occur within the affected area. These species are sand dune obligates endemic to Nevada, where they are restricted primarily to the Crescent Dunes in Esmeralda County. The nearest recorded occurrences of these two species are from the Crescent Dunes, approximately 6 mi (10 km) east of the SEZ (Figure 11.7.12.1-1). According to the SWReGAP land cover model, potentially suitable sand dune habitat for these species does not occur on the SEZ; however, approximately 150 acres (0.6 km^2) of potentially suitable sand dune habitat occurs in the area of indirect effects (Table 11.7.12.1-1). Additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

11.7.12.1.4 BLM-Designated Sensitive Species

There are 16 BLM-designated sensitive species that may occur in the affected area of the proposed Millers SEZ (Table 11.7.12.1-1). These BLM-designated sensitive species include the following (1) plants: Eastwood milkweed, Nevada dune beardtongue, sanicle biscuitroot, and Toquima milkvetch; (2) invertebrates: Crescent Dunes aegialian scarab beetle and Crescent Dunes serican scarab beetle; (3) birds: ferruginous hawk, greater sage-grouse, prairie falcon, Swainson's hawk, and western burrowing owl; and (3) mammals: fringed myotis, Nelson's bighorn sheep, spotted bat, Townsend's big-eared bat, and western small-footed bat. Of these BLM-designated sensitive species with potentially suitable habitat in the affected area, only the western small-footed bat has been recorded within 5 mi (8 km) of the SEZ boundary. Habitats in which BLM-designated sensitive species are found, the amount of potentially suitable habitat for each in the affected area, and known locations of the species relative to the SEZ are presented in Table 11.7.12.1-1. Three of these species—Crescent Dunes aegialian scarab beetle, Crescent Dunes serican scarab beetle, and greater sage-grouse—were discussed above because of their known or pending status under the ESA (Sections 11.7.12.1.2 and 11.7.12.1.3). The remaining species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Eastwood Milkweed

The Eastwood milkweed is a perennial forb endemic to Nevada found on public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties. It occurs in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, washes, or shale outcrops at elevations between 4,700 and 7,100 ft (1,430 and 2,150 m). The species is known to occur about 12 mi (19 km) southeast of the SEZ. Although it is not known to occur in the affected area, potentially suitable shrubland and desert wash habitat may occur in the SEZ and other portions of the affected area (Table 11.7.12.1-1).

Nevada Dune Beardtongue

The Nevada dune beardtongue is a perennial forb endemic to sandy habitats in western Nevada. The species occurs primarily on dunes or deep sand in valley bottoms, alkaline areas, or road banks. Nearest recorded occurrences are from Peavine Creek, about 17 mi (27 km) northeast of the SEZ. The species is not known to occur within the affected area of the SEZ, and potentially suitable habitat does not occur on the SEZ. However, potentially suitable dune habitat may occur in the area of indirect effects (Table 11.7.12.1-1).

Sanicle Biscuitroot

The sanicle biscuitroot is a perennial forb endemic to Nevada occurring in mixed desert scrub and pinyon-juniper woodland communities on sandy to gravelly alkaline substrates and volcanic deposits. The nearest recorded occurrences are about 12 mi (19 km) northeast of the SEZ. Although it is not known to occur in the affected area, potentially suitable desert scrub habitats may occur in the SEZ and other portions of the affected area (Table 11.7.12.1-1).

Toquima Milkvetch

The Toquima milkvetch is a perennial forb endemic to Nevada on sandy to gravelly slopes or flats at elevations between 6,500 and 7,500 ft (1,980 and 2,280 m). The nearest recorded occurrences are about 21 mi (34 km) east of the SEZ. This species is not known to occur in the affected area, and potentially suitable habitat does not occur on the SEZ. However, potentially suitable sagebrush habitat may occur in the area of indirect effects (Table 11.7.12.1-1).

Ferruginous Hawk

The ferruginous hawk occurs throughout the western United States. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat for the ferruginous hawk may occur within the affected area of the proposed Millers SEZ. This species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. It occurs in Esmeralda County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.7.12.1-1). On the basis of an evaluation of SWReGAP land cover types, no suitable nesting habitat occurs within the area of direct effects, but about 54 acres (0.2 km^2) of pinyon-juniper woodlands and 720 acres (3 km^2) of cliffs and rock outcrops that may be potentially suitable nesting habitat occur in the area of indirect effects.

Prairie Falcon

The prairie falcon occurs throughout the western United States. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat for the prairie falcon may occur within the affected area of the proposed Millers SEZ. The species occurs in open habitats in mountainous areas, sagebrush-steppe, grasslands, or cultivated areas. Nests are typically constructed in well-sheltered ledges of rocky cliffs and outcrops. This species occurs in Esmeralda County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.7.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat within the area of direct effects, but about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Swainson's Hawk

The Swainson's hawk occurs throughout the southwestern United States. According to the SWReGAP habitat suitability model, only potentially suitable summer foraging and nesting habitat occurs in the affected area of the proposed Millers SEZ. This species inhabits desert, savanna, open pine-oak woodland, grassland, and cultivated habitats. Nests are typically constructed in solitary trees, bushes, or small groves. This species occurs in Esmeralda County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.7.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat (solitary trees) within the area of direct effects, but about 54 acres (0.2 km^2) of pinyon-juniper woodland that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Western Burrowing Owl

According to the SWReGAP habitat suitability model for the western burrowing owl, only potentially suitable summer breeding habitat may occur in the affected area of the proposed Millers SEZ. The species forages in grasslands, shrublands, open disturbed areas, and nests in burrows typically constructed by mammals. The species occurs in Esmeralda County, Nevada, and potentially suitable breeding habitat is expected to occur in the SEZ and in other portions of the affected area (Table 11.7.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Fringed Myotis

The fringed myotis is a year-round resident in the proposed Millers SEZ region. It occurs in a variety of habitats, including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. The species roosts in buildings and caves. It occurs in Esmeralda County, Nevada, and the SWReGAP habitat suitability model for the species indicates that potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.7.12.1-1). On the basis of an evaluation of SWReGAP land cover types, no suitable roosting habitat occurs within the SEZ, but about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep (also called the desert bighorn sheep) is a subspecies of bighorn sheep known to occur in the proposed Millers SEZ region. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats, and may utilize desert valleys as corridors for travel between range habitats. It occurs in Esmeralda County, Nevada. According to the SWReGAP habitat suitability model for the species, potentially suitable habitat does not occur on the SEZ; but portions of the affected area may provide important range and migratory habitat for the Nelson's bighorn sheep (Table 11.7.12.1-1).

Spotted Bat

The spotted bat is a year-round resident in the proposed Millers SEZ region, where it occurs in a variety of forested and shrubland habitats. It roosts in caves and rock crevices. The species occurs about 30 mi (56 km) south of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.7.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ, but about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident in the proposed Millers SEZ region, where it forages in a wide variety of desert and non-desert habitats. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. The nearest recorded occurrences of this species are about 7 mi (11 km) south of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.7.12.1-1). On the basis of an evaluation of SWReGAP land cover types, no suitable roosting habitat occurs within the SEZ, but about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects.

Western Small-Footed Bat

The western small-footed bat is a year-round resident in the proposed Millers SEZ region, where it occupies a wide variety of desert and non-desert habitats. including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, tunnels, buildings, and other man-made structures and beneath boulders or loose bark. The species is known to occur as near as 4 mi (6 km) north of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.7.12.1-1). On the basis of an evaluation of SWReGAP land cover types, no suitable roosting habitat occurs within the SEZ, but about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects.

11.7.12.1.5 State-Listed Species

There are 5 species listed by the State of Nevada that may occur in the proposed Millers SEZ affected area (Table 11.7.12.1-1). These species are (1) birds: ferruginous hawk and Swainson's hawk; and (2) mammals: fringed myotis, spotted bat, and Townsend's big-eared bat. All of these species are protected in the state of Nevada under NRS 501.110. Each of these species has been previously discussed because of its status under the BLM (Section 11.7.12.1.4). Appendix J provides additional life history information for these species.

11.7.12.1.6 Rare Species

There are 17 rare species (i.e., state rank of S1 or S2 in Nevada or a species of concern by the State of Nevada or USFWS) that may be affected by solar energy development on the proposed Millers SEZ (Table 11.7.12.1-1). Of these species, three rare plants have not been discussed previously—Ripley biscuitroot, squalid milkvetch, and Tonopah milkvetch. The only rare species known to occur within 5 mi (8 km) of the proposed Millers SEZ are the Tonopah milkvetch and western small-footed bat (Table 11.7.12.1-1).

11.7.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Millers SEZ is discussed in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts to special status species is based on available information on the presence of species in the affected area as presented in Section 11.7.12.1 following the analysis approach described in Appendix M. It is assumed that pre-disturbance surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 11.7.12.3).

Solar energy development within the proposed Millers SEZ could affect a variety of habitats (see Sections 11.7.9 and 11.7.10). These impacts on habitats could in turn affect special status species dependent on those habitats. Based on NNHP records, two special status species are known to occur within 5 mi (8 km) of the proposed Millers SEZ boundary: Tonopah milkvetch and western small-footed bat (listed in bold in Table 11.7.12.1-1). Other special status species may occur on the SEZ or within the affected area based on the presence of potentially suitable habitat. As discussed in Section 11.7.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur there and, therefore, may overestimate impacts to some special status species.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if those activities are sited in areas where special status species are known to or could occur. As presented in Section 11.7.1.2, impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ where ground disturbing activities are expected to occur. Indirect impacts could result from depletion of groundwater resources, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground disturbing activities associated with projects are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts to individuals and habitats adjacent to project areas, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., dunes and playa habitats). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce groundwater consumption, runoff, sedimentation, spills, and fugitive dust.

11.7.12.2.1 Impacts on Species Listed under the ESA

In their scoping comments on the proposed Millers SEZ, the USFWS did not express concern for impacts of project development within the SEZ on any species listed as threatened or endangered under the ESA (Stout 2009). There are no NNHP records or potentially suitable habitats for any ESA-listed species within the affected area. For these reasons, solar energy development within the proposed Millers SEZ is not likely to affect any species currently listed under the ESA.

11.7.12.2.2 Impacts on Species That Are Candidates for Listing under the ESA

The greater sage-grouse is the only ESA candidate species that could occur in the affected area of the proposed Millers SEZ, based upon information provided by the NNHP (NDCNR 2004, 2005) and SWReGAP (USGS 2007). This species is known to occur in Esmeralda County, Nevada, and potentially suitable year-round sagebrush habitat is expected to occur within the SEZ and other portions of the affected area (Figure 11.7.12.1-1). According to the SWReGAP habitat suitability model, about 125 acres (0.5 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat for the greater sage-grouse in the SEZ region. About 6,450 acres (26 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 0.5% of the available suitable habitat in the SEZ region (Table 11.7.12.1-1).

The overall impact on the greater sage-grouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features alone may not be sufficient to reduce impacts because potentially suitable sagebrush habitats may not be avoided in the area of direct effects.

Efforts to mitigate the impacts of solar energy facilities in the proposed Millers SEZ on the greater sage-grouse should be developed in consultation with the USFWS and NDOW following the *Strategic Plan for Management of Sage Grouse* (UDWR 2002) and *Guidelines to*

Manage Sage Grouse Populations and Their Habitats (Connelly et al. 2000). Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effects. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. Any mitigation plans should be developed in coordination with the USFWS and NDOW.

11.7.12.2.3 Impacts on Species That Are under Review for Listing under the ESA

Two species under review for ESA listing may occur in the affected area of the proposed Millers SEZ: Crescent Dunes aegialian scarab beetle and Crescent Dunes serican scarab beetle. Both species are sand dune obligates, and they are restricted primarily to the Crescent Dunes, about 6 mi (10 km) east of the SEZ (Figure 11.7.12.1-1). According to the SWReGAP land cover model, potentially suitable sand dune habitat for these species does not occur on the SEZ. However, about 150 acres (0.6 km^2) of dune habitat occurs in the area of indirect effects; this area represents about 0.5% of the available suitable habitat for both of these species in the SEZ region (Table 11.7.12.1-1).

The overall impact on the Crescent Dunes aegialian scarab beetle and Crescent Dunes serican scarab beetle from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels. However, given the location of these species and their habitat adjacent to the SEZ boundary, a review of mitigation effectiveness to avoid indirect effects (e.g., site runoff and erosion, disruption of sand transport systems) on these species should be conducted during the project design phase and in coordination with the USFWS and NDOW. Coordination would identify the need for mitigation, which may include avoidance, minimization, translocation, or compensation.

11.7.12.2.4 Impacts on BLM-Designated Sensitive Species

BLM-designated sensitive species that may be affected by solar energy development on the proposed Millers SEZ and that have not previously been discussed are discussed below.

Eastwood Milkweed

The Eastwood milkweed is not known to occur in the affected area of the proposed Millers SEZ; however, about 3,300 acres (13 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents about 0.9% of potentially suitable habitat in the SEZ region. About 22,000 acres

(89 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5.8% of the potentially suitable habitat in the SEZ region (Table 11.7.12.1-1).

The overall impact on the Eastwood milkweed from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible option for mitigating impacts on the Eastwood milkweed because potentially suitable sagebrush and mixed shrubland habitat is widespread throughout the area of direct effects. For this species and other special status plants, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not feasible, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Nevada Dune Beardtongue

The Nevada dune beardtongue is not known to occur in the affected area of the proposed Millers SEZ, and potentially suitable sand dune habitat does not occur in the area of direct effects. However, about 150 acres (0.6 km^2) of potentially suitable sand dune habitat occurs in the area of indirect effects; this area represents about 0.4% of the potentially suitable habitat in the SEZ region (Table 11.7.12.1-1).

The overall impact on the Nevada dune beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Sanicle Biscuitroot

The sanicle bisuitroot is not known to occur in the affected area of the proposed Millers SEZ; however, about 13,475 acres (55 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the SEZ region. About 102,500 acres

(415 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.5% of the potentially suitable habitat in the SEZ region (Table 11.7.12.1-1).

The overall impact on the sanicle biscuitroot from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible option for mitigating impacts on the sanicle biscuitroot because potentially suitable shrubland habitat is widespread throughout the area of direct effect. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Eastwood milkweed. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Toquima Milkvetch

The Toquima milkvetch is not known to occur in the affected area of the proposed Millers SEZ and potentially suitable sand dune habitat does not occur in the area of direct effects. However, approximately 150 acres (0.6 km^2) of potentially suitable sand dune habitat occurs in the area of indirect effects; this area represents about 0.4% of the potentially suitable habitat in the SEZ region (Table 11.7.12.1-1).

The overall impact on the Toquima milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Ferruginous Hawk

According to the SWReGAP habitat suitability model, potentially suitable year-round habitat for the ferruginous hawk exists in the affected area of proposed Millers SEZ. About 3,125 acres (13 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 24,000 acres (97 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.7% of the available suitable habitat in the SEZ region (Table 11.7.12.1-1). Most of the suitable habitat in the affected area could serve as foraging habitat (open shrublands). On the basis of SWReGAP land cover data, suitable nesting habitat (large trees and rock outcrops) does not occur on the SEZ. However, about 54 acres (0.2 km^2) of woodland habitat (pinyon-juniper) and 720 acres

(0.6 km^2) of cliffs and rock outcrops that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible option for mitigating impacts on this species because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

Prairie Falcon

The prairie falcon is a year-round resident in the proposed Millers SEZ region, and potentially suitable foraging habitat is expected to occur in the affected area. About 12,050 acres (49 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents 0.3% of potentially suitable habitat in the SEZ region. About 100,300 acres (406 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.8% of the potentially suitable habitat in the SEZ region (Table 11.7.12.1-1). Most of this area could serve as foraging habitat (open shrublands). On the basis of SWReGAP land cover data, potentially suitable nesting habitat (cliffs and rock outcrops) does not occur on the SEZ. However, about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the prairie falcon from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible option for mitigating impacts on this species because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

Swainson's Hawk

Potentially suitable summer foraging and nesting habitat for the Swainson's hawk is expected to occur throughout much of the proposed Millers SEZ region, and potentially suitable habitat is expected to occur in the affected area. About 125 acres (0.5 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents <0.1% of potentially suitable habitat in the SEZ region. About 2,225 acres (9 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.3% of the available suitable foraging habitat in the SEZ region (Table 11.7.12.1-1). On the basis of SWReGAP land cover data, potentially suitable nesting habitat (solitary trees) does not occur on the SEZ. However, about 54 acres (0.2 km^2) of woodland habitat (pinyon-juniper) that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the Swainson's hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible option for mitigating impacts on this species because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

Western Burrowing Owl

Potentially suitable breeding habitat for the western burrowing owl occurs throughout much of the proposed Millers SEZ region, and potentially suitable habitat is expected to occur in the affected area. About 13,600 acres (55 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents 0.3% of potentially suitable habitat in the SEZ region. About 105,600 acres (427 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.6% of the potentially suitable habitat in the SEZ region (Table 11.7.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible option for mitigating impacts on the western burrowing owl because potentially suitable desert scrub habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. Impacts on the western burrowing owl could be reduced to negligible levels through the implementation of programmatic design features and by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows on the SEZ. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Fringed Myotis

The fringed myotis is a year-round resident within the proposed Millers SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ. However, about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects. About 15,200 acres (62 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents about 0.3% of potentially suitable foraging habitat in the region. About 119,600 acres (484 km^2) of potentially suitable foraging habitat occurs in the area of indirect effect; this area represents about 2.6% of the available suitable foraging habitat in the region (Table 11.7.12.1-1). Most of the suitable habitat in the affected area could serve as foraging habitat (open shrublands). On the basis of SWReGAP land cover data, potentially suitable roosting habitat (cliffs and rock outcrops) does not occur on the SEZ. However, about 720 acres (3 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible option for mitigating impacts on this species because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is not known to occur on the proposed Millers SEZ and potentially suitable habitat does not occur on the site. However, about 17,250 acres (70 km^2) of potentially suitable habitat occurs within the area of indirect effect; this area represents about 0.9% of the potentially suitable habitat in the region (Table 11.7.12.1-1).

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because no potentially suitable habitat for this species has been identified in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels. Impacts on the Nelson's bighorn sheep may be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to important movement corridors within the area of direct effects.

Spotted Bat

The spotted bat is a year-round resident within the proposed Millers SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves and rock outcrops) do not occur on the SEZ. However, about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects. About 15,075 acres (61 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents about 0.4% of potentially suitable foraging habitat in the region. About 114,000 acres (461 km^2) of potentially suitable foraging habitat occurs in the area of indirect effect; this area represents about 2.9% of the potentially suitable foraging habitat in the region (Table 11.7.12.1-1). Most of the suitable habitat in the affected area could serve as foraging habitat (open shrublands). On the basis of SWReGAP land cover data, potentially suitable roosting habitat (cliffs and rock outcrops) does not occur on the SEZ. However, about 720 acres (3 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible option for mitigating impacts on this species because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident within the proposed Millers SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ. However, about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects. About 13,600 acres (55 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents about 0.4% of potentially suitable foraging habitat in the region. About 102,100 acres (413 km^2) of potentially suitable foraging habitat occurs in the area of indirect effect; this area represents about 2.9% of the potentially suitable foraging habitat in the region (Table 11.7.12.1-1). Most of the suitable habitat in the affected area could serve as foraging habitat (open shrublands). On the basis of SWReGAP land cover data, potentially suitable roosting habitat (cliffs and rock outcrops) does not occur on the SEZ. However, about 720 acres (3 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible option for mitigating impacts on this species because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

Western Small-Footed Bat

The western small-footed bat is a year-round resident within the proposed Millers SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves, rock outcrops, and buildings) do not occur on the SEZ. However, about 720 acres (3 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the area of indirect effects. About 16,725 acres (68 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 11.7.12.1-1). This direct impact area represents about 0.3% of potentially suitable foraging habitat in the region. About 125,275 acres (507 km^2) of potentially suitable foraging habitat occurs in the area of indirect effect; this area represents about 2.5% of the potentially suitable foraging habitat in the region (Table 11.7.12.1-1). Most of the suitable habitat in the affected area could serve as foraging habitat (open shrublands). On the basis of SWReGAP land cover data, potentially suitable roosting habitat (cliffs and rock outcrops) does not occur on the SEZ. However, about 720 acres (3 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects.

The overall impact on the western small-footed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Millers SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats (desert shrublands) is not a feasible option for mitigating impacts on this species because potentially suitable habitat is widespread throughout the area of direct effects and in other portions of the SEZ region.

11.7.12.2.5 Impacts on State-Listed Species

There are five species listed by the State of Nevada that may occur in the proposed Millers SEZ affected area or may be affected by solar energy development on the SEZ (Table 11.7.12.1-1). Impacts to these species have been previously discussed because of their designation by the BLM as sensitive species (Section 11.7.12.2.4).

11.7.12.2.6 Impacts on Rare Species

There are 17 rare species (state rank of S1 or S2 in Nevada or listed as a species of concern by the State of Nevada or USFWS) that may be affected by solar energy development on the proposed Millers SEZ. Impacts have been previously discussed for 14 of these species that are under review for ESA listing (Section 11.7.12.2.3) or that are BLM-designated sensitive (Section 11.7.12.2.4). Impacts to the following three rare species have not been previously discussed: Ripley biscuitroot, squalid milkvetch, and Tonopah milkvetch. Impacts and potentially applicable mitigation measures (if necessary) for each of these species are provided in Table 11.7.12.1-1.

11.7.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2,would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 11.7.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effects, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies

- Coordination should be conducted with the USFWS and NDOW for the Crescent Dunes aegialian scarab beetle, Crescent Dunes serican scarab beetle, and greater sage-grouse – species that are candidates or under review for ESA listing. Coordination would identify an appropriate survey protocol, and mitigation requirements, which may include avoidance, minimization, translocation, or compensation.

- Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species could be reduced.

11.7.13 Air Quality and Climate

11.7.13.1 Affected Environment

11.7.13.1.1 Climate

The proposed Millers SEZ is located in southwestern Nevada, in the northern portion of Esmeralda County. Nevada lies on the eastern lee side of the Sierra Nevada Range, which markedly influences the climate of the state under the prevailing westerlies (NCDC 2010a). In addition, the mountains east and north of Nevada act as barriers to the cold arctic air masses; thus making long periods of extremely cold weather uncommon. The SEZ lies at an average elevation of about 4,830 ft (1,470 m) in the southwestern portion of the Great Basin Desert, which has an high desert climate marked by pleasant weather (mild winters and warm summers) with large daily temperature swings due to dry air, scant precipitation, low relative humidity, and abundant sunshine. Meteorological data collected at the Tonopah Airport, about 20 mi (32 km) east-southeast of the Millers SEZ boundary, are summarized below.

A wind rose from the Tonopah Airport for the 5-year period 2005 to 2009, taken at a level of 33 ft (10 m), is presented in Figure 11.7.13.1-1 (NCDC 2010b). During this period, the annual average wind speed at the airport was about 9.6 mph (4.3 m/s), with a prevailing wind direction from the north (about 19.7% of the time) and secondarily from the north-northwest (about 16.4% of the time). The northerly wind component predominates, with about 46.7% of wind directions from the northwest clockwise to north. Winds blew predominantly from the north every month throughout the year, except in January and April, when wind blew more frequently from the north-northwest. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 10% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were relatively uniform: the highest in spring at 11.2 mph (5.0 m/s); lower in summer and fall at 9.2 mph (4.1 m/s); and lowest in winter at 9.0 mph (4.0 m/s).

For the 1954 to 2009 period, the annual average temperature at Tonopah Airport was 51.6°F (10.9°C) (WRCC 2010e). January was the coldest month, with an average minimum temperature of 19.1°F (−7.2°C), and July was the warmest month with an average maximum of 91.5°F (33.1°C). In summer, daytime maximum temperatures were frequently in the 90s, and minimums were in the 50s. The minimum temperatures recorded were below freezing (≤32°F [0°C]) during the colder months (most days from November through March), but subzero temperatures were recorded about 2 days per year, mostly in December and January. During the same period, the highest temperature, 104°F (40.0°C), was reached in July 1960, and the lowest, −15°F (–26.1°C), in January 1962. In a typical year, about 50 days had a maximum temperature of ≥90°F (32.2°C), while about 158 days had minimum temperatures at or below freezing.

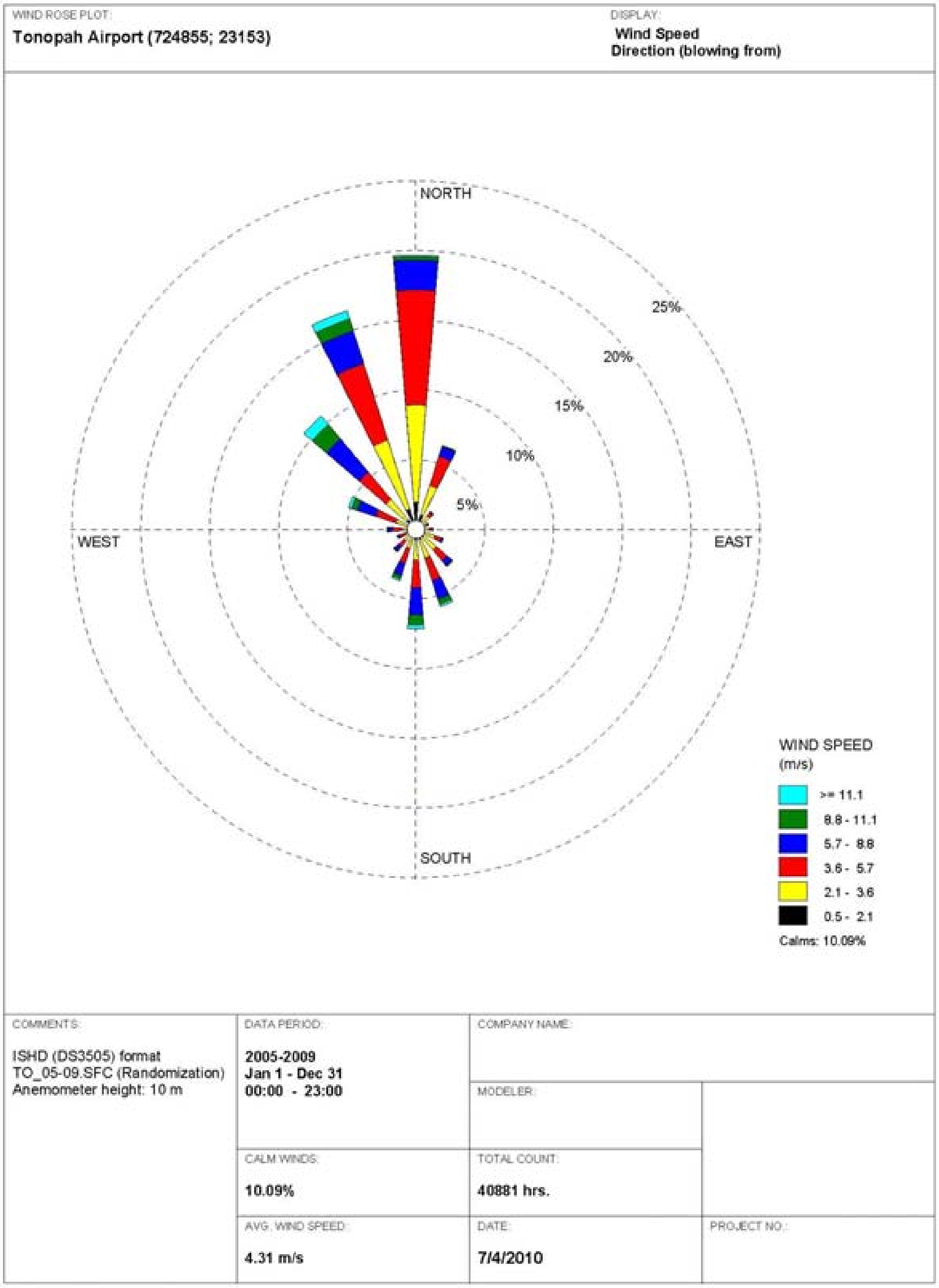

FIGURE 11.7.13.1-1 Wind Rose at 33 ft (10 m) at Tonopah Airport, Nevada, 2005 to 2009 (Source: NCDC 2010b)

Along with prevailing westerlies, Pacific air masses lose most of their moisture on the windward side of the Sierra Nevada Range parallel to Nevada's western boundary with California (NCDC 2010a). Thus, leeward areas like the Millers SEZ vicinity experience a lack of precipitation. For 1954 to 2009, annual precipitation at Tonopah Airport averaged about 5.08 in. (12.9 cm) (WRCC 2010e). On average, 36 days annually have measurable precipitation (0.01 in. [0.025 cm] or higher). Precipitation is relatively evenly distributed by season, although it is slightly higher in spring and summer than in winter and fall. Snow falls as early as October and continues as late as May; most of the snow falls from December to March. The annual average snowfall at Tonopah Airport is about 13.0 in. (33.0 cm).

Because the area surrounding the proposed Millers SEZ is far from major water bodies (more than 250 mi [402 km]) and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as thunderstorms and tornadoes, are rare.

In Nevada, flooding could occur from melting of heavy snowpack. On occasion, heavy summer thunderstorms also cause flooding of local streams, usually in sparsely populated mountainous areas, but these are seldom destructive (NCDC 2010a). Since 1997, four flash floods have been reported in Esmeralda County, all of which occurred far from the SEZ and one of which caused minor property damage.

In Esmeralda County, no hail storms have been reported (NCDC 2010c). Forty-two high-wind events have been reported since 1999, which caused some property damage. Such events, with a maximum wind speed of up to 127 mph (57 m/s), have occurred any time of the year, with peaks in March and June (NCDC 2010c). In addition, one thunderstorm wind event with a maximum wind speed of 52 mph (23 m/s) was reported in 2010, which caused minor property damage.

No dust storm events have been reported in Esmeralda County (NCDC 2010c). However, the SEZ is covered primarily with gravelly sands and sandy loams, which have a relatively low dust storm potential. On occasion, high winds and dry soil conditions result in blowing dust in Esmeralda County. Dust storms can deteriorate air quality and visibility and have adverse effects on health.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes never hit Nevada. Historically, no tropical storm has passed within 100 mi (160 km) of the proposed Millers SEZ (CSC 2010). Tornadoes in Esmeralda County, which encompasses the proposed Millers SEZ, occur infrequently. Only one tornado has been reported; it occurred in 1982 (NCDC 2010c). However, the tornado occurred far from the SEZ and was relatively weak (i.e., F1 on the Fujita tornado scale). It did not cause property damage, injuries, or deaths.

11.7.13.1.2 Existing Air Emissions

Esmeralda County has a few industrial emission sources, related to minerals and mining, but their emissions are relatively small. All industrial sources are located far from the proposed

Millers SEZ. Because of the sparse population, only a handful of major roads, such as U.S. 6 and U.S. 95 and several State Routes (264, 265, 266, and 773) are present in Esmeralda County. Thus, onroad mobile source emissions are not substantial. Data on annual emissions of criteria pollutants and volatile organic compounds (VOCs) in Esmeralda County are presented in Table 11.7.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, point sources were major contributors to total emissions of SO_2 (about 78%). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions primarily contributed to NO_x and CO emissions (about 62% and 64%, respectively) and accounted for most of VOC emissions (about 99%). Area sources were major contributors to total emissions of PM_{10} (about 96%) and $PM_{2.5}$ (about 91%), and secondary contributors to SO_2 emissions (about 20%). Onroad sources were secondary contributors to NO_x and CO emissions (about 30% and 35%, respectively). In Esmeralda County, nonroad sources were minor contributors to criteria pollutants and VOCs. (Fire emissions were not estimated in Esmeralda County in 2002.)

TABLE 11.7.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Esmeralda County, Nevada, Encompassing the Proposed Millers SEZ, 2002[a]

Pollutant	Emissions (tons/yr)
SO_2	106
NO_x	1,116
CO	13,832
VOCs	59,144
PM_{10}	937
$PM_{2.5}$	202

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

Source: WRAP (2009).

In 2005, Nevada produced about 56.3 MMt of *gross*[5] carbon dioxide equivalent (CO_2e)[6] emissions, which is about 0.8% of total U.S. GHG emissions in that year (NDEP 2008). Gross GHG emissions in Nevada increased by about 65% from 1990 to 2005 because of Nevada's rapid population growth, compared to 16.3% growth in U.S. GHG emissions during the same period. In 2005, electrical generation (48%) and transportation (30%) were the primary contributors to gross GHG emission sources in Nevada. Fuel use in the residential, commercial, and industrial sectors combined accounted for about 12% of total state emissions. Nevada's *net* emissions were about 51.3 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in Nevada. Its estimate of CO_2 emissions from fossil fuel combustion was 49.6 MMt, which was comparable to the state's estimate. Electric power generation and transportation accounted for about 52.7% and 33.6% of the CO_2 emissions total, respectively, while the residential, commercial, and industrial sectors accounted for the remainder (about 13.7%).

[5] Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

[6] A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

11.7.13.1.3 Air Quality

The EPA set National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (EPA 2010a): SO_2, NO_2, CO, O_3, PM (PM_{10} and $PM_{2.5}$), and Pb. Nevada has its own State Ambient Air Quality Standards (SAAQS), which are generally similar to the NAAQS but with some differences (NAC 445B.22097). In addition, Nevada has set standards for 1-hour H_2S emissions, which are not addressed by the NAAQS. The NAAQS and Nevada SAAQS for criteria pollutants are presented in Table 11.7.13.1-2.

Esmeralda County is located administratively in the Nevada Intrastate AQCR, along with 10 other counties in Nevada. Not included are Las Vegas Intrastate AQCR, including Clark County only, which encompasses Las Vegas; and Northwest Nevada Intrastate AQCR, including five northwest counties, which encompasses Reno. Currently, the area surrounding the proposed SEZ is designated as being in unclassifiable/attainment of NAAQS for all criteria pollutants (Title 40, Part 81, Section 329 of the *Code of Federal Regulations* [40 CFR 81.329]).

Because of Esmeralda County's low population density, it has no significant emission sources of its own and only minor mobile emissions along major highways. Accordingly, ambient air quality in Esmeralda County is relatively good. No ambient air-monitoring stations are located in Esmeralda County. To characterize ambient air quality around the SEZ, one monitoring station in Clark County was chosen: Jean, about 200 mi (322 km) southeast of the SEZ. The Jean station, which is located upwind of the Las Vegas area, can be considered representative of the proposed SEZ, although its air quality is, to some extent, influenced by transport of air pollutants from the South Coast Air Basin, which includes Los Angeles, along with prevailing westerlies. Ambient concentrations of NO_2, O_3, PM_{10}, and $PM_{2.5}$ are recorded at Jean. The East Sahara Avenue station, which is on the outskirts of Las Vegas, has only one SO_2 monitor in the area. The CO concentrations at the East Tonopah Avenue station in Las Vegas, which is the farthest downwind of Las Vegas among CO monitoring stations, were presented. No Pb measurements have been made in the state of Nevada because of low Pb concentration levels after the phase-out of leaded gasoline. The background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 11.7.13.1-2 (EPA 2010b). Monitored concentration levels at either station were lower than their respective standards (up to 44%), except O_3, which approaches the 1-hour NAAQS/SAAQS and exceeds the 8-hour NAAQS. However, ambient concentrations around the SEZ are anticipated to be lower than those presented in the table, except PM_{10} and $PM_{2.5}$, which can be either higher or lower.

The Prevention of Significant Deterioration (PSD) regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. Several Class I areas are located around the Millers SEZ, but none of these is situated within 62-mi (100-km) distance in Nevada and California. The nearest Class I area is the John Muir WA in California (40 CFR 81.405), about 73 mi (118 km) southwest of the proposed Millers SEZ. This Class I area is not located downwind of prevailing

TABLE 11.7.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed Millers SEZ in Esmeralda County, Nevada, 2004 to 2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	SAAQS	Concentration[b,c]	Data Source[d]
SO_2	1-hour	75 ppb[e]	–[f]	–	–
	3-hour	0.5 ppm	0.5 ppm	0.009 ppm (1.8%)	Las Vegas, 2005
	24-hour	0.14 ppm	0.14 ppm	0.008 ppm (5.7%)	Las Vegas, 2005
	Annual	0.030 ppm	0.030 ppm	0.006 ppm (20%)	Las Vegas, 2005
NO_2	1-hour	100 ppb[g]	–	–	–
	Annual	0.053 ppm	0.053 ppm	0.004 ppm (7.5%)	Jean Station, 2007
CO	1-hour	35 ppm	35 ppm	5.7 ppm (16%)	Las Vegas, 2004
	8-hour	9 ppm	9 ppm	3.9 ppm (43%)	Las Vegas, 2005
O_3	1-hour	0.12 ppm[h]	0.12 ppm	0.098 ppm (82%)	Jean, 2005
	8-hour	0.075 ppm	–	0.083 ppm (111%)	Jean, 2007
PM_{10}	24-hour	150 $\mu g/m^3$	150 $\mu g/m^3$	66 $\mu g/m^3$ (44%)	Jean, 2008
	Annual	–	50 $\mu g/m^3$	17 $\mu g/m^3$ (34%)	Jean, 2005
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	–	12.9 $\mu g/m^3$ (37%)	Jean, 2008
	Annual	15.0 $\mu g/m^3$	–	4.93 $\mu g/m^3$ (33%)	Jean, 2008
Pb	30-day	–	1.5 $\mu g/m^3$	–	–
	Calendar quarter	1.5 $\mu g/m^3$	–	–	–
	Rolling 3-month	0.15 $\mu g/m^3$ [i]	–	–	–

[a] Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

[b] Monitored concentrations are the second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5}$; and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

[c] Values in parentheses are background concentration levels as a percentage of NAAQS or SAAQS. Calculation of 1-hour SO_2 and NO_2 compared to NAAQS was not made, because no measurement data based on new NAAQS are available.

[d] All air monitoring stations listed are located in Clark County.

[e] Effective August 23, 2010.

[f] A hyphen denotes not applicable or not available.

[g] Effective April 12, 2010.

[h] The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

[i] Effective January 12, 2009.

Sources: EPA (2010a,b); NAC 445B.22097.

winds at the Millers SEZ (Figure 11.7.13.1-1). The next nearest Class I areas are Ansel Adams WA, Kings Canyon NP, Yosemite NP, and Hoover WA, which are about 86 mi (139 km) west–southwest, 88 mi (141 km) southwest, 89 mi (143 km) west, and 91 mi (146 km) west of the Millers SEZ, respectively.

11.7.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using heat transfer fluids [HTFs], fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities could displace air emissions that would otherwise be released from fossil fuel power plants to generate an equivalent amount of electricity.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Millers SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.7.13.3 below identifies SEZ-specific design features of particular relevance to the Millers SEZ.

11.7.13.2.1 Construction

The Millers SEZ has a relatively flat terrain; thus only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[7] However, no receptors were modeled for PSD analysis at the nearest Class I area, John Muir WA in California, because it is about 73 mi (118 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the John Muir WA were selected as surrogates for the PSD analysis. For the Millers SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions of 3,000 acres (12.1 km^2) each and 6,000 acres (24.3 km^2) in total, in the southeastern portion of the SEZ, close to the nearest residences and the town of Tonopah,

- Surface hourly meteorological data from Tonopah Airport[8] and upper air sounding data from the Mercury/Desert Rock Airport for the 2005 to 2009 period, and

- A regularly spaced receptor grid over a modeling domain of 62 × 62 mi (100 km × 100 km) centered on the proposed SEZ, and additional discrete receptors at the SEZ boundaries.

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 11.7.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 539 μg/m^3, which far exceeds the relevant standard level of 150 μg/m^3. Total 24-hour PM_{10} concentrations of 605 μg/m^3 would also exceed the standard level at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 15 μg/m^3 at the Silver Peak (about 26 mi [42 km] south-southwest from the SEZ), about 4 μg/m^3 at Coaldale, and about 2 μg/m^3 at Tonopah (the closest town, about 11 mi [18 km] east-southeast of the SEZ boundary). Annual average modeled PM_{10} concentration increments and total concentration (increment plus background) at the SEZ boundary would be about 75.8 μg/m^3 and 92.8 μg/m^3, respectively, which are much higher than

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[7] To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/SAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

[8] The number of missing hours at the Tonopah Airport amounts to about 17.6% of the total hours, which may not be acceptable for regulatory applications because that percentage exceeds the 10% limit defined by the EPA. However, because the wind patterns at Tonopah Airport are more representative of wind at the Millers SEZ than the wind patterns at other airports (which have more complete data but are located in different topographic features), the former values were used for the screening analysis.

TABLE 11.7.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Millers SEZ

			Concentration ($\mu g/m^3$)				Percentage of NAAQS/SAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ SAAQS	Increment	Total
PM_{10}	24 hours	H6H	539	66	605	150	359	403
	Annual	–[d]	75.8	17	92.8	50	152	186
$PM_{2.5}$	24 hours	H8H	34.9	12.9	47.8	35	100	136
	Annual	–	7.6	4.9	12.5	15.0	51	83

a $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

b Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

c See Table 11.7.13.1-2.

d A dash indicates not applicable.

the SAAQS level of 50 $\mu g/m^3$. Annual PM_{10} increments would be much lower, about 0.3 $\mu g/m^3$ at Silver Peak, about 0.1 $\mu g/m^3$ at Tonopah, and lower than 0.1 $\mu g/m^3$ at Coaldale. Total 24-hour $PM_{2.5}$ concentrations would be 48 $\mu g/m^3$ at the SEZ boundary, which is higher than the NAAQS level of 35 $\mu g/m^3$; modeled increments contribute about three times more than background concentration to this total. The total annual average $PM_{2.5}$ concentration would be 12.5 $\mu g/m^3$, which is below the NAAQS level of 15.0 $\mu g/m^3$. At Silver Peak, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 0.3 and 0.03 $\mu g/m^3$, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—John Muir WA in California—would be about 8.7 and 0.2 $\mu g/m^3$, or 109% and 5% of the PSD increments for Class I area, respectively. These surrogate receptors are more than 36 mi (58 km) from the John Muir WA, and thus predicted concentrations in John Muir WA would be much lower than the above values (about 55% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed the standard levels used as guidelines at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Predicted total concentrations for annual $PM_{2.5}$ would be below the respective standard levels. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area (John Muir WA in California). Construction activities are not subject to the PSD program, and the comparison provides only a screen for gauging the size of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearby federal Class I areas. The SO_X emissions from engine exhaust would be very low, because programmatic design features would require ultra-low-sulfur fuel with a sulfur content of 15 ppm. The NO_X emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 120-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary.

11.7.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle traffic (commuter, visitor, support, and delivery); maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology if wet cooling was implemented (drift comprises low-level PM emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Appendix M, Section M.13.4.

Potential air emissions displaced by the solar project development at the proposed Millers SEZ are presented in Table 11.7.13.2-2. Total power generation capacity ranging from 1,492 to 2,686 MW is estimated for the proposed Millers SEZ for various solar technologies (see Section 11.7.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). Full development of solar power in the SEZ could result in substantial avoided air emissions—ranging from 6.9 to 12% of total emissions of SO_2, NO_X, Hg, and CO_2 from electric power systems in the state of Nevada (EPA 2009c). Avoided emissions could be up to 2.6% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities could displace up to 10% of SO_2, 3.8% of NO_X, and 6.7% of CO_2 emissions in the state of Nevada (EPA 2009a; WRAP 2009). These emissions could be up to 1.4% of total emissions from all

TABLE 11.7.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Millers SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
16,787	1,492–2,686	2,614–4,706	3,689–6,639	3,164–5,695	0.021–0.038	2,030–3,655
Percentage of total emissions from electric power systems in Nevada[d]			6.9–12%	6.9–12%	6.9–12%	6.9–12%
Percentage of total emissions from all source categories in Nevada[e]			5.6–10%	2.1–3.8%	–[f]	3.7–6.7%
Percentage of total emissions from electric power systems in the six-state study area[d]			1.5–2.6%	0.86–1.5%	0.72–1.3%	0.77–1.4%
Percentage of total emissions from all source categories in the six-state study area[e]			0.78–1.4%	0.12–0.21%	–	0.24–0.44%

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

[b] Assumed capacity factor of 20%.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.82, 2.42, 1.6×10^{-5}, and 1,553 lb/MWh, respectively, were used for the state of Nevada.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] A dash indicates not estimated.

Sources: EPA (2009a,c); WRAP (2009).

source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for about 93% of the total electric power generated in Nevada for which contribution of natural gas and coal combustion is comparable (EPA 2009c). Thus, solar facilities to be built in the Millers SEZ could be more important than those built in other states in terms of reducing fuel combustion–related emissions.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for high-voltage lines during rain or very humid conditions. Since the Millers SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

11.7.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but are on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

11.7.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Millers SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

11.7.14 Visual Resources

11.7.14.1 Affected Environment

The proposed Millers SEZ is located in Esmeralda County in southwestern Nevada, 44 mi (71 km) east of the California border. The SEZ occupies 16,787 acres (67.9 km^2) within the Big Smoky Valley and extends about 7.7 mi (12.4 km) east to west and nearly 5.8 mi (9.3 km) north to south. The SEZ ranges in elevation from 4,778 ft (1,456 m) in the southwest portion to 4,892 ft (1,491 m) in the northwest portion.

The SEZ lies within the Central Basin and Range Level III ecoregion, which consists of northerly trending fault-block ranges and intervening drier basins. Valleys, lower slopes, and alluvial fans are either shrub- and grass-covered or shrub-covered. Higher elevation mountain slopes support woodland, mountain brush, and scattered forests. The land is primarily used for grazing, with some irrigated cropland found in valleys near mountain water sources. Millers SEZ is located within two Level IV ecoregions. The southwest corner of the SEZ is within the nearly level and mostly barren Lahontan and Tonopah Playas Level IV ecoregion. The playas contain mud flats, alkali flats, and intermittent saline lakes. Playas occur at the lowest elevations in the Lahontan Basin and fill with seasonal runoff from surrounding mountain ranges during winter, providing habitat for migratory birds. (Bryce et al. 2003). The rest of the SEZ is within the *Tonopah Basin* Level IV ecoregion, which is a transition between the Great Basin and the more southerly Mojave Desert. It is typified by broad, nearly flat to rolling valleys containing lake plains, scattered hills, alluvial fans, bajadas, sand dunes, and hot springs. Ephemeral washes occur. Surface water comes from springs and sporadic foothill precipitation events, but is generally scarce.

The SEZ is located within a very flat treeless plain of the broad Big Smoky Valley, resulting in a very strong horizon line. The SEZ is bounded by mountain ranges on the east, south, and west, with open views to the northeast and southwest. Lone Mountain rises 5.5 mi (8.9 km) south of the SEZ. The Monte Cristo Range is located about 3 mi (5 km) west of the SEZ. The San Antonio Mountains to the east are more distant, rising about 9 mi (15 km) from the SEZ. These ranges include peaks generally between 6,000 and 8,000 ft (1,829 and 2,438 m) in elevation, with the peak of Lone Mountain at 9,108 ft (2,776 m). From the northeast to the southwest, the Big Smoky Valley extends 50 mi (81 km) and is about 12 mi (19 km) wide. The SEZ and surrounding mountain ranges are shown in Figure 11.7.14.1-1.

The overall visual impression of the SEZ and its surroundings is of a vast, light-colored plain rising abruptly to rugged mountains to the south and west, with more distant mountains to the east, and generally open views to the north and southwest. The mountains to the south (Lone Mountain) are dark, while the mountains to the west (Monte Cristo Range) present a range of colors from nearly white through rusty red to darker grays and browns. The light soils and lack of vegetation in playas add some visual interest, and in other, scattered, smaller areas, black, featureless, and nearly perfectly flat desert pavement provides striking visual contrasts in color and texture with surrounding vegetation and soils.

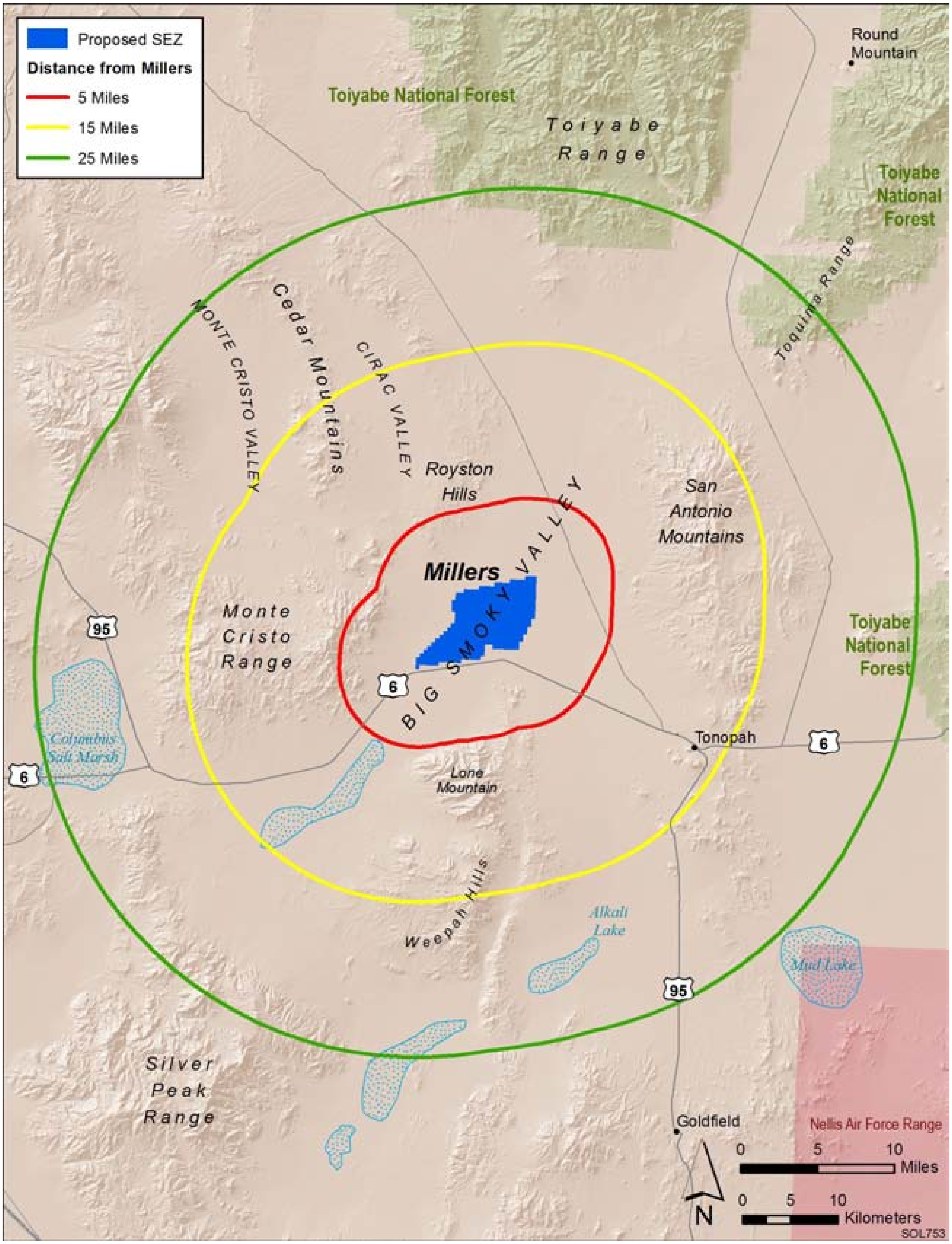

FIGURE 11.7.14.1-1 Proposed Millers SEZ and Surrounding Lands

Vegetation is generally sparse in much of the SEZ, with widely spaced low shrubs generally less than 3 ft (1 m) tall, and much bare soil, particularly in the playas. The vegetation is predominantly greasewood-shadscale. During an August 2009 site visit, the vegetation presented a limited range of light greens, tans, and grays, with medium to coarse textures, and generally low visual interest.

There is no permanent surface water within the SEZ. A number of washes, including Ione Wash, cross the SEZ in a generally north-south direction.

Cultural disturbances visible within the SEZ include existing transmission lines, fences, and roads. There is evidence of OHV use in some areas, but in general, the level of cultural disturbance is low. These cultural modifications generally detract from the scenic quality of the SEZ; however, the SEZ is so large that from many locations within the SEZ, these features are either not visible or are so distant as to have minimal effect on views. From most locations within the SEZ, the landscape is generally natural in appearance, with little disturbance visible.

Off-site cultural disturbances visible from the SEZ include U.S. 6, just south of the SEZ and generally paralleling the southern boundary of the SEZ. Traffic on the highway would be plainly visible from many locations within the SEZ. The Millers rest stop on U.S. 6 includes fences, cleared areas roads, groves of trees, a few low buildings, and a communications tower that is visible for long distances, including from within the SEZ. Transmission towers and lines are visible along U.S. 6 and also between the highway and the SEZ.

The general lack of topographic relief, water, and variety results in low scenic value within the SEZ itself; however, because of the flatness of the landscape, the lack of trees, and the breadth of the Big Smoky Valley, the SEZ presents a vast panoramic landscape with sweeping views of the surrounding mountains that add to the scenic values within the SEZ viewshed. In general, the mountains appear to be devoid of vegetation, and their jagged, irregular forms, and varied colors provide dramatic visual contrasts to the strong horizontal line, light-colored vegetation, the light playa soils and dark desert pavement areas of the valley floor, particularly when viewed from nearby locations within the SEZ. The mountain slopes and peaks to the east, south, and west of the SEZ are, in general, visually pristine. Panoramic views of the SEZ are shown in Figures 11.7.14.1-2, 11.7.14.1-3 and 11.7.14.1-4.

The BLM conducted a VRI for the SEZ and surrounding lands in 2004. The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or KOPs. Based on these three factors, BLM-administered lands are placed into one of four VRI Classes, which represent the relative value of the visual resources. Class I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas for which decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is presented in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

FIGURE 11.7.14.1-2 Approximately 180° Panoramic View of the Proposed Millers SEZ, Facing Southwest from Desert Pavement Area, with Lone Mountain at Left, and Monte Cristo Range at Right

FIGURE 11.7.14.1-3 Approximately 120° Panoramic View of the Proposed Millers SEZ, Facing West toward Monte Cristo Range from Southeastern Portion of the SEZ

FIGURE 11.7.14.1-4 Approximately 120° Panoramic View of the Proposed Millers SEZ, Facing South toward Lone Mountain from West-Central Portion of the SEZ

The VRI values for the SEZ are VRI Class 4, indicating low relative visual values. Most of the immediate surroundings are also VRI Class 4, with the exception of the area immediately to the east of the SEZ. This is VRI Class 3 (BLM 2009c). The BLM conducted a new VRI for the SEZ and surrounding lands in 2010, ; however, the VRI was not completed in time for the new data to be included in this draft PEIS. The new VRI data will be incorporated into the analyses presented in the final PEIS. More information about VRI methodology is presented in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The Tonopah Resource Management Plan (BLM 1997) indicates that the SEZ and surrounding area is managed as VRM Class IV, which permits major modification of the existing character of the landscape. More information about the BLM VRM program is presented in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

11.7.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Millers SEZ and surrounding lands, as well as the impacts of related projects (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project and a relatively complete and accurate description of its major components and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment used in this PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of the PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ. However, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

11.7.14.2.1 Impacts on the Proposed Millers SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities utilizing highly reflective surfaces or major light-emitting facility components (solar dish, parabolic trough, and power tower technologies) , with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby. Additional, and potentially large, impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 11.7.22.4.13 of this PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV (as seen from nearby KOPs), the current VRM class designated for the SEZ. More information about impact determination using the BLM VRM program is presented in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

11.7.14.2.2 Impacts on Lands Surrounding the Proposed Millers SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance. (For a detailed discussion of visibility and related factors, see Section 5.12). The intervisibility between the project and potentially affected lands is a key component in determining impact levels; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ are visible from the SEZ (see Appendix M for information on assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different equipment heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are presented in Appendix N.

Figure 11.7.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, and dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in the PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]), and transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

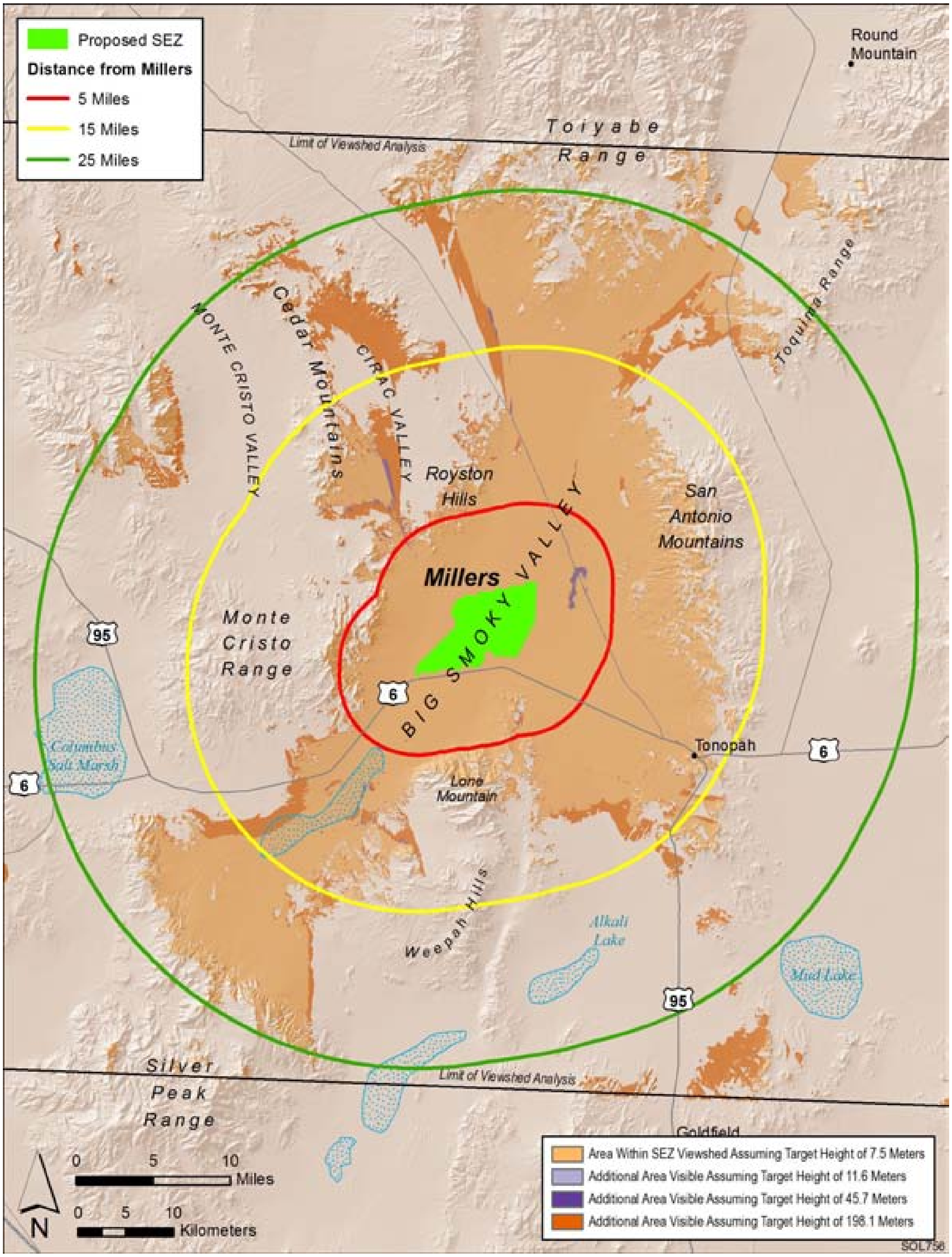

FIGURE 11.7.14.2-1 Viewshed Analyses for the Proposed Millers SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

A GIS analysis was conducted that overlaid selected federal, state, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds. This was done in order to identify which of these sensitive visual resource areas would have views of solar facilities within the SEZ and, therefore, would potentially be subject to visual impacts from those facilities.

The scenic resources included in the analysis were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

- All-American Roads, National Scenic Byways, State Scenic Highways; and BLM- and USFS-designated scenic highways/byways;

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

The results of the GIS analysis demonstrate that none of these types of scenic resources are located within the 25-mi (40-km) viewshed of the Millers SEZ.

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. In addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below. Further discussion of impacts on these areas is presented in Sections 11.7.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and Section 11.7.17 (Cultural Resources) of this PEIS.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. There is currently a 120-kV transmission line within the proposed SEZ, so construction and operation of a transmission line outside the proposed SEZ would not be required; however, transmission lines to connect facilities to the existing line would be required. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 120-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. Depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.12.1. A detailed site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the landscape seen by the viewer, including changes in the forms, lines, colors, and textures of objects. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations where the project might be viewed from; and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

Impacts on Selected Other Lands and Resources

U.S. 6. About 31 mi (50 km) of U.S. 6 is within the SEZ 25 mi (40 km) viewshed. As shown in Figure 11.7.14.2-1, at the point of closest approach, U.S. 6 passes within 0.2 mi (0.3 km) of the southern boundary of the Millers SEZ and approaches the SEZ from the direction of Tonopah (southeast) and Coaldale (southwest). The AADT value for U.S. 6 just west of Tonopah was 3,900 vehicles in 2009 (NV DOT 2010), although traffic would increase slightly as a result of solar energy development within the SEZ.

For westbound travelers on U.S. 6, solar facilities within the SEZ would come into view just west of Tonopah and would be in full view as vehicles descended the approximately 14-mi (23-km) slope from Tonopah. Near Tonopah, U.S. 6 is elevated nearly 1,000 ft [300 m] above the SEZ elevation, but because of the long distance to the SEZ, the vertical angle of view is low.

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

The angle of view would decrease as travelers approached the SEZ, but the facilities within the SEZ would increase in apparent size. The SEZ would be visible directly in front of vehicles on the upper portions of the slope, but would gradually appear to shift to the right as westbound travelers approached the SEZ to pass it on its southern side. At highway speeds, the SEZ would be in view or about 15 minutes for westbound travelers as they approached and passed it.

Figure 11.7.14.2-2 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from U.S. 6, on the western outskirts of Tonopah about 12.4 mi (20.0 km) from the southeast corner of the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aide for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (139.9-m) tall power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) tall heliostats, each representing about 100 MW of electric generating capacity. Four models were placed in the SEZ for this and other visualizations shown in this section of the PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The visualization suggests that from this distance and viewing angle, irregularities in the gentle downward sloping terrain toward the SEZ would screen parts of the SEZ from view, although most of it would be visible. The SEZ would occupy a substantial portion of the horizontal field of view, but solar facilities within the SEZ would be seen nearly edge on, so that the collector/reflector arrays would appear as thin lines at the base of the Monte Cristo Range. The edge-on view of the facilities would reduce the visible surface area, conceal the strong regular geometry of the collector arrays, and repeat the strong horizon line, all of which would tend to reduce associated visual contrasts, although there could be glinting or glare from the collectors or ancillary facilities that might attract visual attention. The receivers of operating power towers within the SEZ would likely be visible as bright point light sources against the

FIGURE 11.7.14.2-2 Google Earth Visualization of the Proposed Millers SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models as Seen from U.S. 6, just West of Tonopah, Nevada

backdrop of the valley floor or the bajadas of the Monte Cristo Range. The tower structures would likely be visible underneath the receiver "glow." Under the 80% development scenario analyzed in the PEIS and depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak to moderate visual contrasts from solar energy development within the SEZ could be expected at this location.

Figure 11.7.14.2-3 is a Google Earth visualization of the SEZ as seen from U.S. 6 about 5 mi (8 km) from the southeast corner of the SEZ, the outer limit of the BLM VRM Program's foreground-middleground distance. From this viewpoint, the SEZ would occupy most of the horizontal field of view. Solar facilities within the SEZ would be seen edge on, but any ancillary facilities, such as STGs, cooling towers, substations, etc. would likely be visible projecting above the collector arrays, and adding contrasts in form, line, texture, and color, with the possibility and glinting and glare from any reflective surfaces associated with those project components. The light from operating power tower receivers in the SEZ could appear as very bright non-point light sources as viewed from the road and would be expected to strongly attract visual attention. Under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would likely command visual attention and could potentially dominate views from U.S. 6. Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, strong visual contrasts from solar energy development within the SEZ could be expected at this location.

Figure 11.7.14.2-4 is a Google Earth visualization of the SEZ as seen from U.S. 6 about 0.4 mi (0.7 km) from the southern boundary of the SEZ. From this viewpoint, the SEZ could not be encompassed in a single view; viewers would have to turn their heads to see the entire SEZ. Solar facilities within the SEZ would be seen edge on, but if they were located in closer parts of the SEZ, they could be too large to appear as lines. Depending on the technology, project layout, and location, facilities could block views of the surrounding mountains and dominate views from the roadway.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power tower facilities were located in the SEZ in close proximity to the highway, when operating, the receivers could appear as brilliant white no-point (i.e. having visible cylindrical or rectangular surfaces) light sources as viewed from the highway, and if sufficiently close to the road, would likely strongly attract visual attention. Also, under certain viewing conditions, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower. At night, if more than 200 ft (61 m) tall, power towers would have hazard navigation lights that could potentially be visible from this location. The lights could be red flashing lights or red or white strobe lights, and the light could be visible from U.S. 6. Other lighting associated with solar facilities could be visible as well.

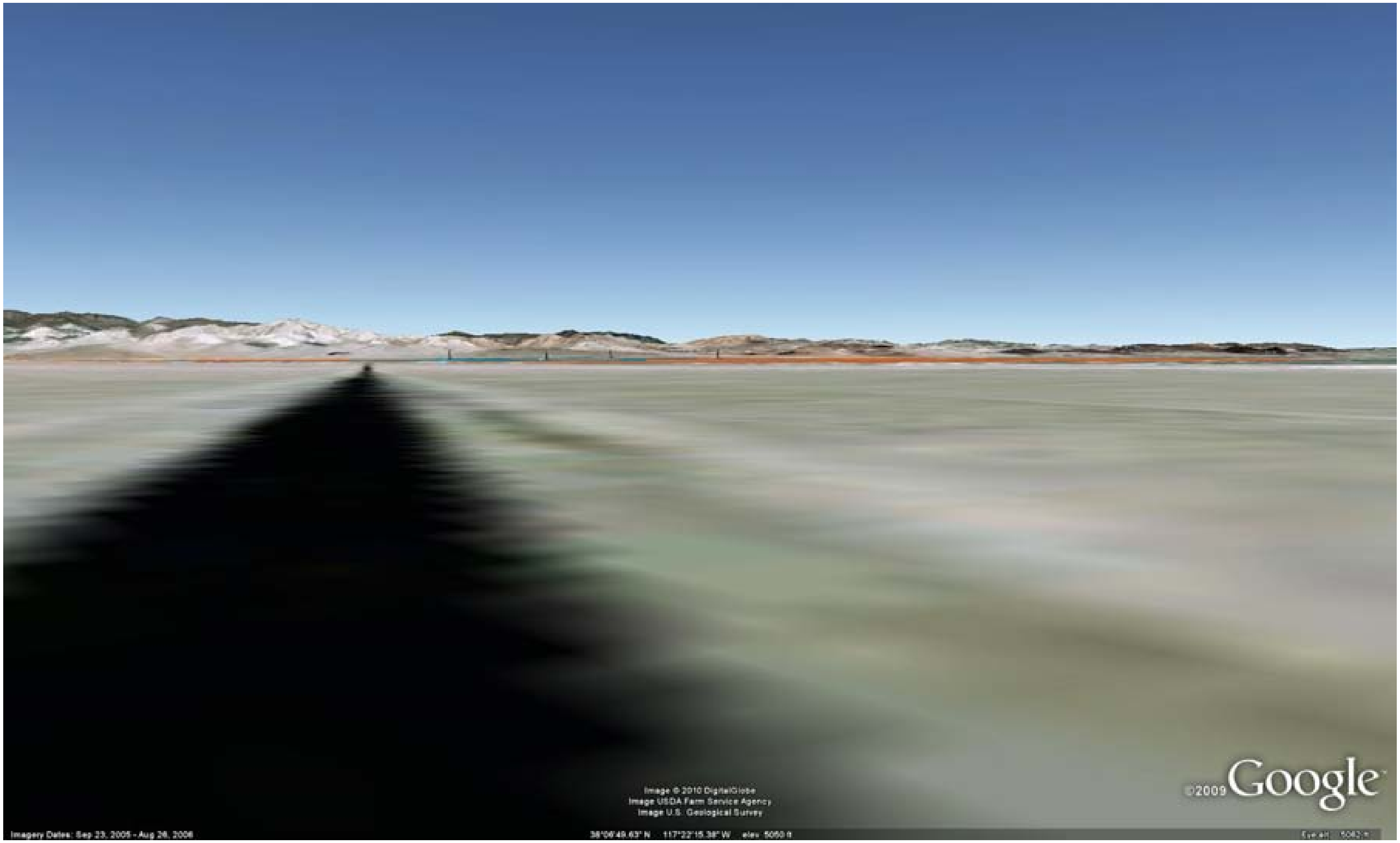

FIGURE 11.7.14.2-3 Google Earth Visualization of the Proposed Millers SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models as Seen from U.S. 6 approximately 5 mi (8 km) Southeast of the SEZ

FIGURE 11.7.14.2-4 Google Earth Visualization of the Proposed Millers SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models as Seen from U.S. 6, 0.4 mi (0.7 km) from the SEZ

As travelers approached and passed by the SEZ, depending on lighting conditions, the solar technologies present, facility layout, and mitigation measures employed, there would be the potential for reflections from facility components. These effects could potentially distract drivers and/or impair views toward the facilities. These potential impacts could be reduced by siting reflective components away from the roadways, employing various screening mechanisms, and/or adjusting the mirror operations to reduce potential impacts; however, it could be difficult to screen power towers from view, because of their height. Under the 80% development scenario analyzed in the PEIS, the various solar facilities within the SEZ would likely dominate views from the roadway and would be expected to create strong visual contrasts as seen from this viewpoint on U.S. 6.

Eastbound travelers on U.S. 6 would have roughly similar visual experiences to westbound travelers in terms of impact magnitude; however, because U.S. 6 essentially does not slope downward toward the SEZ as it approaches the SEZ from the east, there are no elevated views of the SEZ, so the general level of visual contrasts created would likely be somewhat less than for westbound travelers. The SEZ would first come into view about 11 mi (18 km) west of the SEZ. At highway speeds, the SEZ would be in view for about 15 minutes for eastbound travelers as they approached and passed it.

In summary, under the 80% development scenario analyzed in the PEIS and depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak to strong visual contrasts from solar energy development within the SEZ would be expected for travelers on U.S. 6.

Town of Tonopah. The viewshed analyses indicate visibility of the SEZ from the town of Tonopah (approximately 13 mi [20.9 km] southeast of the SEZ). Tonopah is more than 1,000 ft (305 m) higher in elevation than the SEZ, so portions of the SEZ would be visible. A detailed future site-specific NEPA analysis is required to determine visibility precisely, but a site visit in 2009 determined that views of the SEZ are screened in most of Tonopah by trees, structures, and small variations in local topography. Visibility of the SEZ is more likely in the far western portions of Tonopah, where the density of structures and planted vegetation diminishes. Figure 11.7.14.2-2 (see above) is a Google Earth visualization of the SEZ with hypothetical solar power tower facilities as seen from the far western outskirts of Tonopah. As noted above, the visualization suggests that from this distance and viewing angle, under the 80% development scenario analyzed in the PEIS, weak levels of visual contrasts would be expected to arise from solar facilities located within the Millers SEZ.

Other Impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

11.7.14.2.3 Summary of Visual Resource Impacts for the Proposed Millers SEZ

Under the 80% development scenario analyzed in the PEIS, the SEZ could contain multiple solar facilities utilizing differing solar technologies, as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal landscape of the flat valley in which the SEZ is located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development due to major modification of the character of the existing landscape. The potential exists for additional impacts from construction and operation of transmission lines and access roads within the SEZ.

The SEZ is in an area of low scenic quality. Residents of Tonopah and nearby areas, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ. U.S. 6 passes very close to the SEZ, and travelers on that road could be subjected to strong visual contrasts from solar development within the SEZ, but typically their exposure would be brief. Utility-scale solar energy development within the proposed Millers SEZ could cause weak levels of visual contrast for some residents of Tonopah, generally for persons in the westernmost parts of the community.

11.7.14.3 SEZ-Specific Design Features and Design Features Effectiveness

No SEZ-specific design features have been identified to protect visual resources for the proposed Millers SEZ. As noted in Section 5.12, the presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

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11.7.15 Acoustic Environment

11.7.15.1 Affected Environment

The proposed Millers SEZ is located in the northern portion of Esmeralda County in southwestern Nevada. Neither the State of Nevada nor Esmeralda County has established quantitative noise-limit regulations.

The proposed Millers SEZ is in an undeveloped area, the overall character of which is rural. U.S. 6/95 extends east–west as close as 800 ft (244 m) south of the SEZ, while State Route 89 extends north–south as close as 2.5 mi (4.0 km) east of the SEZ. Numerous dirt roads cross the SEZ. The nearest railroad is in Luning in neighboring Mineral County, about 40 mi (64 km) northwest of the SEZ. Nearby airports include: Coaldale Airport, about 19 mi (30 km) west-southwest of the SEZ; Tonopah Airport in Nye County, about 20 mi (32 km) east–southeast; Goldfield Airport in Esmeralda County, about 32 mi (51 km) south–southeast; and Mina Airport in Mineral County, about 33 mi (53 km) west–northwest. Small-scale irrigated agricultural lands are situated about 10 mi (16 km) north of the SEZ. No industrial or commercial activities are located around the SEZ; grazing is about the only agricultural activity in the immediate vicinity of the SEZ. Millers, a ghost town, is about 0.8 mi (1.3 km) from the southeast corner of the SEZ. No sensitive receptors (e.g., residences, hospitals, schools, or nursing homes) exist around the proposed Millers SEZ. The closest population center with schools is Tonopah, the county seat of Nye County. It is about 11 mi (18 km) east–southeast of the SEZ.

Accordingly, noise sources around the SEZ include road traffic, aircraft flyovers, and cattle grazing. Other noise sources are associated with current land use around the SEZ include occasional OHV races, but not much other recreational use occurs in the area. To date, no environmental noise survey has been conducted around the proposed Millers SEZ. On the basis of the population density, the day-night average noise level (L_{dn} or DNL) is estimated to be 17 dBA for Esmeralda County, well below the 33 to 47 dBA L_{dn} range level typical of a rural area (Eldred 1982; Miller 2002).[9]

11.7.15.2 Impacts

Potential noise impacts associated with solar projects in the Millers SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts on the nearest residences (about 11 mi [18 km] east-southeast of the SEZ boundary) from operation of heavy equipment would be expected to be minimal because of the considerable separation distance. During the operations phase, potential noise impacts on the nearest residences also would be expected to be minimal. However, if the Millers SEZ is fully developed, potential noise

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9 Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during the daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

impacts on residences along the roads would be likely because of vehicular traffic (commuters, visitors, support, and deliveries) to and from the SEZ. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed Millers SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional SEZ-specific design features applied (see Section 11.7.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

11.7.15.2.1 Construction

The proposed Millers SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area, where key components (e.g., steam turbine/generator) needed to generate electricity would be located. A maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background level. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment and by temperature lapse conditions typical of daytime hours. Therefore, noise attenuation to a 40-dBA level would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the southeastern SEZ boundary (the closest SEZ boundary to the nearest residences), estimated noise levels at the nearest residences would be about 15 dBA. This noise level is well below a typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn}[10] at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas.

It is assumed that a maximum of two projects would be developed at any one time for SEZs greater than 10,000 acres (40.47 km^2) but less than 30,000 acres (121.4 km^2), such as the

[10] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in day-night average noise level (L_{dn}) of 40 dBA.

Millers SEZ. If two projects were to be built in the southeastern portion of the SEZ near the nearest residences, noise levels would be about 18 dBA, 3 dBA higher than the value for one project. These levels would be still well below the typical daytime mean rural background level, and thus their contribution to the existing L_{dn} would be minimal.

There are no specially designated areas within 25 mi (40 km) of the proposed Millers SEZ. Thus, noise impacts for nearby specially designated areas were not modeled.

Depending on the soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearest residences would be anticipated to be negligible, considering the distance to the nearest residences (about 11 mi [18 km] from the SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction within the proposed Millers SEZ would cause negligible unavoidable but localized short-term noise impacts on neighboring communities, even when construction activities would occur near the southeastern SEZ boundary, the SEZ boundary closest to the nearest residences.

Construction activities could result in various degrees of ground vibration, depending on the construction equipment and methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 120-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a negligible component of construction impacts and would be temporary in nature.

11.7.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area, commuter/visitor/support/delivery traffic within and around the solar facility, and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and firewater pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southeastern SEZ boundary, the predicted noise level would be about 21 dBA at the nearest residences, located about 11 mi (18 km) from the SEZ boundary. This noise level is much lower than typical daytime mean rural background level of 40 dBA. If TES was not used (i.e., if the operation was limited to daytime, 12 hours only[11]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. As for construction, if two parabolic trough and/or power tower facilities were operating at the same time, combined noise levels at the nearest residences would be about 24 dBA, 3 dBA higher than the value for a single facility. These levels are still well below the typical daytime mean rural background level of 40 dBA, and their contribution to existing L_{dn} level would be minimal. However, day-night average noise levels higher than those estimated above by using the simple noise modeling would be anticipated if TES was used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Millers SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong radiative cooling. Such a temperature profile tends to focus noise down toward the ground. There would be little, if any, shadow zone[12] within 1 or 2 mi (1.6 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are lowest. To estimate the day-night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On

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[11] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

[12] A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

the basis of these assumptions, the estimated nighttime noise level at the nearest residences (about 11 mi [18 km] from the SEZ boundary) would be 31 dBA, which is comparable to the typical nighttime mean rural background level of 30 dBA. However, the noise level would be much lower than this value if considering air absorption among other attenuation mechanisms. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 41 dBA L_{dn} at the nearest residences, even if TES was used at a solar facility. In consequence, operating parabolic trough or power tower facilities using TES and located near the SEZ boundary could result in minimal adverse noise impacts on the nearest residences, depending on background noise levels and meteorological conditions..

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might use tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the proposed Millers SEZ, on the basis of the assumption of dish engine facilities of up to 1,492 MW total capacity (covering 80% of the total area, or 13,430 acres [54.4 km^2]), up to 59,690 25-kW dish engines could be employed. For a large dish engine facility, about a thousand step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, for example, about 50 dBA at 1.0 mi (1.6 km) and 47 dBA at 2 mi (3 km) from the boundary of the squarely-shaped dish engine solar field. Both of these values are higher than the typical daytime mean rural background level of 40 dBA. However, because of noise attenuation by atmospheric absorption and temperature lapse during daytime hours, these levels would actually occur at somewhat shorter distance than cited above.

To estimate noise levels at the nearest residences, it was assumed that dish engines were placed all over the Millers SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residences, about 11 mi (18 km) from the SEZ boundary, would be about 33 dBA, which is below the typical daytime mean rural background level of 40 dBA. Assuming 12-hour daytime operation only, the estimated 40 dBA L_{dn} at these residences is well below the EPA guideline of 55 dBA L_{dn} for residential areas. Considering other noise attenuation mechanisms, noise levels at the nearest residences would be lower than values estimated above, and thus potential impacts on nearby residences would be expected to be minimal.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the proposed Millers SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be negligible.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited to within the facility boundary and not be heard at the nearest residence, assuming a 11.5-mi (18.5-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 11 mi [18 km] to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be negligible.

For impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of 230-kV transmission line towers would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. Corona noise includes high-frequency components, considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts unless a residence was located close by (e.g., within 500 ft [152 m] of a 230-kV transmission line). The proposed Millers SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residences from corona noise along transmission lines within the SEZ would be negligible.

11.7.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and items of equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities, such as buildings/structures and mechanical/electrical installations; disposal of debris; grading; and revegetation as needed. Activities for decommissioning would be similar to those for construction but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minimal and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus negligible.

11.7.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. Because of the considerable separation distances, activities within the proposed Millers SEZ during construction and operation would be anticipated to cause only minimal increases in noise levels at the nearest residences and no increases in noise levels at the specially designated areas. Accordingly, SEZ-specific design features are not required.

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11.7.16 Paleontological Resources

11.7.16.1 Affected Environment

The surface geology of the proposed Millers SEZ is predominantly lacustrine sediments (less than 100 ft [30 m] thick) and thick alluvial deposits (more than 100 ft [30 m] thick), ranging in age from the Pliocene to Holocene, with minimal playa deposits (approximately 0.1 acre [0.0004 km^2]) of similar age in the southern tip of the SEZ. The total acreage of the lacustrine sediments within the SEZ is 15,819 acres (64 km^2), and the alluvial deposits include 968 acres (3.9 km^2), or 94% and 6% of the SEZ, respectively. In the absence of a PFYC map for Nevada, a preliminary classification of PFYC Class 3b is assumed for the lacustrine and playa deposits. Class 3b indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.14 for a discussion of the PFYC system). Pleistocene lake beds could have a high potential for subsurface fossil resources and could alternatively be classified as PFYC Class 4/5. A preliminary classification of PFYC Class 2 is assumed for the young Quaternary alluvial deposits, similar to that assumed for the Amargosa Valley SEZ (Section 11.1.16). Class 2 indicates a low potential for the occurrence of significant fossil material.

11.7.16.2 Impacts

The potential for impacts on significant paleontological resources in 94% of the proposed Millers SEZ is unknown but potentially high. A more detailed investigation of the lacustrine and playa deposits is needed prior to project approval. A paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 (BLM 2007) and IM2009-011 (BLM 2008a). Few, if any, impacts on significant paleontological resources are likely to occur in the remaining 6% of the proposed SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above and are classified as PFYC Class 2, further assessment of paleontological resources in this portion of the SEZ is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found to be present within the Millers SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely, because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new roads or transmission lines are currently assessed for the proposed Millers SEZ, assuming existing corridors would be used; therefore, no impacts on paleontological resources are anticipated from new access pathways. Impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing excavation of the resource, if warranted. Depending on the significance of the find, it could also result in some modification to the project footprint. Since the SEZ is predominantly located in an area classified as PFYC Class 3b or greater, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources were uncovered during surface-disturbing activities.

11.7.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

The need for and nature of SEZ-specific design features for 94% of the proposed Millers SEZ would depend on the results of future paleontological investigations. If the geological deposits for the remaining 6% of the SEZ are determined to be as described above and are classified as PFYC Class 2, mitigation of paleontological resources in the alluvial deposits would not likely be necessary.

11.7.17 Cultural Resources

11.7.17.1 Affected Environment

11.7.17.1.1 Prehistory

The proposed Millers SEZ is located in Big Smoky Valley in the Great Basin region of Nevada. It is situated in an area that was once a Late Pleistocene pluvial lake, Lake Tonopah. The earliest known use of the area was during the Paleoindian Period, starting sometime between 12,000 and 10,000 years before present (B.P.). Surface finds of Paleoindian projectile points, the hallmark of the Clovis culture, have been found in the Big Smoky Valley and around the former lakeshores of Pleistocene Lake Tonopah, but no sites with any stratigraphic context have been excavated. The Clovis culture is characterized by fluted projectile points and a hunting and gathering subsistence economy that followed migrating herds of Pleistocene mega fauna. Within the proposed Millers SEZ, a probable Clovis site was documented associated with Lake Tonopah. Sites established during this time period may be difficult to find if they have been buried by the ebb and flow of the pluvial lakes.

The cultural material associated with slightly later pluvial lake habitations is referred to as the Western Pluvial Lakes Tradition; at least eight sites affiliated with this cultural tradition have been well documented in the Big Smoky Valley, and in the proposed Millers SEZ. It is likely that people during this time did not rely entirely on the marshland habitats, but were nomadic hunters and gatherers who relied on both the wetland resources and those resources located away from the pluvial lakes. The archaeological assemblage associated with this cultural tradition is characterized by Lake Mohave and Silver Lake stemmed projectile points, leaf-shaped bifaces, scrapers, crescents, and in some cases ground stone tools for milling plant material. Often, projectile points and tools were made from locally procured obsidian, sources of which are not far from the proposed Millers SEZ. Exploiting these sources of obsidian and collecting raw materials for tool manufacture were a part of a larger resource exploitation system, in which groups moved in seasonal rounds to take advantage of resources in different localities (Haarklau et al. 2005; Fowler and Madsen 1986; Hockett et al. 2008; Eerkins and Glascock 2000; McGonagle and Waski 1978; NROSL 2009).

The Early Archaic Period in the region began with the recession of most of the pluvial lakes in the area, around 8,000 to 6,000 B.P., and extended until about 4,000 B.P. Archaic Period groups likely congregated around marsh areas, where they still existed, but also used the vast caves that can be found in the mountains of the Great Basin. The settlement system in some areas was most likely based around a central base camp, with temporary camps located at the margins of their territory to exploit resources that were not in the immediate vicinity of the base camp. Archaic groups would sometimes perform communal hunts, notably antelope drives, in which antelope were herded into a corral and then shot, and rabbit drives, in which large nets were used. Some of the key Archaic Period sites in the area near the proposed Millers SEZ are Gatecliff Shelter and Toquima Cave, to the northeast of the SEZ, and Lovelock Cave, Humbolt Cave, and Hidden Cave, to the north of the SEZ. Many of these sites are located near Pleistocene lakes, such as Lake Lahontan to the north of the proposed Millers SEZ, Mud Lake to the east, and Lake Tonopah. The archaeological assemblage from the Early Archaic Period maintains some cultural continuity with the previous period, consisting of large notched Elko and Gatecliff points, leaf-shaped bifaces, scrapers, drills, gravers, and manos and metates (Fowler and Madsen 1986; Neusius and Gross 2007; McGonagle and Waski 1978).

The Middle Archaic Period, 4,000 to 1,500 B.P., saw the climatic shift known as the Little Pluvial, a wetter and cooler climate that caused some of the pluvial lakes to fill back up. The cultural material of this time period is similar to the Early Archaic, with an increased concentration of milling stones, mortars and pestles, and the appearance of normally perishable items that become well preserved in the arid Great Basin climate, such as wicker baskets, split-twig figurines, duck decoys, and woven sandals (Beck and Jones 2008).

In the vicinity of the proposed Millers SEZ, the Late Archaic Period began around 1,500 B.P. and extended until about 800 B.P. This period saw major technological shifts, evidenced by smaller projectile points that were more useful because groups began using bow-and-arrow technology instead of the atlatl and dart technology and changes in subsistence techniques, particularly in the use of horticulture. Around A.D. 1000, Numic-speaking groups migrated into the region; however, the exact timing of these events is unclear and is a subject for further research in the region. These Numic-speaking people were the antecedents of the Northern Paiute and Western Shoshone, and the archaeological assemblage associated with this time period consists of Desert Series projectile points, brown-ware ceramic, unshaped manos and milling stones, incised stones, mortars, pestles, and shell beads. Contemporary Native Americans dispute the separation of periods between the Late Archaic and the Numic periods, because they believe that they have been in the area since time immemorial, and see themselves as descendents of all prehistoric people, and not just of Numic derivation. The following section describes the cultural history of the time period in greater detail.

11.7.17.1.2 Ethnohistory

The proposed Millers SEZ is located in territory most often ascribed to the Western Shoshone (Thomas et al. 1986). The Western Shoshone allowed their neighbors, the Northern Paiute, with whom they were on good terms, access to its resources (McGonagle and Waski 1978), but they were far from the main centers of Northern Paiute population. Traditionally, the closest Northern Paiute base camps were around Mono Lake in California; however, some Northern Paiute travelled widely (Fowler and Liljeblad 1986). The Northern Paiute's southern neighbors, the Owens Valley Paiute, may also have interacted with the Western Shoshone.

Western Shoshone

The Western Shoshone are a group of ethnically similar Central Numic speakers who traditionally occupied a swath of the central Great Basin stretching from Death Valley in California through central Nevada and northwestern Utah to southeastern Idaho (Thomas et al. 1986). Their territory lies primarily within the basin and range province of the

Great Basin. They lived in small groups with rather fluid membership, usually identified with the land on which they were centered. Their subsistence base and lifestyle varied with the resources within their territory. Groups often established stable base camps near reliable water sources where they could grow crops. From these base camps, they would move seasonally in a flexible round to exploit resources as they became available in the surrounding mountains and other areas. They gathered a wide variety of plant resources (Stoffle et al. 1990; Crum 1994; Fowler 1986), which they supplemented by hunting and fishing. Pine nuts, available in the mountains, were a storable staple. Pronghorn antelope, bighorn sheep, and mule deer were among the large game animals they hunted, but smaller game, including rodents, birds, and, where available, fish, provided more protein to their diet. Groups varied in size and composition with the season. The largest groups gathered for the pine nut harvest, which could include a rabbit or antelope drive as well. Winter villages were usually close to stores of pine nuts. Additional information on the Western Shoshone can be found in Section 11.1.17.1.2.

Northern Paiute

At the time of Euro-American contact, the Northern Paiute consisted of a collection of politically distinct, but linguistically homogenous, family-centered groups occupying much of northwestern Nevada and southeastern Oregon extending into southwestern Idaho. Probably arriving in the Great Basin sometime between A.D. 500 and A.D. 1000 (Quinian and Woody 2003), their traditional lifeway was similar to that of other indigenous Great Basin populations. Living in small, family-based groups, they pursued a hunting and gathering subsistence base. They congregated in winter base camps located near relatively abundant resources where many family groups could gather. From these base locations, smaller groups followed a seasonal round taking advantage of plant and animal resources as they became available. Although their seasonal movements were patterned, and individual hunting and gathering territories were considered the property of one group or another, there was considerable flexibility and sharing of resources between groups and with their Shoshone neighbors, who spoke related languages (Fowler and Liljeblad 1986).

The game and plants that they exploited varied with local conditions. The more southerly groups, based in the piedmont of the Sierra Nevada, relied on piñon nuts, mule deer, bighorn sheep, quail, marmots, and the larvae of the Pandora moth. Large game animals were hunted individually or in cooperative drives. Smaller game, including rabbits, marmots, porcupines, grouse, and quail, was hunted individually or taken in traps or nets. Rabbits were also taken in cooperative drives. Seeds and other plant products were gathered from over 150 plant species (Fowler and Liljeblad 1986; Fowler and Leland 1967; Fowler 1986). Seeds were often gathered using a variety of twined tools including beaters, trays, and gathering baskets, but some were cut from the plant with knives and flash burned to harden. Seeds and nuts were ground with manos and metates, or with wooden or stone mortars and pestles. Seed meal mushes were stone boiled in twined cooking baskets. Winter houses were dome-shaped and mat-covered structures varying in size with the size of the family, or conical semi-subterranean structures. Summer housing was in open-sided ramada-like structures. Clothing was made of skins, including woven rabbit skins, or plant materials, including tules and sagebrush bark. The family was the basic social and political unit, but non-hereditary headmen emerged in local camp groups and chiefs emerged in response to Euro-American contact. Supernatural power was believed to reside in natural objects, including animals, plants, stones, water, and geographic features (Fowler and Liljeblad 1986).

As with other Great Basin groups, the Northern Paiute were affected by the introduction of the horse by the Spanish, and the "opening of the west" by Euro-American trappers, prospectors and miners, and eventually farmers and ranchers. Immigrant trains and settlements, along with their associated livestock, consumed or destroyed many of the plant, animal, and water resources upon which the Northern Paiute relied. Northern Paiute response varied. Some groups retreated from major trails; others associated themselves with settlements and ranches, forming colonies; and others formed mounted bands that preyed upon immigrants and their settlements. The Northern Paiute were pacified by 1868. Three reservations, Pyramid Lake and Walker River in Nevada, and Malheur in Oregon, were set aside in 1859 and formally established in 1874. The intent was for all Northern Paiutes to subsist on these parcels of land, and for the hunting and gathering Paiute to learn to farm. However, these reservations were not well suited for agriculture and generally lacked sufficient water. Many Paiutes refused to leave their home ranges, where they adapted to the new situation by engaging in wage labor. The establishment of additional colonies and reservations continued well into the twentieth century. The closest of these to the SEZ are Bridgeport Rancheria and Benton Reservation in California. Most groups have organized under the Indian Reorganization Act of 1934 and reservations are managed by Tribal councils. A free-ranging people, individual descendants of the Northern Paiute may be found on reservations as far away as Oregon and Washington. Knowledge of their former subsistence pursuits has been reduced, but has continued on a more limited scale (Fowler and Liljeblad 1986).

Owens Valley Paiute

The Owens Valley Paiute inhabit the valley of the Owens River that parallels the eastern slope of the Sierra Nevada. They speak Mono, a Western Numic language, and are linguistically closely tied to the Northern Paiute (Liljeblad and Fowler 1986). A brief description of the Owens Valley Paiute can be found in Section 11.1.17.1.2.

11.7.17.1.3 History

The Great Basin was one of the last areas of the continental United States to be fully explored. The harsh and rugged landscape deterred most European and American explorers until the late eighteenth century. Several early explorers made their way into the southern portion of the state by the late eighteenth century, but the area around the proposed Millers SEZ was not explored by Euro-Americans until about 1826. Fur trapping was a popular enterprise during this time, and overzealous trappers were quickly depleting their supplies of furs as they moved west in search of additional materials. Peter Ogden of the Hudson Bay Company and Jedidiah Smith of the Rocky Mountain Fur Company were parts of two different expeditions that entered Nevada in 1827 and 1826, respectively, seeking new beaver fields. Odgen took a more northerly route through Elko, Pershing, and Humbolt Counties, and Smith entered Nevada near Mesquite and traveled across the southern tip of Nevada into California. When he entered California, Smith was detained by Mexican authorities, as he had entered Mexican territory, and was ordered to go back the way from which he had come. However, he decided to travel farther north in California; he was the first white man to cross the Sierra Nevada Mountains, and entered Nevada just south of Lake Tahoe. From there he crossed the state of Nevada and passed very close to (if not actually through) the proposed Millers SEZ; it is assumed that he likely followed a path that would eventually be U.S. 6. Another fur-trapping party, the Walker-Bonneville party, explored the region between 1833 and 1834. This group also likely explored the lands near the proposed Millers SEZ on its way to exploring large portions of the Yosemite Valley in California and the Great Basin. Fur trapping never became a lucrative enterprise in Nevada; however, these trailblazers paved the way for later explorers and mappers, such as John C. Frémont. Frémont was a member of the Topographical Engineers, and was commissioned to map and report on the Great Basin area in 1843 and 1844. The results of his work gained wide circulation and were of great importance in understanding the topography of the Great Basin, both for official use and for those moving westward to seek new homes and fortunes. Frémont passed through the vicinity of the proposed Millers SEZ, probably about 25 mi (40 km) to the north, at the northernmost point of Esmeralda County, where it meets Mineral and Nye Counties (Elliott 1973).

Nevada and the Great Basin region have provided a corridor of travel for those seeking to emigrate west. Several heavily traveled trails crossed the region, although other than those initially traversed by Smith and the Walker-Bonneville party, none of the trails passes particularly close to the proposed Millers SEZ. The Old Spanish Trail was an evolving trail system generally established in the early nineteenth century that tended to follow established paths used by earlier explorers and Native Americans. The 2,700-mi (4,345-km) network of trails passes through six states, beginning in Santa Fe, New Mexico, and ending in Los Angeles, California. The closest portion of the congressionally designated Old Spanish National Historic Trail is about 200 mi (322 km) to the southeast of the proposed Millers SEZ as it passes near Las Vegas, Nevada. Mormons also frequently used the Old Spanish Trail in emigrating farther west to Nevada, Arizona, and California, and often the trail is referred to as the Old Spanish Trail/ Mormon Road. Other notable trails that crossed Nevada included the California Trail, which followed portions of the Oregon Trail farther east of Nevada, then broke off from that trail and continued through the northern portion of Nevada along the Humbolt River, about 120 mi (120 km) north of the proposed SEZ, until it reached California. The Pony Express Trail, a mail route that connected Saint Joseph, Missouri, to Sacramento, California, entered Nevada northeast of Ely and exited just south of Lake Tahoe, the closest portion being about 70 mi (113 km) northwest of the proposed SEZ (von Till Warren 1980).

With the ratification of the Treaty of Guadalupe Hidalgo in 1848 closing out the Mexican-American War, the area came under American control. In 1847, the first American settlers arrived in the Great Basin, among them Mormon immigrants under the leadership of Brigham Young, who settled in the Valley of the Great Salt Lake in Utah. They sought to bring the entire Great Basin under their control, establishing an independent State of Deseret. From its center in Salt Lake City, the church sent out colonizers to establish agricultural communities in surrounding valleys and missions to acquire natural resources such as minerals and timber. Relying on irrigation to support their farms, the Mormons often settled in the same places as the Native Americans had centuries before. The result was a scattering of planned agricultural communities from northern Arizona to southern Idaho and parts of Wyoming, Nevada, and southern California. One of the first Mormon settlements in Nevada was a trading post, located just north of Genoa, over 100 mi (160 km) northwest of the SEZ. Established in 1850, this trading post provided supplies for those traversing the California Trail.

Nevada's nickname is the "Silver State;" it is so named for the Comstock Lode strike in Virginia City, about 145 mi (233 km) north of the proposed Millers SEZ, in 1859. This was the first major silver discovery in the United States, and with the news of the strike hopeful prospectors flocked to the area in an effort to capitalize on the possible wealth under the surface of the earth. The discovery of the Comstock Lode led to the creation of Virginia City and other nearby towns that served the population influx. The population increase was so dramatic that in 1850 there were less than a dozen non-native people in the state of Nevada; by 1860, there were 6,857, and by 1875 an estimated 75,000 people had migrated to the state. The Comstock Lode strike is important to the history of Nevada not just because of the population growth and significant amount of money that was consequently brought to the area, but also because of several technological innovations that were created and employed in the mines, including the use of square-set timbering. This technique kept loose soil from collapsing on miners, a concept that eventually was employed around the world in other mines (Paher 1970).

Mining for valuable deposits occurred in all regions of the state of Nevada, including in the vicinity of the proposed Millers SEZ. Esmeralda County did not experience much of the early mining boom that was associated with the Comstock Lode strike, other than a small silver strike at Silverpeak, about 20 mi (32 km) south of the proposed Millers SEZ. Major mining operations did not come into the area until the major silver strike at Tonopah, just 13 mi (22 km) to the southeast of the proposed Millers SEZ. The strike at Tonopah was made in 1900, and miners there soon began exporting large amounts of silver. Tonopah's location made it difficult to obtain some of the raw materials and supplies necessary for large-scale mining operations, and the Tonopah-Goldfield Railroad was constructed to alleviate some of these issues. The town of Millers, just 1 mi (1.6 km) south of the proposed SEZ, was originally created as a watering and resting place for stage coaches and freight wagons travelling between Silverpeak Mine and San Antonio Mines to the northeast. After the Tonopah-Goldfield Railroad was constructed in 1904, repair shops for the railroad were built here. In addition, a 100-stamp mill was constructed at Millers in 1906 for crushing the Tonopah ore, and another 50-stamp mill was built the next year. A turquoise mine at Royston, 14 mi (23 km) northeast of the proposed SEZ, was mined by Native Americans in the region for several years, until Tiffany and Co. took control of the mine to obtain the turquoise. Crow Spring, just 5 mi (8 km) north of the proposed Millers SEZ, was an overnight stopping place for teamsters and stages between Sodaville and Tonopah, and supported a short-lived turquoise mine. Goldfield, 25 mi (40 km) south of Tonopah, was initially discovered in 1902 and was one of the single most prosperous gold strikes in the West. The mining stampede to the area began in 1904, with the most lucrative years, 1906 and 1907, producing about $15 million in gold ore. Other mines in the vicinity of the proposed Millers SEZ were mined for borax, notably at Columbus and Fish Lake, located 25 mi (40 km) and 30 mi (48 km) east of the proposed Millers SEZ, respectively, and minor turquoise mining occurred at Gilbert, approximately 6 mi (10 km) from the proposed SEZ.

Nevada's desert-mountain landscape has made it a prime region for use by the U.S. military for several decades. Beginning in October 1940, President Franklin D. Roosevelt established the Las Vegas Bombing and Gunnery Range, a 3.5- million-acre (14,000-km^2) parcel of land northwest of Las Vegas, near Indian Springs, Nevada, 150 mi (241 km) southeast of the SEZ. At the start of the Cold War in 1948, the range was renamed the Nellis Air Force Base; three years later, the Nevada Test Site (NTS) was established within Nellis Air Force Base. For the next 41 years, testing of nuclear weapons occurred throughout regions of the NTS, in addition to regular Air Force training missions. Although the proposed Millers SEZ does not fall within the specific boundaries of Nevada Test Site and Range, the closest portion of the military installation is about 45 mi (72 km) to the southeast, and the Air Force Base and associated ranges have impacted the overall history and context of the region.

11.7.17.1.4 Traditional Cultural Properties—Landscape

The Native Americans whose historical homelands lie within the Great Basin have traditionally taken a holistic view of the world. In this view, the sacred and profane are inextricably intertwined. Landscapes as a whole are often culturally important. Adverse effects on one part damage the whole (Stoffle 2001). From their perspective, landscapes include places of power. Among the most important such places are sources of water; peaks, mountains, and elevated features; caves; distinctive rock formations; and panels of rock art. Places of power are important to the religious beliefs of the Western Shoshone and Northern Paiute, and may be sought out for individual vision quests or healing. The view from such a point of power or the ability to see from one important place to another can be an important element of its integrity (Stoffle and Zedeño 2001b). Landscapes as a whole are often tied together by a network of culturally important trails (Stoffle and Zedeño 2001a).

The proposed Millers SEZ is located in Big Smoky Valley between the Monte Cristo Range and Lone Mountain. As stated above, mountain prominences are often culturally important landscape features and may be places of power. Project-specific investigations would need to establish the cultural importance of these mountains through consultation with the relevant Native American Tribe(s). Mt. Grant, where the Northern Paiute believe their ancestors emerged (Fowler et al. 1970), is 72 mi (116 km) to the northwest and is not likely to be visible from the SEZ. Known important rock art panels are located primarily well south and southwest of the SEZ and should not be affected by development within the SEZ. Archaeological sites within the proposed SEZ, including those associated with pluvial lakeshores, are considered by the Tribes to be the work of their ancestors and form an important part of the Native American cultural landscape. Native Americans commenting on a proposed site for the construction of a solar energy facility directly east of the proposed Millers SEZ indicated that this part of the Big Smoky Valley appeared to have been a travel corridor, not a living area (Rigby 2010).

11.7.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources

In the proposed Millers SEZ, four surveys covering about 4% of the proposed SEZ have been conducted within the boundaries of the SEZ; three were linear surveys and one was a block survey. These surveys have documented 30 sites within the boundaries of the SEZ, all of which are prehistoric in nature. An additional 49 surveys have been performed within 5 mi (8 km) of the proposed SEZ, recording a total of 100 sites (86 prehistoric, 12 historic, and 2 multi-component sites; de Dufour 2009).

Most of the sites that have been documented within the boundaries of the proposed Millers SEZ are prehistoric lithic scatters, some of which contain diagnostic projectile points, as mentioned in Section 11.5.17.1. There is one documented temporary camp site. The potential eligibility of these sites for inclusion on the NRHP has not been evaluated.

The proposed SEZ has the potential to yield further significant cultural resources, especially in the dune area along the edge of the former Lake Tonopah. Because of the fact that the proposed Millers SEZ is located in the immediate vicinity of the Pleistocene lake, more prehistoric cultural resources are likely to be encountered around the margins of this area. Historic period artifacts, likely associated with the town site of Millers, as well as obsidian debitage, were also noted during an initial site visit of the proposed SEZ.

The BLM has also designated several locations within 25 mi (40 km) of the proposed Millers SEZ as cultural resources that should be managed for conservation (BLM 1997); these areas include significant petroglyph sites.

National Register of Historic Places

There are no historic properties listed in the NRHP in the SEZ or within 5 mi (8 km) of the SEZ. However, there are 16 sites that have been documented within 5 mi (8 km) of the proposed Millers SEZ that are potentially eligible for NRHP inclusion. The Millers town site has been determined to be potentially eligible, and five additional sites have been documented that are associated with the Millers town site. One site is the remains of three house basements, associated residential trash, and a mine shaft. Residential activity has also been documented at two sites. Another site is the remains of locomotive maintenance pits, a concrete foundation, and associated trash. Historic corrals and feed lots that were associated with the Millers town site and the Tonopah-Goldfield Railroad were also documented near the proposed Millers SEZ. The Sodaville-Tonopah freight road, a 60-mi (97-km) road that connected these mining towns, has been documented within 5 mi (8 km) of the SEZ. There are nine prehistoric sites within 5 mi (8 km) of the proposed SEZ that are potentially eligible for NRHP inclusion. One site is an Archaic campsite associated with Pleistocene Lake Tonopah. Six sites are campsites and lithic scatters. Another site is a possible proto-historic site, consisting of Shoshone brown-ware pottery and projectile points. A multi-component site, consisting of a prehistoric lithic scatter and an historic wall/lean-to and associated trash, is also eligible for inclusion in the NRHP (de Dufour 2009).

In Esmeralda County, only one property, the Goldfield Historic District, which is located about 32 mi (52 km) south of the proposed Millers SEZ, is listed in the NRHP. In neighboring Nye County, there are 53 properties listed in the NRHP, 48 of which are associated with the Tonopah Multiple Resource Area 13 mi (21 km) southeast of the proposed Millers SEZ. The other five NRHP properties in Nye County are located far enough away (Gatecliff Rockshelter near Austin, 97 mi [157 km] northeast; James Wild Horse Trap near Fish Springs, 80 mi

[129 km] northeast; Tybo Charcoal Kilns, near Tybo, 65 mi [105 km] east; Manhattan School, Manhattan, 42 mi [68 km] northeast; Sedan Crater, near Mercury, 132 mi [212 km] southeast) from the SEZ not to be affected by solar development.

11.7.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Millers SEZ; however, further investigation is needed. At least 30 sites have been recorded within the SEZ, although none of them have been evaluated for inclusion in the NRHP. Consistent with findings at other SEZs, dune areas continue to be areas with considerable potential for containing significant sites on the valley floors suitable for solar development. The area within the proposed Millers SEZ associated with Lake Tonopah also has the potential to provide significant sites related to exploitation of lacustrine resources. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. It is further recommended that subsurface testing be conducted, because there is potential for significant buried cultural deposits associated with prehistoric use of Lake Tonopah. Section 5.15 discusses the types of effects that could occur on any significant cultural resources found to be present within the proposed Millers SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur. No traditional cultural properties have been identified to date within the vicinity of the SEZ.

Indirect impacts on cultural resources that result from erosion outside of the SEZ boundary (including along ROWs) are unlikely, assuming programmatic design features to reduce water runoff and sedimentation are implemented (as described in Appendix A, Section A.2.2).

No needs for new transmission or access corridors have currently been identified, assuming existing infrastructure would be used. Therefore, no new areas of cultural concern would be made accessible as a result of development within the proposed Millers SEZ, so indirect impacts resulting from vandalism or theft of cultural resources is not anticipated. However, impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades were to occur.

11.7.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features, cultural awareness training for the workforce, and measures for addressing possible looting/vandalism issues through formalized agreement documents, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

- Avoidance of high-potential, high-density areas is recommended. Because of the high sensitivity of the area for containing prehistoric sites associated with Lake Tonopah and the presence of historic period sites related to the development of Millers town site, complete avoidance of NRHP-eligible sites may not be possible, and it may not be possible to fully mitigate the loss of such a large number of sites associated with one lake system; therefore avoidance of these general areas is recommended.

11.7.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns specific to Native Americans and to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Millers SEZ, Section 11.7.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 11.7.8 discusses mineral resources; Section 11.7.9.1.3 discusses water rights and water use; Section 11.7.10 discusses plant species; Section 11.7.11 discusses wildlife species, including wildlife migration patterns; Section 11.7.13 discusses air quality; Section 11.7.14 discusses visual resources; Sections 11.7.19 and 11.7.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21.

11.7.18.1 Affected Environment

The proposed Millers SEZ falls within the Tribal traditional use area generally attributed to the Western Shoshone (Liljeblad and Fowler 1986) and is within the area recognized as traditionally belonging to the Western Shoshone by the Indian Claims Commission (Royster 2008). Lying near the western edge of Western Shoshone territory, the SEZ was accessible by the Northern Paiutes, who were on friendly terms with the Western Shoshone (McGonagle and Waski 1978). All federally recognized Tribes with Western Shoshone, Northern Paiute, or Owens Valley Paiute roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 11.7.18.1-1. Details of government-to-government consultation efforts are presented in Chapter 14; a listing of all federally recognized tribes contacted for this PEIS is given in Appendix K.

11.7.18.1.1 Territorial Boundaries

Western Shoshone

The Western Shoshone traditionally occupied a swath of the central Great Basin stretching from Death Valley in California through central Nevada and northwestern Utah to southeastern Idaho (Thomas et al. 1986). The proposed Millers SEZ lies near the northwestern periphery of their traditional range where Shoshone territory blends into Northern and Owens Valley Paiute territory.

Northern Paiutes

The traditional territory of the Northern Paiute lies mainly along the eastern front of the Sierra Nevada and the divide separating the Pit and Klamath Rivers from the Great Basin,

TABLE 11.7.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed Millers SEZ

Tribe	Location	State
Benton Paiute-Shoshone Tribe	Benton	California
Big Pine Paiute Tribe	Big Pine	California
Bishop Paiute Tribe	Bishop	California
Bridgeport Indian Colony	Bridgeport	California
Duck Valley Shoshone-Paiute Tribes	Owyhee	Nevada
Duckwater Shoshone Tribe	Duckwater	Nevada
Ely Shoshone Tribe	Ely	Nevada
Las Vegas Paiute Tribe	Las Vegas	Nevada
Lone Pine Paiute-Shoshone Tribe	Lone Pine	California
Lovelock Paiute Tribe	Lovelock	Nevada
Reno-Sparks Indian Colony	Reno	Nevada
Summit Lake Paiute Tribe	Sparks	Nevada
Te-Moak Tribe of Western Shoshone	Elko	Nevada
Timbisha Shoshone Tribe	Death Valley	California
Washoe Tribe	Gardnerville	Nevada
Wells Indian Colony	Wells	Nevada
Yerington Paiute Tribe	Yerington	Nevada
Yomba Shoshone Tribe	Austin	Nevada

extending from Mono Lake (California) in the south as far as southeastern Oregon. They occupied a wedge-shaped territory extending as far as western Idaho in the north and as far as Nevada's Reese River in the south (Fowler and Liljeblad 1986).

Owens Valley Paiutes

The Owens Valley Paiutes occupy five relatively small reservations within Owens Valley in Inyo and Mono Counties, California, west of the SEZ. Their traditional use area ranged from the headwaters of the Owens River near Benton, California, southward to Owens Lake. They shared the shores of Owens Lake with Western Shoshone groups. The Indian Claims Commission placed Owens Valley within the traditional territory of the Northern Paiutes, with whom the Owens Valley Tribes are linked linguistically (Liljeblad and Fowler 1986; Royster 2008).

11.7.18.1.2 Plant Resources

Native Americans continue to make use of a wide range of indigenous plants for food, medicine, construction materials, and other uses. Although the proposed SEZ is sparsely vegetated, some species traditionally used by Native Americans have been observed or are possible in the SEZ. The vegetation present at the proposed Millers SEZ is described in Section 11.7.10. The cover types present at the SEZ are part of the Inter-mountain Basin series.

Mixed Salt Desert Scrub dominates, but there are substantial areas of Greasewood Flat, smaller amounts of Playa, and a sprinkling of Semi-desert Shrub Steppe (USGS 2005a). As shown in Table 11.7.18.1-2, there are some plants found in the SEZ that have been traditionally used by Native Americans for food and medicine (Stoffle and Dobyns 1983; Stoffle et al. 1999; Fowler 1986). The most common is black greasewood. Other seed-bearing plants appear to be scarce. However, project-specific analyses will be needed to determine their presence at any proposed development site. The importance of any stand to Native Americans must be determined in consultation with the affected Tribe(s).

11.7.18.1.3 Other Resources

Water is an essential prerequisite for life in the arid areas of the Great Basin. As a result, it is a keystone of desert cultures' religion. Most desert cultures consider all water sacred and a purifying agent. Water sources are often associated with rock art. Springs are often associated with powerful beings, and hot springs in particular figure prominently in Owens Valley Paiute creation stories. Water sources are seen as connected—damage to one source damages all (Stoffle and Zedeño 2001a). Tribes are also sensitive about the use of scarce local water supplies for the benefit of distant communities and recommend that determination of adequate water supplies be a primary consideration for whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

Wildlife likely to be found in the proposed Millers Valley SEZ is described in Section 11.7.11. Native American game species whose range includes the SEZ are listed in Table 11.7.18.1-3. Most of these are small animals and birds common throughout much of the

TABLE 11.7.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Millers SEZ

Common Name	Scientific Name	Status
Food		
Big Sagebrush	*Artemisia tridentata*	Possible
Dropseed	*Sporobolus airoides*	Possible
Greasewood	*Sarcobatus vermiculatus*	Observed
Indian Rice Grass	*Oryzopsis hymenoides*	Observed
Iodine Bush	*Allenrolfea occidentalis*	Possible
Wolfberry	*Lycium andersonii*	Possible
Medicine		
Greasewood	*Sacarbatus vermiculatus*	Possible
Mormon Tea	*Ephedra nevadensis*	Possible
Saltbush	*Atriplex canescens*	Observed

Sources: Field visit; USGS (2005a); Stoffle and Dobyns (1983); Stoffle et al. (1999); Fowler (1986).

TABLE 11.7.18.1-3 Animal Species Used by Native Americans as Food whose Range Includes the Proposed Millers SEZ

Common Name	Scientific Name	Status
Mammals		
Badger	*Taxidea taxus*	All year
Black-tailed jack rabbit	*Lepus californicus*	Observed
Wood rats	*Neotoma* spp.	All year
Chipmunks	*Tamias* spp.	Observed
Cottontails	*Silvilagus* spp.	All year
Coyote	*Canis latrans*	Observed
Kangaroo rats	*Dipodomys* spp.	All year
Kit fox	*Vulpes macotis*	All year
Pocket gopher	*Thomomys bottae*	All year
Pocket mice	*Perognathus* spp.	All year
Porcupine	*Erethizon dorsatum*	All year
Rock squirrel	*Spermophilus variegates*	All year
Striped skunk	*Mephitis mephitis*	All year
Birds		
Burrowing owl	*Athene cunicular*	Summer
Common raven	*Corvus corax*	All year
Golden eagle	*Aquila chrysaetos*	Observed
Great horned owl	*Bubo virginianus*	All year
Northern mockingbird	*Mimus polyglottos*	All year
Red-tailed hawk	*Buteo jamaicensis*	Observed
Sharp-shinned hawk	*Accipiter striatus*	Winter
Reptiles		
Western rattlesnake	*Crotalus viridis*	All year
Lizards	Various species	Observed

Sources: Field visit; USGS (2005b); Fowler (1986).

Great Basin. Traditionally, the most important was the black-tailed jackrabbit (*Lepus californicus*), which provided both meat and pelts. Rabbit skin blankets and clothing were common throughout the Great Basin. Important large game animals, mule deer (*Odocoileus hemionus*) and bighorn sheep (*Ovis canadensis*), occur in the nearby Monte Cristo Range and on Lone Mountain (BLM 1994), and occasionally cross through the SEZ when passing between mountain habitats. Bighorn sheep have been observed near the SEZ. The golden eagle (*Aquila chrysaetos*), which is important culturally, has also been observed at the SEZ.

Other natural resources traditionally important to Native Americans include clay for pottery, salt, and naturally occurring mineral pigments for the decoration and protection of the skin (Stoffle and Dobyns 1983). None of these has been reported in the SEZ (see Section 11.7.7).

11.7.18.2 Impacts

In the past, the Western Shoshone and Owens Valley Paiutes have expressed concern over project impacts on a variety of resources. They tend to take a holistic view of their traditional homelands. Effects on one part have ripple effects on the whole. For them, cultural and natural features are inextricably bound together. Western distinctions between the sacred and the secular have no meaning in their traditional worldview (Stoffle and Dobyns 1983). While no comments specific to the proposed Millers SEZ have been received from Native American Tribes to date, the Big Pine Paiute Tribe of the Owens Valley has commented on the scope of this PEIS. The Tribe recommends that the BLM preserve undisturbed lands intact and that recently disturbed lands, such as abandoned farm fields, rail yards, mines, and airfields, be given primary consideration for solar energy development. Potential impacts on existing water supplies are also a primary concern (Moose 2009). During energy development projects in adjacent areas, other Great Basin Tribes have expressed concern over adverse effects on a wide range of resources. Among these are geophysical features and physical cultural remains. Known resources of this type in the Millers area are discussed in Section 11.7.17.1.4. Such places are often seen as important because they are thought to be places of power. They are often the location of or have ready access to a variety of plant, animal, and mineral resources (Stoffle et al. 1997). Resources that Native Americans have identified as important include food plants, medicinal plants, plants used in basketry, and plants used in construction; game animals and birds; and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those likely to be found within the proposed Millers SEZ are discussed in Section 11.7.18.1.

The construction of utility-scale solar energy facilities within the proposed SEZ would almost certainly result in the destruction of some plants important to Native Americans and the habitat of some traditionally important animals. The Big Smoky Valley is reported to have been a joint use area shared by the surrounding Native American groups (McGonagle and Waski 1978), and to have been a travel corridor, not a habitation area (Rigby 2010). Although it includes some plant species traditionally important to Native Americans, they appear to be relatively scant. While it is within the range of a number of traditional Native American game species, these species for the most part are common throughout the valleys in the area, and may be more abundant elsewhere (See Sections 11.7.10 and 11.7.11). The most important traditional resource likely to be present in the valley is the black-tailed jackrabbit (*Lepus californicus*). Project-specific consultation with Western Shoshone and Northern Paiute Tribes will be required to determine whether the resources present at the SEZ are significant.

As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concern over potential visual, acoustic and other effects of solar energy development within the SEZ on specific resources including culturally important landscapes.

Implementation of required programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

11.7.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate impacts of potential concern to Native Americans, such as avoidance of sacred sites, water resources, and tribally important plant and animal species are provided in Appendix A, Section A.2.2.

The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with the affected Tribes listed in Table 11.7.18.1-1.

Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 11.7.17.3, in addition to programmatic design features for historic properties also discussed in Section A.2.2.

11.7.19 Socioeconomics

11.7.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Millers SEZ. The ROI is a three-county area comprising Esmeralda, Mineral, and Nye Counties in Nevada. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

11.7.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 18,672 (Table 11.7.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was low in each county in the ROI, with lower rates in Nye County (0.5%) and in Esmeralda County (−2.7%). At 0.4%, growth rates in the ROI as a whole were lower than the average rate for Nevada (2.7%).

In the ROI in 2006, the services sector provided the highest percentage of employment at 46.5%, followed by wholesale and retail trade at 17.9%, with a smaller employment share held by construction (8.7%) and mining (7.0%) (Table 11.7.19.1-2).

TABLE 11.7.19.1-1 ROI Employment in the Proposed Millers SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Esmeralda County	590	448	–2.7
Mineral County	1,971	2,188	1.0
Nye County	15,325	16,036	0.5
ROI	17,886	18,672	0.4
Nevada	978,969	1,282,012	2.7

Sources: U.S. Department of Labor (2009a,b).

TABLE 11.7.19.1-2 ROI Employment in the Proposed Millers SEZ by Sector, 2006

Industry	Esmeralda County		Mineral County		Nye County		ROI	
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	10	7.0	0	0.0	325	3.6	335	3.1
Mining	10	7.0	10	0.6	750	8.3	770	7.0
Construction	10	7.0	10	0.6	925	10.2	945	8.7
Manufacturing	60	42.0	10	0.6	329	3.6	399	3.7
Transportation and public utilities	20	14.0	385	22.0	292	3.2	697	6.4
Wholesale and retail trade	60	42.0	185	10.6	1,714	19.0	1,959	17.9
Finance, insurance, and real estate	0	0.0	38	2.2	328	3.6	366	3.4
Services	30	21.0	710	40.6	4,340	48.1	5,080	46.5
Other	0	0.0	0	0.0	0	0.0	0	0.0
Total	143		1,750		9,029		10,922	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009).

11.7.19.1.2 ROI Unemployment

The average unemployment rate in Nye County over the period 1999 to 2008 was 6.9%, slightly higher than the rate in Mineral County (6.7%) and higher than the rate for Esmeralda County (Table 11.7.19.1-3). The average rate in the ROI over this period was 6.9%, higher than the average rate for Nevada. Unemployment rates for the first 11 months of 2009 contrast with rates for 2008 as a whole; in Nye County, the unemployment rate increased to 14.3%, in Mineral County to 9.1%, and in Esmeralda County to 8.4%. The average rates for the ROI (13.6%) and for Nevada as a whole (11.0%) were also higher during this period than the corresponding average rates for 2008.

11.7.19.1.3 ROI Urban Population and Income

There are no incorporated places in the ROI, and consequently, no urban population or income.

11.7.19.1.4 ROI Total Population

Table 11.7.19.1-4 presents recent and projected populations in the ROI and for the state as a whole. Population in the ROI stood at 49,487 in 2008, having grown at an average annual rate of 3.2% since 2000. Growth rates for ROI were higher than those in Nevada (3.4%) over the same period.

Only one of the three counties in the ROI experienced growth in population between 2000 and 2008; population in Nye County grew at an annual rate of 3.9%, while in Mineral

TABLE 11.7.19.1-3 ROI Unemployment Rates for the Proposed Millers SEZ (%)

Location	1999–2008	2008	2009[a]
Esmeralda County	6.1	5.1	8.4
Mineral County	6.7	7.5	9.1
Nye County	6.9	9.7	14.3
ROI	6.9	9.4	13.6
Nevada	5.0	6.7	11.0

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

TABLE 11.7.19.1-4 ROI Population for the Proposed Millers SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Esmeralda County	971	664	–4.6	1,387	1,420
Mineral County	5,071	4,648	–1.1	4,160	4,149
Nye County	32,485	44,175	3.9	76,735	79,452
ROI	38,527	49,487	3.2	82,282	85,021
Nevada	1,998,257	2,615,772	3.4	3,675,890	3,779,745

Sources: U.S. Bureau of the Census (2009d,e); Nevada State Demographers Office (2008).

County, population fell by −1.1%, and by −4.6% in Esmeralda County. The ROI population is expected to increase to 82,282 by 2021 and to 85,021 by 2023.

11.7.19.1.5 ROI Total Income

Total personal income in the ROI stood at $1.6 billion in 2007 and has grown at an annual average rate of 3.9% over the period 1998 to 2007 (Table 11.7.19.1-5). Per-capita income also rose over the same period at a rate of 1.5%, increasing from $29,208 to $31,882. Per-capita incomes were higher in Esmeralda County ($41,370) than in Nye County ($31,836) and Mineral County ($30,935) in 2007. Growth rates in total personal income have been higher in Nye County than in Mineral County and Esmeralda County. Personal income growth rates in Nevada (4.3%) were higher than the rate for the ROI (3.9%), while per-capita income growth rates in Esmeralda County were higher than those for Nevada as a whole (1.0%), the same as the state rate in Nye County and lower in Mineral County.

Median household income in 2006 to 2008 varied from $42,275 in Nye County, to $42,348 in Mineral County to $42,749 in Esmeralda County (U.S. Bureau of the Census 2009c).

11.7.19.1.6 ROI Housing

In 2007, more than 20,300 housing units were located in the three ROI counties, with about 82% of these located in Nye County (Table 11.7.19.1-6). Owner-occupied units account for approximately 72% of the occupied units in the three counties, with rental housing making up 28% of the total. Vacancy rates in 2007 were 45.4% in Esmeralda County, 23.3% in Mineral County, and 19.3% in Nye County; with an overall vacancy rate of 21% in the ROI, there were

TABLE 11.7.19.1-5 ROI Personal Income for the Proposed Millers SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Esmeralda County			
Total income[a]	0.0	0.0	0.2
Per-capita income	26,781	41,370	4.4
Mineral County			
Total income[a]	0.2	0.1	-1.5
Per-capita income	31,655	30,935	-0.2
Nye County			
Total income[a]	0.9	1.4	4.8
Per-capita income	28,857	31,836	1.0
ROI			
Total income[a]	1.1	1.6	3.9
Per-capita income	29,208	31,882	0.9
Nevada			
Total income[a]	68.9	105.3	4.3
Per-capita income	37,188	41,022	1.0

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of Census (2009d,e).

4,258 vacant housing units in the ROI in 2007, of which 1,198 are estimated to be rental units that would be available to construction workers. There were 734 units in seasonal, recreational, or occasional use in the ROI at the time of the 2000 Census, with 9.5% of housing units in Esmeralda County, 3.5% in Nye County and 3.2% in Mineral County used for seasonal or recreational purposes.

Housing stock in the ROI as a whole grew at an annual rate of 0.5% over the period 2000 to 2007, with 675 new units added to the existing housing stock (Table 11.7.19.1-6).

The median value of owner-occupied housing in 2006 to 2008 varied between $59,500 in Mineral County, $75,600 in Esmeralda County and $122,100 in Nye County (U.S. Bureau of the Census 2009f).

TABLE 11.7.19.1-6 ROI Housing Characteristics for the Proposed Millers SEZ

Parameter	2000	2007[a]
Esmeralda County		
Owner-occupied	305	314
Rental	150	154
Vacant units	378	389
Seasonal and recreational use	79	Na[b]
Total units	833	857
Mineral County		
Owner-occupied	1,593	1,589
Rental	604	603
Vacant units	669	667
Seasonal and recreational use	93	NA
Total units	2,866	2,859
Nye County		
Owner-occupied	10,167	9,630
Rental	3,142	3,760
Vacant units	2,625	3,202
Seasonal and recreational use	562	NA
Total units	15,934	16,592
ROI		
Owner-occupied	12,065	11,533
Rental	3,896	4,517
Vacant units	3,672	4,258
Seasonal and recreational use	734	NA
Total units	19,633	20,308

[a] 2007 data for number of owner-occupied, rental, and vacant units for Esmeralda County and Mineral County are not available; data are based on 2007 total housing units and 2000 data on housing tenure.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009g-i).

11.7.19.1.7 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 11.7.19.1-7. In addition, one Tribal governments is located in the ROI, with members of other Tribal groups located in the county, but whose Tribal governments are located in adjacent counties or states.

11.7.19.1.8 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

Schools

In 2007, the three-county ROI had a total of 32 public and private elementary, middle, and high schools (NCES 2009). Table 11.7.19.1-8 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Nye County schools (16.2) is higher than that in Mineral County (11.5) and Esmeralda County schools (9.6), while the level of service is higher in Esmeralda County (11.6) than elsewhere in the ROI, where there are fewer teachers per 1,000 population (Mineral County, 11.2; Nye County, 9.0).

Health Care

The total number of physicians (41) is much higher in Nye County than Mineral County (4), while the number of physicians per 1,000 population in both counties is similar. No data are available for Esmeralda County (Table 11.7.19.1-9).

TABLE 11.7.19.1-7 ROI Local Government Organizations and Social Institutions in the Proposed Millers SEZ

Governments	
City	
None	
County	
Esmeralda County	Nye County
Mineral County	
Tribal	
Walker River Paiute Tribe of the Walker River Reservation, Nevada	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

TABLE 11.7.19.1-8 ROI School District Data for the Proposed Millers SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Esmeralda County	77	8	9.6	11.6
Mineral County	612	53	11.5	11.2
Nye County	6,427	396	16.2	9.0
ROI	7,116	457	15.6	9.2

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

TABLE 11.7.19.1-9 Physicians in the Proposed Millers SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Esmeralda County	0	--
Mineral County	4	0.8
Nye County	41	0.9
ROI	45	0.9

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 11.7.19.1-10). Esmeralda County has 10 officers and would provide law enforcement services to the SEZ; there are 104 officers in Nye County and 18 officers in Mineral County. Levels of service of police protection are 14.5 per 1,000 population in Esmeralda County, 3.8 in Mineral County, and 2.4 in Nye County. Currently, there are 110 professional firefighters in the ROI (Table 11.7.19.1-10).

11.7.19.1.9 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and

TABLE 11.7.19.1-10 Public Safety Employment in the Proposed Millers SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Esmeralda County	10	14.5	0	0.0
Mineral County	18	3.8	28	6.0
Nye County	104	2.4	82	1.9
ROI	132	2.7	110	2.2

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and, consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism and illicit drug use, metal health, and divorce, which might be used as indicators of social change, are presented in Tables 11.7.19.1-11 and 11.7.19.1-12, respectively.

There is some variation in the level of crime across the ROI, with higher rates of violent crime in Esmeralda County (4.5 per 1,000 population) than in Mineral County (3.2) and Nye County (2.9) (Table 11.7.19.1-11). Property-related crime rates are higher in Nye County (20.8) than in Esmeralda County (15.1) and Mineral County (5.2); overall crime rates in Nye County (23.0) were higher than in Esmeralda County (19.6) and Mineral County (8.4).

Data on other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located (Table 11.7.19.1-12).

TABLE 11.7.19.1-11 County and ROI Crime Rates for the Proposed Millers SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
Esmeralda County	3	4.5	10	15.1	13	19.6
Mineral County	15	3.2	24	5.2	39	8.4
Nye County	124	2.9	892	20.8	1,016	23.0
ROI	142	2.9	926	18.7	1,068	21.6

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 11.7.19.1-12 Alcoholism, Drug Use, Mental Health and Divorce in the Proposed Millers SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Nevada Rural (includes Esmeralda, Mineral and Nye County)	8.0	2.7	9.5	–[d]
Nevada				6.5

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] A dash indicates date not available.

Sources: SAMHSA (2009); CDC (2009).

11.7.19.1.10 ROI Recreation

Various areas in the vicinity of the proposed Millers SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including backcountry driving, OHV use and hunting. These activities are discussed in Section 11.7.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 1,859 people were employed in the ROI in the various sectors identified as recreation, constituting 9.8 % of total ROI employment (Table 11.7.19.1-13). Recreation spending also produced almost $41.5 million in income in the ROI in 2007. The primary sources of recreation-related employment were hotels and lodging places and eating and drinking places.

11.7.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation, social change, and livestock grazing. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of facilities employing various solar energy technologies are analyzed in detail in subsequent sections.

TABLE 11.7.19.1-13 Recreation Sector Activity in the Proposed Millers SEZ ROI, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	105	3.8
Automotive rental	13	0.4
Eating and drinking places	923	16.5
Hotels and lodging places	691	17.8
Museums and historic sites,	1	0.2
Recreational vehicle parks and campsites	56	1.5
Scenic tours	39	1.0
Sporting goods retailers	31	0.4
Total ROI	1,859	41.5

Source: MIG, Inc. (2010).

11.7.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Millers SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries and on procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy facilities are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic, because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar development in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodations otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy development in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, and delinquency and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 4.4% in regional population during construction of the trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families and insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar development are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

Livestock Grazing Impacts

*C*attle ranching and farming supported 82 jobs, and $1.8 million in income in the ROI in 2007,(MIG, Inc. 2010). The construction and operation of solar facilities in the Millers SEZ could result in a decline in the amount of land available for livestock grazing. However, because the amount of acreage that would be used in the proposed SEZ would be small compared to the overall size of locally affected land allotments, acreage loss would not have a significant impact on overall grazing operations, with livestock management changes, or the provision of additional livestock management facilities, meaning that no loss of AUMs is anticipated.

11.7.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis is presented in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of two projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 6,000 acres (24 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower, 2022 for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period, because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 4,578 jobs (Table 11.7.1.19.2-1). Construction activities would constitute 14.7% of total ROI employment. A solar facility would also produce $278.3 million in income and $0.2 million in direct sales taxes.

Based on the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 3,654 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would be expected to be large, with 1,827 rental units expected to be occupied in the ROI. This occupancy rate would represent 91.7% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 34 new teachers, 3 physicians, and 17 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 4.4% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 785 jobs (Table 11.7.19.2-1). Such a solar facility would also produce $26.3 million in income and $0.2 million in direct sales taxes. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), acreage–related fees would be $1.1 million, and solar generating capacity fees would total at least $17.6 million.

Based on the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 373 persons in-migrating into the ROI.

TABLE 11.7.19.2-1 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Millers SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	3,283	585
Total	4,578	785
Income[b]		
Total	278.3	26.3
Direct state taxes[b]		
Sales	0.2	0.2
BLM payments		
Acreage-related fee	NA	1.1
Capacity fee[d]	NA	17.6
In-migrants (no.)	3,654	373
Vacant housing[c] (no.)	1,827	336
Local community service employment		
Teachers (no.)	34	3
Physicians (no.)	3	0
Public safety (no.)	17	2

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,200 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,686 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 336 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, 3 new teachers and 2 public safety employees (career firefighters and uniformed police officers) would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 1,823 jobs (Table 11.7.19.2-2). Construction activities would constitute 5.9% of total ROI employment. Such a solar facility would also produce $110.8 million in income and $0.1 million in direct sales taxes.

Based on the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 1,456 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 728 rental units expected to be occupied in the ROI. This occupancy rate would represent 36.5% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 13 new teachers, 1 physician, and 7 public safety employees would be required in the ROI. These increases would represent 1.8% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 370 jobs (Table 11.7.19.2-3). Such a solar facility would also produce $12.0 million in income. Direct sales taxes would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), acreage–related fees would be $1.1 million, and solar generating capacity fees would total at least $9.8 million.

TABLE 11.7.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Millers SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	1,308	302
Total	1,823	370
Income[b]		
Total	110.8	12.0
Direct state taxes[b]		
Sales	0.1	<0.1
BLM payments		
Acreage-related fee	NA	1.1
Capacity fee[d]	NA	9.8
In-migrants (no.)	1,456	193
Vacant housing[c] (no.)	728	173
Local community service employment		
Teachers (no.)	13	2
Physicians (no.)	1	0
Public safety (no.)	7	1

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,492 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Based on the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 193 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 173 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 2 new teachers and 1 public safety employee would be required in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 741 jobs (Table 11.7.19.2-3). Construction activities would constitute 2.4% of total ROI employment. Such a solar facility would also produce $45.1 million in income and less than $0.1 million in direct sales taxes.

Based on the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 592 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 296 rental units expected to be occupied in the ROI. This occupancy rate would represent 14.9% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 5 new teachers, 1 physician, and 3 public safety employees would be required in the ROI. These increases would represent less than 0.7% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 360 jobs (Table 11.7.19.2-3). Such a solar facility would also produce $11.7 million in income and less than $0.1 million in direct sales taxes. Based on fees established by the BLM in its Solar

TABLE 11.7.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Millers SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	532	294
Total	741	360
Income[b]		
Total	45.1	11.7
Direct state taxes[b]		
Sales	<0.1	<0.1
BLM payments		
Acreage-related fee	NA	1.1
Capacity fee[d]	NA	9.8
In-migrants (no.)	592	187
Vacant housing[c] (no.)	296	168
Local community service employment		
Teachers (no.)	5	2
Physicians (no.)	1	0
Public safety (no.)	3	1

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,492 MW.

b Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Energy Interim Rental Policy (BLM 2010d), acreage–related fees would be $1.1 million, and solar generating capacity fees would total at least $9.8 million.

Based on the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 187 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 168 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 2 new teachers and 1 public safety employee would be required in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 346 jobs (Table 11.7.19.2-4). Construction activities would constitute 1.1% of total ROI employment. Such a solar development would also produce $21.0 million in income and less than $0.1 million in direct sales taxes.

Based on the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 276 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 138 rental units expected to be occupied in the ROI. This occupancy rate would represent6.9% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 3 new teachers and 1 public safety employee would be required in the ROI. This increase would represent less than 0.3% of total ROI employment expected in this occupation.

TABLE 11.7.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Millers SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	248	29
Total	346	36
Income[b]		
Total	21.0	1.2
Direct state taxes[b]		
Sales	<0.1	<0.1
BLM payments		
Acreage-related fee	NA	1.1
Capacity fee[d]	NA	7.8
In-migrants (no.)	276	19
Vacant housing[c] (no.)	138	17
Local community service employment		
Teachers (no.)	3	0
Physicians (no.)	0	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,492 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada.

[c] Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

[d] The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d) , assuming full build-out of the site.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 36 jobs (Table 11.7.19.2-4). Such a solar facility would also produce $1.2 million in income and less than $0.1 million in direct sales taxes. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010d), acreage–related fees would be $1.1 million, and solar generating capacity fees would total at least $7.8 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 19 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 17 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

11.7.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Millers SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

11.7.20 Environmental Justice

11.7.20.1 Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register,* Volume 59, page 7629, Feb. 11, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed Millers SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009j,k). The following definitions were used to define minority and low-income population groups:

- **Minority**. Persons who identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origin may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009j).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income**. Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009k).

The data in Table 11.7.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

Minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in California, 18.2% of the population is classified as minority, while 9.3% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ area.

In the Nevada portion of the 50-mi (80-km) radius, 16.2% of the population is classified as minority, while 11.6% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or

TABLE 11.7.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Millers SEZ

Parameter	California	Nevada
Total population	3,162	7,713
White, non-Hispanic	2,586	6,464
Hispanic or Latino	348	535
Non-Hispanic or Latino minorities	228	714
One race	170	460
Black or African American	3	66
American Indian or Alaskan Native	144	337
Asian	13	24
Native Hawaiian or Other Pacific Islander	5	12
Some other race	5	21
Two or more races	58	254
Total minority	576	1,249
Low-income	293	893
Percentage minority	18.2	16.2
State percentage minority	53.3	34.8
Percentage low-income	9.3	11.6
State percentage low-income	14.2	10.5

Source: U.S. Bureau of the Census (2009j,k).

more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ area.

11.7.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of the programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed Millers SEZ include noise and dust during the construction; noise and electromagnetic field (EMF) effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Impacts are likely to be small, however, and there are no minority populations defined by CEQ guidelines (Section 11.7.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects could not disproportionately affect minority populations. Because there are no low-income populations within the 50-mi (80-km) radius, there could be no impacts on low-income populations.

11.7.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Millers SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

11.7.21 Transportation

The proposed Millers SEZ is accessible by road. One U.S. highway serves the immediate area. The nearest railroad access is approximately 90 mi (145 km) away. Five small airports serve the area within a drive of approximately 90 mi (145 km). General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

11.7.21.1 Affected Environment

U.S. 95/U.S. 6 runs east–west along the southern border of the Millers SEZ, as shown in Figure 11.7.21.1-1. The small town of Tonopah is approximately 15 mi (24 km) to the east of the SEZ along U.S. 95. To the southeast of the SEZ, U.S. 95 intersects Interstate 15 (I-15) in the center of the Las Vegas metropolitan area, about 230 mi (370 km) away. The town of Fernley to the northwest, at about the closest approach of I-80 to the SEZ, is approximately a 185-mi (298-km) drive. From the east, U.S. 6 merges with U.S. 95 at Tonopah before they pass along the southern edge of the SEZ. Approximately 20 mi (32 km) to the west of the SEZ, U.S. 95 and U.S. 6 again become separate highways. Several local unimproved dirt roads cross the SEZ as shown in Figure 11.7.21.1-1. Data identifying open OHV routes within the proposed SEZ were not available. As listed in Table 11.7.21.1-1, U.S. 95 carries an average traffic volume of about 2,000 vehicles per day in the vicinity of the Millers SEZ (NV DOT 2010).

The UP Railroad serves the region. A spur from the main line that crosses northern Nevada ends at Thorne (UP Railroad 2009), 90 mi (145 km) northwest of the SEZ along U.S. 95, immediately north of Hawthorne.

The nearest public airport is the Tonopah Airport, a small county airport about a 23-mi (37-km) drive to the east of the SEZ on U.S. 6. The airport has two asphalt runways in good condition, as listed in Table 11.7.21.1-2. Three small airports with single dirt runways managed by the BLM—Dyer, Lida Junction, and Mina—are within a 64-mi (103-km) drive of the Millers SEZ. Hawthorne Industrial Airport, in Hawthorne, has one asphalt and one dirt runway. None of the airports has scheduled commercial passenger service or regular freight service.

Nellis Air Force Base, available only to military aircraft, lies on the northeastern edge of the Las Vegas metropolitan area. Nellis Air Force Base is one of the largest fighter bases in the world and is involved in conducting advanced fighter training. Operations occur over the NTTR, which offers 4,700 mi^2 (12,173 km^2) of restricted land (U.S. Air Force 2010). The northwestern corner of the NTTR is approximately 26 mi (42 km) to the southeast of the Millers SEZ.

11.7.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum) or possibly 4,000 vehicle trips per day if two larger projects were to be developed at the same time. The volume of traffic on U.S. 95

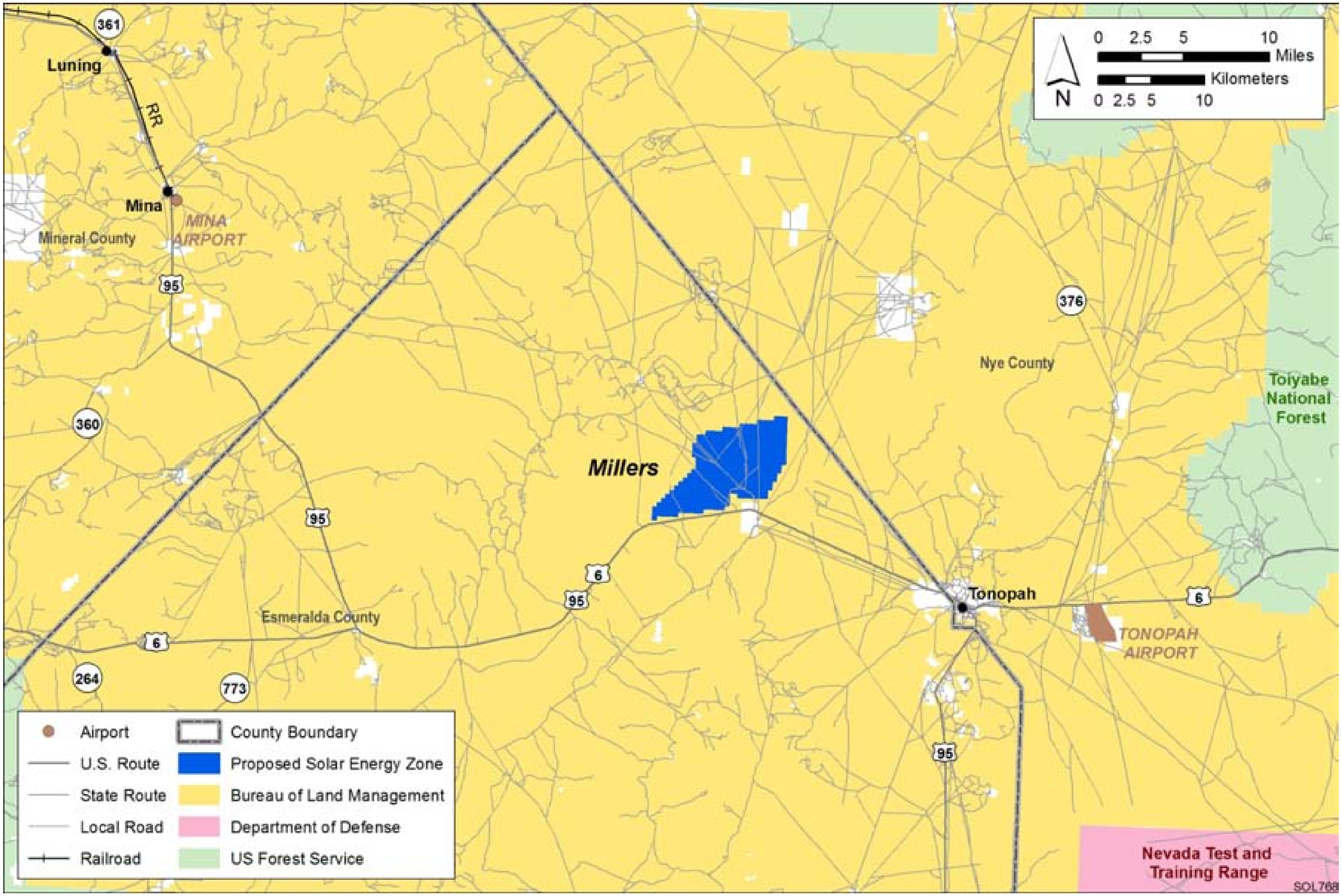

FIGURE 11.7.21.1-1 Local Transportation Network Serving the Proposed Millers SEZ

TABLE 11.7.21-1 AADT on Major Roads near the Proposed Millers SEZ for 2009

Road	General Direction	Location	AADT (Vehicles)
U.S. 6	East–West	*East of merge with U.S. 95*	
		East of State Route 376	580
		East of Tonopah (west of State Route 376)	1,100
		West of merge with U.S. 95	
		West of Coaldale junction	280
U.S. 95	Northwest–Southeast	North of Coaldale junction	1,700
		West of junction with State Route 265 (west of SEZ)	2,000
		North of Tonopah, 13 mi (21 km) past the Nye/ Esmeralda County line (east of the SEZ)	1,900
		South of Tonopah	2,100
		South of Goldfield	2,000
		North of junction with State Route 266	1,900
		South of junction with State Route 266	2,000
State Route 265	North–South	South of junction with U.S. 95	110
State Route 376	North–South	North of U.S. 6	490
State Route 773	Southwest–Northeast	South of junction with U.S. 6	70

Source: NV DOT (2010).

along the southern edge of the Millers SEZ would represent an increase in traffic of about 100 or 200% for one or two projects, respectively, should all traffic access the SEZ in that area.

Because higher traffic volumes would be experienced during shift changes, traffic on U.S. 95 would experience slowdowns during these time periods in the vicinity of access roads for projects in the SEZ. Local road improvements would be necessary on any portion of U.S. 95 that might be developed so as not to overwhelm the local access roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any designated as open within the proposed SEZ, open routes crossing areas issued ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

11.7.21.3 Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed Millers SEZ. The programmatic design features described in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

TABLE 11.7.21-2 Airports Open to the Public in the Vicinity of the Proposed Millers SEZ

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Dyer	Southeast of Dyer, 64 mi (103 km) from the SEZ via U.S. 95, U.S. 6, and State Route 264	BLM	2,870 (875)	Dirt	Fair	NA[b]	NA	NA
Hawthorne Industrial	89 mi (143 km) northwest of the SEZ on U.S. 95 in Hawthorne	Mineral County	3,500 (1,067)	Dirt	Good	6,000 (1,829)	Asphalt	Good
Lida Junction	South–southeast of the SEZ on U.S. 95 at the junction with State Route 266, 58 mi (93 km) away	BLM	6,100 (1,859)	Dirt	Good	NA	NA	NA-
Mina	54 mi (87 km) northwest of the SEZ in Mina on U.S. 95	BLM	4,600 (1,402)	Dirt	Good	NA	NA	NA
Tonopah	East of Tonopah, 23 mi (37 km) east of the SEZ on U.S. 6	Nye County	6,196 (1,889)	Asphalt	Good	7,161 (2,183)	Asphalt	Good

[a] Source: FAA (2009).

[b] NA = not applicable.

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11.7.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Millers SEZ in Esmeralda County, Nevada. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The Millers SEZ is located 15 mi (24 km) northwest of Tonopah, Nevada. The land surrounding the Millers SEZ is undeveloped with few permanent residents living in the area. The nearest population center is the small community of Tonopah, population approximately 1,500. The NTTR is 30 mi (48 km) northeast of the SEZ. Several WAs in California are within 50 mi (80 km) of the SEZ. The BLM administers approximately 68% of the land in the Southern Nevada District, which contains the Millers SEZ, and about 56% of the land in Nye County.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the Millers SEZ is identified in Section 11.7.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 11.7.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 11.7.22.3. Cumulative impacts for each resource area are discussed in Section 11.7.22.4.

11.7.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Millers SEZ is provided in Table 11.7.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than visual resources). The BLM, USFS, and DoD administer most of the land around the SEZ; there are also some Tribal lands nearby at the Yomba Reservation 48 mi (77 km) to the north of the SEZ. The BLM administers approximately 76.6% of the lands within a 50-mi (80-km) radius of the SEZ.

11.7.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable"; that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;

TABLE 11.7.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Millers SEZ

Resource Area	Geographic Extent
Land Use	Esmeralda County
Specially Designated Areas and Lands with Wilderness Characteristics	Esmeralda County
Rangeland Resources	
Grazing	Esmeralda County
Wild Horses and Burros	A 50 mi (80 km) radius from the center of the Millers SEZ
Recreation	Esmeralda County
Military and Civilian Aviation	Esmeralda and Nye Counties
Soil Resources	Areas within and adjacent to the Millers SEZ
Minerals	Esmeralda County
Water Resources	
Surface Water	Ione Wash, Peavine Creek, unnamed wash, Slime Wash, unnamed dry lake
Groundwater	Tonopah Flat Groundwater Basin
Air Quality and Climate	A 31-mi (50-m) radius from the center of the Millers SEZ
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Millers SEZ, including portions of Esmeralda, Nye, and Mineral Counties in Nevada, and Inyo County in California
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Millers SEZ
Acoustic Environment (noise)	Areas adjacent to the Millers SEZ
Paleontological Resources	Areas within and adjacent to the Millers SEZ
Cultural Resources	Areas within and adjacent to the Millers SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Millers SEZ for other properties, such as traditional cultural properties.
Native American Concerns	Areas within and adjacent to the Millers SEZ in the Big Smoky Valley viewshed within a 25-mi (40-km) radius of the Millers SEZ
Socioeconomics	Esmeralda and Nye Counties
Environmental Justice	Esmeralda and Nye Counties
Transportation	U.S. 95, U.S. 6

- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the *Federal Register* or state publications;
- Proposals for which enabling legislations has been passed; and
- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 11.7.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 11.7.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

11.7.22.2.1 Energy Production and Distribution

On February 16, 2007, Governor Gibbons signed an Executive Order to encourage the development of renewable energy resources in Nevada (Gibbons 2007a). The Executive Order requires all relevant state agencies to review their permitting processes to ensure the timely and expeditious permitting of renewable energy projects. On May 9, 2007, and June 12, 2008, the Governor signed Executive Orders creating the Nevada Renewable Energy Transmission Access Advisory Committee Phase I and Phase II, which will propose recommendations for improved access to the grid system for renewable energy industries (Gibbons 2007b, 2008). In May 28, 2009, the Nevada Legislature passed a bill modifying the Renewable Energy Portfolio Standards (Nevada Senate 2009). The bill requires that 25% of the electricity sold to be produced by renewable energy sources by 2025.

Reasonably foreseeable future actions related to energy production and distribution are identified in Table 11.7.22.2-1 and described in the following sections.

TABLE 11.7.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Millers SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Fast-Track Solar Energy Projects on BLM-Administered Land			
Crescent Dunes Solar Energy Project (NVN-86292); 180 MW, solar tower, 1,600 acres	NOI, Nov. 24, 2009	Terrestrial habitats, wildlife, vegetation, water, soils, cultural, visual, aviation, and land use	3 mi (5 km) east of the SEZ
Renewable Energy Development			
Darrough Hot Springs Geothermal Leasing Project; 27 MW, 160 acres	ROD issued Aug. 18, 2009	Terrestrial habitats, wildlife	45 mi (72 km) north of the SEZ
Transmission and Distribution Systems			
None			

[a] Projects in later stages of agency environmental review and project development.

Renewable Energy Development

Renewable energy ROW applications are considered as either foreseeable or potential projects. Fast-track applications are considered to represent foreseeable projects, since the environmental review and public participation process is completed or under way and the applications could be approved by December 2010. There is one fast-track solar project and one other foreseeable geothermal project within 50 mi (80 km) of the proposed Millers SEZ, the Crescent Dunes Solar Energy Project, and Darrough Hot Springs Geothermal Leasing Project, respectively. Regular-track applications are considered potential future projects, but not necessarily foreseeable projects, since not all applications would be expected to result in competed projects. These proposals are considered together as a general level of interest in development of renewable energy in the region. Identified foreseeable and potential (pending) renewable energy projects are discussed in the following sections.

Foreseeable Renewable Energy Projects

Crescent Dunes Solar Energy Project (NVN 86292). This proposed fast-track project would be a CSP/tower facility with an output of 180 MW. Tonopah Solar Energy proposed to construct and operate the facility. The project would be located about 3 mi (5 km) east of the SEZ on 1,600 acres (6.5 km^2) of the 7,680-acre (31-km^2) site on BLM-administered land 13 mi

(21 km) northwest of Tonopah, Nevada. The facility would include a circular array of 17,350 heliostats that reflect the sunlight onto a central 633-ft (193-m) tall receiver tower. A liquid salt circulating through the tubes of the receiver is heated to more than 1,000°F (538°C) and routed to a thermal storage tank. When electricity is to be generated, the hot salt passes through a heat exchanger to produce steam for use in a steam turbine/generator. A hybrid cooling system would consist of an air-cooled condenser augmented with a wet-cooling system. The facility would also include associated equipment, an 8-mi (13-km) transmission line, an operation and maintenance building, and access roads (Tonopah Solar Energy 2009; BLM 2009a).

Darrough Hot Springs Geothermal Leasing Project. Great America Energy is proposing to construct and operate a 27-MW geothermal plant on 160 acres (0.65 km^2) of Humboldt-Toiyabe National Forest land, 45 mi (72 km) north of the SEZ. The physical facilities comprise production and injection wells, a gathering and injection system, and a power generation plant on site, with a transmission line connecting it to the grid (Great American Energy 2010).

Pending Solar, Wind, and Geothermal ROW Applications on BLM-Administered Lands. Applications for ROWs that have been submitted to the BLM include one fast-track solar application, one pending solar project, one pending wind site testing application, four authorized wind site testing projects, and two authorized geothermal projects that would be located within 50 mi (80 km) of the Millers SEZ. Table 11.7.22.2-2 lists these applications and Figure 11.7.22.2-1 shows their locations.

There is a pending solar project that would be on private land adjacent to the Millers SEZ. In 2010, Altella Energy Corporation proposed to Esmeralda County the development of a 100-MW solar energy facility on private land. The proposed site is located within one mile south of the Millers SEZ, near Highways 6 and 95. The site is known as the Miller's Well site. The project's estimated cost is $500 million (Esmeralda County 2010a,b).

The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The number and types of applications listed in Table 11.7.22.2-2 are an indication of the level of interest in the development of renewable energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

Wind testing would involve some relatively minor activities that could have some environmental effects, mainly the erection of meteorological towers and monitoring of wind conditions. These towers may or may not employ guy wires and may be 200 ft (60 m) high.

TABLE 11.7.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Millers SEZ[a,b]

Serial Number	Applicant	Application Received	Size (acres)[c]	MW	Technology	Status	Field Office
Solar Applications							
NVN 85215	Luning Solar Energy	May 20, 2008	575	30	PV	Pending	Stillwater
Wind Applications							
NVN 85811	Wasatch Wind	June 4, 2008	6,023	–	Wind	Pending wind site testing	Stillwater
NVN 80354	Windqwest, LLC	June 10, 2005	1,248	–	Wind	Authorized wind site testing	Stillwater
NVN 84404	–[d]	–	–	–	Wind	Authorized wind site testing	Tonopah
NVN 86261	Greenwing Energy Management	Oct. 24, 2008	15,680	–	Wind	Authorized wind site testing	Tonopah
NVN 87324	Pacific Wind Development	March 23, 2009	4,280	–	Wind	Authorized wind site testing	Tonopah
Geothermal Leases							
NVN 56347X	Fish Lake Power	–	47,769	–	Geothermal	Authorized	Tonopah
NVN 85257X	Ormat Technologies	–	5,130	–	Geothermal	Authorized	Tonopah

[a] Source: BLM (2009b).

[b] Information for pending solar and pending wind (BLM and USFS 2010b) energy projects downloaded from GeoCommunicator.

[c] To convert acres to km^2, multiply by 0.004047.

[d] A dash indicates data not available.

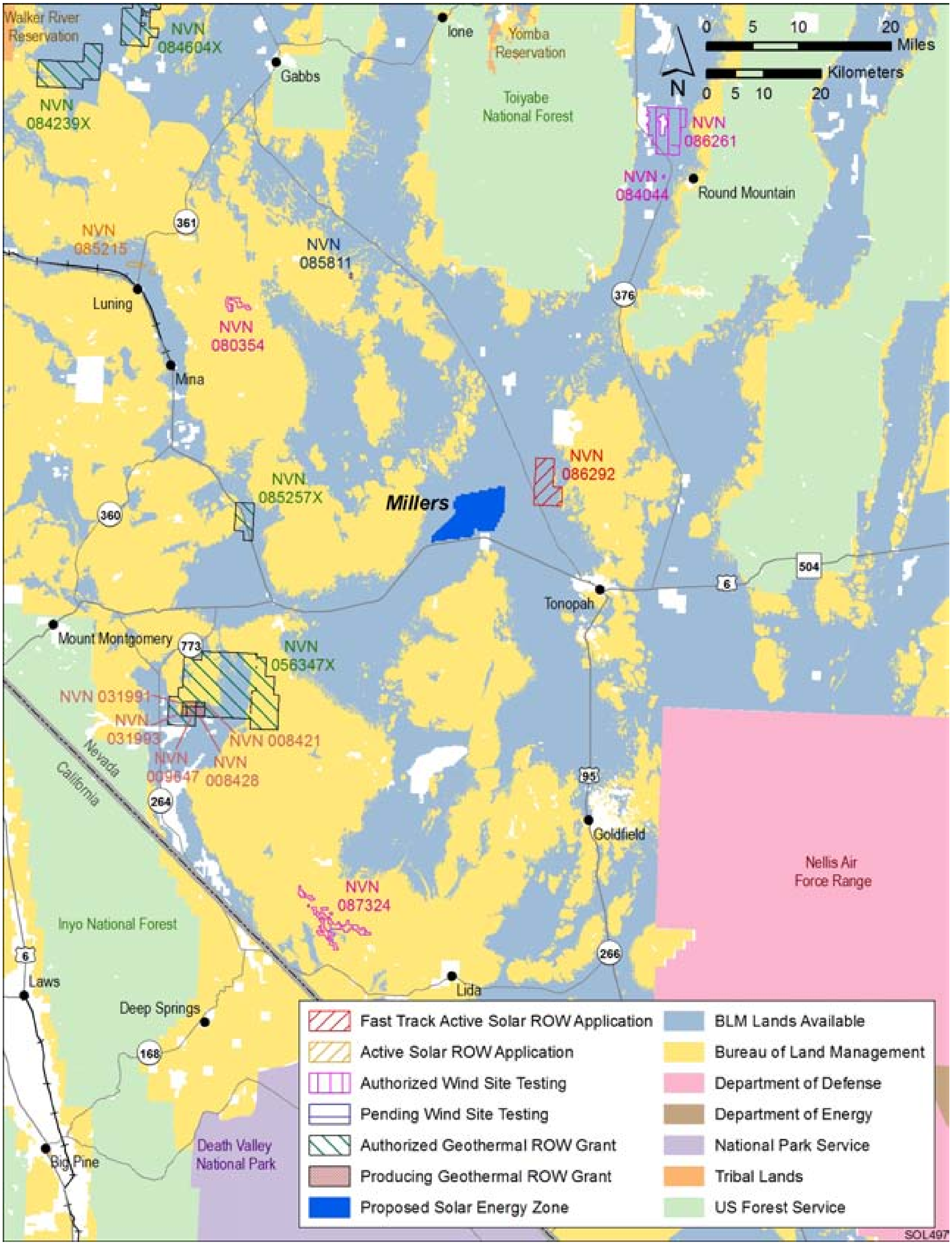

FIGURE 11.7.22.2-1 Locations of Renewable Energy Project ROW Applications on Public Land within a 50-mi (80-km) Radius of the Proposed Millers SEZ

11.7.22.2.2 Other Actions

Other major ongoing and foreseeable actions identified within 50 mi (80 km) of the proposed Millers SEZ are listed in Table 11.7.22.2-3 and are described in the following subsections. Producing geothermal leases are covered in the previous section.

Round Mountain Mine Expansion. The Round Mountain Gold Corporation proposes to expand its existing Round Mountain Mine, located east and southeast of the town of Carver and 45 mi (72 km) north of the SEZ, including expansion of the Round Mountain open pit, North Waste Rock Dump, mill facility, tailings impoundment, growth media and ore stockpiles, stormwater control and diversion structures, dewatering operations for the open pit, west and south dedicated leach pads, reusable pad, and process facilities. The proposed action would include the expansion and development of facilities and construction of new facilities in the Gold Hill area, 1.6 mi (2.4 km) north, and would include the construction of a 1.1-mi (1.8-km) long

TABLE 11.7.22.2-3 Other Major Actions near the Proposed Millers SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Round Mountain Mine Expansion	FEIS issued April 2010	Terrestrial habitats, wildlife, cultural resources	45 mi (72 km) north of the SEZ
Chemetall Foote Lithium Carbonate Facility Expansion	EA issued Sept 2010	Terrestrial habitats, wildlife, air quality	30 mi (48 km) south of the SEZ
Mineral Ridge Project	Restarting in 2011	Terrestrial habitats, groundwater, air quality	28 mi (45 km) south of the SEZ
Caliente Rail Realignment	FEIS June 2008	Terrestrial habitats, wildlife cultural resources	24 mi (38 km) southeast of the SEZ
Montezuma Peak Herd Management Area (HMA) and Paymaster HMA Wild Horse and Burro Gather	EA issued June 2010	Terrestrial habitats, wildlife	32 mi (51 km) and 8 mi (13 km) southeast of the SEZ
Five Producing Geothermal Leases: NVN 8421, 8428, 9647, 31991, and 31993	Operating	Terrestrial habitats, wildlife	32 mi (51 km) southwest of the SEZ

[a] Projects in latter stages of agency environmental review and project development.

Transportation/Utility Corridor between the Round Mountain and Gold Hill areas, which would include a haul road, electric transmission line, water pipeline, and communication lines. The total disturbed area would be 4,698 acres (19.0 km^2) The existing total employment level of approximately 730 workers would grow to a maximum of 1,140 during construction and would range between 760 and 940 through completion of surface mining in 2016 (BLM 2010a).

Chemetall Foote Lithium Carbonate Facility Expansion. The DOE is proposing to upgrade an existing brine field production system, brine evaporation pond system, and lithium carbonate plant at the Chemetall Foote facility adjacent to the unincorporated town of Silver Peak, Nevada and 30 mi (48 km) south of the SEZ. The site is about 15,000 acres (61 km^2), mostly occupied by large evaporation ponds. The plant and administrative offices occupy approximately 20 acres (0.08 km^2). Existing lithium brine ponds would be expanded through recovering old ponds and rebuilding the dikes. Construction of new brine production wells would require soil placement for drill pads (DOE 2010).

Mineral Ridge Project. Mineral Ridge, a formerly producing gold and silver mine, has both underground workings and open pits, with a six-acre (0.024-km^2) deep leach operation and a high volume crusher plant. It is currently not operational but engineering work is being performed for future operations. It is anticipated that active mining will commence in 2011. The site is 3 mi (3 km) northwest of the unincorporated town of Silver Peak and approximately 28 mi (45 km) south of the SEZ (Top Stock Picks 2010).

Caliente Rail Alignment. The DOE proposes to construct and operate a railroad for the shipment of spent nuclear fuel and high-level radioactive waste to the geologic repository at Yucca Mountain, Nevada. The rail line would begin near Caliente, Nevada and extend north, then turn in a westerly direction, passing about 24 mi (38 km) southeast of the SEZ, to a location near the northwest corner of the Nevada Test and Training Range (labeled Nellis Air Force Range in Figure 11.7.22.2-1), and then continue south-southwest to Yucca Mountain. The rail line would range in length from approximately 328 mi (528 km) to 336 mi (541 km), depending upon the exact location of the alignment, and would be restricted to DOE shipments. Over a 50-year period, 9,500 casks containing spent nuclear fuel and high-level radioactive waste, and approximately 29,000 rail cars of other materials, including construction materials, would be shipped to the repository. An average of 17 one-way trains per week would travel along the rail line. Construction of support facilities - interchange yard, staging yard, maintenance-of-way facility, rail equipment maintenance yard, cask maintenance facility, and Nevada Rail Control Center and National Transportation Operation Center would also be required. Construction would take 4 to 10 years and cost $2.57 billion. Construction activities would occur inside a 1000 ft (300 m) wide ROW for a total footprint of 40,600 acres (164 km^2) (DOE 2008).

Montezuma Peak HMA and Paymaster HMA Wild Horse and Burro Gather. The BLM Tonopah Field Office is proposing to conduct a wild horse and burro gather to remove approximately 182 wild horses and burros residing primarily outside the boundaries of the

HMAs. The Montezuma Peak HMA is located west of the town of Goldfield, 32 mi (51 km) southeast of the SEZ and encompasses approximately 77,931 acres (315 km^2). The Paymaster HMA is 7 mi (11 km) west of Tonopah, 8 mi (13 km) southeast of the SEZ and encompasses 100.500 acres (425 km^2) (BLM 2010b).

Existing Geothermal Leases. There is a small, contiguous cluster of five producing geothermal leases located about 32 mi (51 km) southwest of the proposed SEZ, shown in Figure 11.7.22.2-1.

Grazing

The Monte Cristo grazing allotment is in the immediate vicinity of the SEZ.

Mining

The existing Round Mountain gold mine and proposed expansion is discussed above in this section.

11.7.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change for the proposed Millers SEZ are presented in this section. Table 11.7.22.2-4 lists the relevant impacting factors for the trends.

11.7.22.3.1 Population Growth

Over the period 2000 to 2008, the population grew annually by 3.9% in Nye County but the population fell by –4.6% annually in Esmeralda County and by –1.1 in Mineral County, the ROI for the Millers SEZ (see Section 11.7.19.1.5). The population of the ROI in 2008 was 49,487, having grown at an average annual rate of 3.2% since 2000. The annual growth rate for the state of Nevada as a whole was 3.4%.

11.7.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in seven-SEZ areas in Nevada between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States

TABLE 11.7.22.2-4 General Trends Relevant to the Proposed SEZs in Nevada

General Trend	Impacting Factors
Population growth	Urbanization Increased use of roads and traffic Land use modification Employment Education and training Increased resource use (e.g., water and energy) Tax revenue
Energy demand	Increased resource use Energy development (including alternative energy sources) Energy transmission and distribution
Water availability	Drought conditions and water loss Conservation practices Changes in water distribution
Climate change	Water cycle changes Increased wildland fires Habitat changes Changes in farming production and costs

between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5, 0.4, and 0.1% each year, respectively (EIA 2009).

11.7.22.3.3 Water Availability

As described in Section 11.7.9.1.3, the perennial yield of the Tonopah Flat groundwater basin is set at 6,000 ac-ft/yr (7.4 million m^3/yr), and water rights in the basin are over-appropriated with a total of 19,588 ac-ft/yr (24.2 million m^3/yr) being allotted for irrigation, mining, municipal, and stockwater uses (95% of allotments used for irrigation and mining [NDWR 2010a]).

The general groundwater flow pattern in the Tonopah Flat basin is from northeast to southwest along the axis of the valley. The depth to groundwater ranges from 8 to 78 ft (2 to 24 m) below the land surface within a 5-mi (8-km) radius of the proposed SEZ (USGS 2010b). In general, depth to groundwater is greater in the northern portion of the Tonopah Flat basin and is near surface levels in the vicinity of the dry lake playas in the south portion of the basin (Meinzer 1917; Rush and Schroer 1971).

In 2005, water withdrawals from surface waters and groundwater in Esmeralda County were 46,786 million ac-ft/yr (57.7 million m^3/yr), of which 9% came from surface waters and 91% came from groundwater. The largest water use categories for groundwater were irrigation and mining at 28,235 and 14,202 ac-ft/yr (34.8 million and 17.5 million m^3/yr), respectively. The remaining groundwater withdrawals were used for domestic and livestock (Kenny et al. 2009). In the Tonopah Flat basin, groundwater extractions totaled 260 ac-ft/yr (320,700 m^3/yr) in 1968, which was primarily used for irrigation purposes (Rush and Schroer 1971).

11.7.22.3.4 Climate Change

Governor Jim Gibbons' Nevada Climate Change Advisory committee (NCCAC) conducted a study of climate change and its effects on Nevada (NCCAC 2008). The report summarized the present scientific understanding of climate change and its potential impacts on Nevada. A report on global climate change in the United States prepared by the U.S. Global Research Change Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from these reports indicate:

- Decreased precipitation, with a greater percentage of that precipitation coming from rain, will result in a greater likelihood of winter and spring flooding and decreased stream flow in the summer.

- The average temperature in the Southwest has already increased by about 1.5ºF (0.08ºC) compared to a 1960 to 1979 baseline, and by the end of the century, the average annual temperature is projected to rise 4ºF to 10ºF (2.2 to 5.5ºC).

- Warming climate and the related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires.

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end.

- Much of the Southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region.

- As temperatures rise, landscape will be altered as species shift their ranges northward and upward to cooler climates.

- Temperature increases, when combined with urban heat island effects for major cities such as Las Vegas, present significant stress to health, electricity, and water supply.

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

11.7.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Millers SEZ on the basis of the following assumptions: (1) because of the moderate size of the proposed SEZ (10,000 to 30,000 acres [40.5 to 121 km^2]), up to two projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 13,430 acres (54.4 km^2) (80% of the entire proposed SEZ). For purposes of analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. Since an existing 120-kV transmission line runs through the SEZ, no analysis of impacts has been conducted for the construction of a new transmission line outside of the SEZ that might be needed to connect solar facilities to the regional grid (see Section 11.7.1.2). Regarding site access, because U.S. 95/U.S. 6 runs from east to west along the southern border of the SEZ, no major road construction activities outside of the SEZ would be needed to support solar development in the SEZ.

Cumulative impacts that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section in each resource area are discussed below. At this stage of development, because of the uncertain nature of the future projects in terms of size, number, location within the proposed SEZ, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

11.7.22.4.1 Lands and Realty

The area covered by the proposed Millers SEZ is largely isolated and undeveloped. In general, the areas surrounding the SEZ are rural in nature. Existing dirt roads from separate access points on U.S. 95/U.S. 6 provide access to the southern portion of the SEZ. Numerous dirt/ranch roads provide access throughout the SEZ (Section 11.7.2.1).

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. Utility-scale solar energy development would be a new and discordant land use in the area.

As shown in Table 11.7.22.2-2 and Figure 11.7.22.2-1, there is one fast-track solar application, one pending solar application, one pending wind site testing application, four authorized wind site testing projects, two authorized geothermal projects, and five producing geothermal lease agreements within a 50-mi (80-km) radius of the proposed Millers SEZ. There are currently no solar applications within the SEZ. The Crescent Dunes Solar Energy Project fast-track solar application lies about 3 mi (5 km) northeast of the SEZ. The mix of renewable energy applications indicates modest interest in renewable energy development of all three major types within 50 mi (80 km) of the proposed SEZ, but only the fast-track solar application and the Darrough Hot Springs geothermal project are considered firmly foreseeable projects (Section 11.7.22.2.1).

The Round Mountain Mine Expansion project is the only other major foreseeable action identified within this distance. The mine is located 45 mi (72 km) north of the proposed SEZ (Section 11.7.22.2.2), and the expansion would have minimal impacts on land use near the SEZ.

The development of utility-scale solar projects in the proposed Millers SEZ in combination with other ongoing, foreseeable, and potential actions within the geographic extent of effects, nominally 50 mi (80 km), could have cumulative effects on land use in the vicinity of the proposed SEZ. Ongoing and foreseeable actions on or near the SEZ could result in small cumulative impacts on land use through impacts on land access, groundwater availability, and on visual resources, especially if the SEZ is fully developed with solar projects.

11.7.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

There are no specially designated areas within 25 mi (40 km) of the proposed Millers SEZ in Nevada (Section 11.7.3.1). Thus, no potential exists for cumulative visual impacts on such areas from the construction of utility-scale solar energy facilities within the SEZ.

11.7.22.4.3 Rangeland Resources

The proposed Millers SEZ contains a small portion of one perennial grazing allotment (Section 11.7.4.1.1). If utility-scale solar facilities were constructed on the SEZ, those areas occupied by the solar projects would be excluded from grazing. The effects of other renewable energy projects within the geographic extent of effects, including pending solar, wind, and geothermal applications within 50 mi (80 km) of the SEZ that are ultimately developed, would not likely result in cumulative impacts on grazing due to the small number and distance of the proposed facilities from the proposed SEZ. Other foreseeable projects would likewise have minimal effects on grazing. However, any closure of county roads or interconnected roads on the SEZ could affect access to grazing areas outside the SEZ unless rerouted. Mitigations would minimize such effects.

A number of BLM HMAs and HAs occur within the 50-mi (80-km) SEZ region for the proposed Millers SEZ (Section 11.7.4.2.1), including two within the 5-mi (8-km) area of indirect effects. While such areas near the proposed SEZ contain wild horses, potential indirect impacts from development within the SEZ would be mitigated. Since foreseeable projects within this distance would have minimal effects on wild horses and burros, cumulative impacts are unlikely to occur.

11.7.22.4.4 Recreation

Limited outdoor recreation (e.g., backcountry driving, OHV use, and some camping and hunting) occurs on or in the immediate vicinity of the SEZ. While there are no current solar applications within the proposed SEZ, construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. Road closures and access restrictions within the proposed SEZ would affect access to recreation both inside and outside the SEZ. OHV use in particular could be affected. Foreseeable and potential actions would also affect areas of low recreational use and would have minimal effects on current recreational activities. Thus, cumulative impacts on recreation within the geographic extent of effects are not expected.

11.7.22.4.5 Military and Civilian Aviation

The eastern two-thirds of the proposed SEZ is covered by MTRs with 50- and 100-ft (15- and 30-m) AGL operating limits. The area is located about 30 mi (48 km) northwest of the boundary of the NTTR. The closest civilian municipal aviation facility is the Tonopah Municipal Airport, which is located about 20 mi (32 km) southeast of the SEZ. The military has expressed serious concern over possible solar energy facilities within the SEZ and at the fast-track solar energy site east of the SEZ. Nellis Air Force Base has indicated that any facilities higher than 50 ft (15 m) AGL may present unacceptable electromagnetic compatibility concerns for their test mission (Section 11.7.6.2). Potential new solar, wind, and geothermal facilities and associated new transmission lines outside the SEZ could present additional concerns for military aviation, depending on the eventual location of such facilities with respect to training routes, and thus, could result in cumulative impacts on military aviation. The Tonopah Airport is located at a distance where there would be no effect on airport operations by facilities in the SEZ.

11.7.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from construction of other potential renewable energy facilities, proposed transmission lines, proposed water line, and recreational uses. Cumulative impacts on soil resources from other foreseeable projects within the geographic extent of effects are possible. The proposed 1,600-acre (6.5-km^2) fast-track Crescent Dunes Solar Energy Project would be located 3 mi (5 km) east of the SEZ and would contribute incremental impacts on soils, as could some number of the pending geothermal projects located to the southwest. Such future impacts from renewable energy projects could produce small cumulative increases over those from any development in the SEZ.

Landscaping of solar energy facility areas in the SEZ could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that from other foreseeable projects and other activities (e.g., OHV use, outside the SEZ). However, with the required programmatic design features in place, cumulative impacts would be small.

11.7.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 11.7.8, about two-thirds of the proposed Millers SEZ is covered by placer mining claims, which would represent prior existing rights, as well as potential limitations on solar development. Conversely, additional mining claims could be foreclosed if the SEZ was identified for solar development. In addition, any road closures on the SEZ could affect access to mining areas outside the SEZ. There are currently no active oil and gas leases within the proposed SEZ, while there are proposals for geothermal energy development pending. Because of the expected low impact on mineral accessibility of other foreseeable actions within the geographic extent of effects, and minimization and mitigation of road access closures, cumulative impacts on mineral resources are not expected.

11.7.22.4.8 Water Resources

Section 11.7.9.2 describes the water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities. The amount of water needed during the peak construction year for all evaluated solar technologies would be 2,288 to 3,300 ac-ft (2.8 million to 4.1 million m^3). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for all evaluated solar technologies would range from 77 to 40,327 ac-ft/yr (95 thousand to 50 million m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. As discussed in Section 11.7.22.3.3, water withdrawals in 2005 from surface waters and groundwater in Esmeralda County were 46,786 ac-ft/yr (57.7 million m^3/yr), of which 9% came from surface waters and 91% came from groundwater. The largest water use categories for groundwater were irrigation and mining at 28,235 and 14,202 ac-ft/yr (34.8 million and 17.5 million m^3/yr), respectively. Therefore, cumulatively the additional water resources needed for solar facilities in the SEZ during operations would constitute from a relatively small (0.2%) to a very large (86%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Esmeralda County), depending on the solar technology used (PV technology at the low end and the wet-cooled parabolic trough technology at the high end). However, as discussed in Section 11.7.9.1.3, very little water has been historically withdrawn from the Tonopah Flat basin, roughly 260 ac-ft/yr (320,700 m^3/yr). The perennial yield of the basin is set at 6,000 ac-ft/yr (7.4 million m^3/yr), and water rights in the basin are over-appropriated. Thus, even if water rights were available, solar facilities on the SEZ would have the capacity to far exceed the physically available groundwater in the basin using wet cooling, while full development with dry-cooled solar trough technologies could require two-thirds of estimated basin yields (Section 11.7.9.2.2).

While solar development of the proposed SEZ with water-intensive technologies would likely be infeasible due to impacts on groundwater supplies and restrictions on water rights, excessive groundwater withdrawals could affect groundwater and surface water flows, cause drawdown of groundwater, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water-wetland-groundwater connectivity in the Tonopah Flat basin (Section 11.7.9.2). Therefore the use of groundwater monitoring wells is encouraged in order to determine the actual impact of development within the SEZ on the water table. Small cumulative impacts could occur when combined with other future projects in the region. The proposed fast-track Crescent Dunes Solar Energy Project, which would be located 3 mi (5 km) east of the SEZ, would use hybrid cooling, which would minimize water use, while the authorized geothermal leases to the southwest would not likely contribute to groundwater impacts in the Tonopah Flats basin.

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 19 to 148 ac-ft (23 to 183 thousand m^3) during the peak construction year and would range from 2 to 38 ac-ft/yr (up to 47,000 m^3/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to put undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet-cooling systems, there would also be from 424 to 763 ac-ft/yr (0.52 to 0.94 million m^3) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

11.7.22.4.9 Vegetation

The proposed Millers SEZ is located within the Tonopah Basin ecoregion, which primarily supports sparse shadscale communities. Lands within the SEZ are classified primarily as Inter-Mountain Basins Mixed Salt Desert Scrub. Much of the SEZ consists of north to south trending broad, barren, gravel-covered washes, with small scattered playa areas, with shadscale and fourwing saltbush along the margins or in isolated stands. In the 5-mi (8-km) area of indirect effects, the predominant cover type is Inter-Mountain Basins Mixed Salt Desert Scrub. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the SEZ over 80% of its area would result in up to moderate impacts on certain cover types (Section 11.7.10.2.1). Wetlands and associated playa habitats could be affected by project development, while intermittently flooded areas downgradient from solar projects or access road could be affected by ground-disturbing activities. Alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Wetland and riparian habitats outside of the SEZ that are supported by groundwater discharge could be affected by hydrologic changes resulting from project activities.

The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other construction, mining, agriculture, recreation, and transportation. The cumulative dust loading could result in reduced productivity or changes in plant community composition. Similarly, surface runoff from project areas after heavy rains could increase sedimentation and siltation in areas downstream. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats. While most of the cover types within the SEZ are relatively common in the greater SEZ region, at least one cover type, Mojave Mid-Elevation Mixed Desert Scrub, is relatively uncommon, representing 1% or less of the land area within the region. Thus, other ongoing and reasonably foreseeable future actions would have a cumulative effect on this and other rare cover types as well as on more abundant species. Such effects could be moderate with full build-out of the SEZ, but would likely fall to small for foreseeable development due to the abundance of the primary species and the relatively small number of foreseeable actions within the geographic extent of effects. However, the proposed fast-track Crescent Dunes Solar Energy Project covering 1,600 acres (174 km^2) and located about 3 mi (5 km) east of the proposed SEZ (Section 11.7.22.2.2), could contribute to cumulative effects on some rare cover types if they are present in the development area. In addition, cumulative effects on wetland species could occur from water use, drainage modifications, and stream sedimentation from this and any other future projects in the region. The magnitude of such effects is difficult to predict at the current time.

11.7.22.4.10 Wildlife and Aquatic Biota

Wildlife species that could potentially be affected by the development of utility-scale solar energy facilities in the proposed Millers SEZ include amphibians, reptiles, birds, and mammals. The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, and wildlife injury or mortality. In general, impacted species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These design features may include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats.

As noted in Section 11.7.22.2, other ongoing, reasonably foreseeable and potential future actions within 50 mi (80 km) of the proposed SEZ include one fast-track solar application, one pending solar development application, one pending wind site testing application, four authorized wind site testing applications, two authorized geothermal lease agreements, and five producing geothermal lease agreements (Figure 11.7.22.2-1). While impacts from full build-out over 80% of the proposed SEZ would result in small to moderate impacts on some amphibian, reptile, and bird species and small impacts on mammal species (Section 11.7.11), impacts from foreseeable development within the 50-mi (80-km) geographic extent of effects would be small.

Many of the wildlife species present within the proposed SEZ that could be affected by other actions have extensive available habitat within the region, while only one foreseeable solar and no foreseeable wind projects have been firmly identified within the geographic extent of effects. The pending solar, wind, and geothermal applications in the region could contribute to small cumulative effects, however, as would one foreseeable fast-track solar project. The proposed Crescent Dunes Solar Energy Project covering 1,600 acres (174 km^2) would be located about 3 mi (5 km) east of the proposed SEZ and could contribute to cumulative effects on some species from habitat disturbance.

There are no surface water bodies or perennial streams within the proposed Millers SEZ or within the 5-mi (8-km) area of indirect effects. One named intermittent/ephemeral wash (Ione Wash) runs for approximately 3 mi (5 km) through the center of the SEZ. This and other ephemeral washes in the SEZ are typically dry and flow only after precipitation, while identified wetlands present in the SEZ rarely contain water. Thus, no standing aquatic communities are likely to be present in the proposed SEZ. Aquatic communities do exist within the 50-mi (80-km) geographic extent of effects, but the nearest perennial surface water feature is more than 35 mi (56 km) from the SEZ (Section 11.7.11.2). Thus, potential contributions to cumulative impacts on aquatic biota and habitats resulting from water or airborne soil transport to surface streams from solar facilities within the SEZ and within the geographic extent of effects are unlikely. There is little foreseeable development within the geographic extent of effects that would affect the same aquatic habitats potentially affected by the proposed SEZ. Adverse impacts on aquatic habitats from groundwater drawdown are unlikely because groundwater is already fully appropriated, and solar energy developers would have to purchase and transfer existing water rights.

11.7.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

On the basis of recorded occurrences or suitable habitat, as many as 19 special status species could occur within the Millers SEZ. Of these species, two are known to occur within the affected area of the SEZ: Tonopah milkvetch and western small-footed bat. No groundwater-dependent species and no potentially suitable habitat for the desert tortoise, a species listed as threatened under the ESA, occurs within the affected area of the SEZ. Numerous additional species that occur on or in the vicinity of the SEZ are listed as threatened or endangered by the states of Nevada or California or listed as a sensitive species by the BLM (Section 11.7.12.1). Programmatic design features to be used to reduce or eliminate the potential for effects on these species from the construction and operation of utility-scale solar energy projects in the SEZs and related projects (e.g., access roads and transmission line connections) outside the SEZ include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. Ongoing effects on special status species include those from roads, transmission lines, and recreational activities in the area. However, the amount or foreseeable development within the geographic extent of effects is low, including mainly one foreseeable fast-track solar and several potential solar, wind and geothermal projects. Cumulative impacts on protected species are possible but are expected to be relatively low. Actual impacts would depend on the number, location, and cooling technologies of projects that are actually built. Projects would employ mitigation measures to limit effects.

11.7.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other nearby projects outside the proposed Millers SEZ or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. The dust generation from the construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment.

Because the area proposed for the SEZ is rural and undeveloped land, there are no significant industrial sources of air emissions in the area. The only type of air pollutant of concern is dust generated by winds. Because the number of other foreseeable and potential actions that could produce fugitive dust emissions is small, while such projects are unlikely to overlap in both time and affected area, cumulative air quality effects due to dust emissions during any overlapping construction periods would be small.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as coal, oil, and natural gas. As discussed in Section 11.7.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the Millers SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 12% of all emissions from the current electric power systems in Nevada.

11.7.22.4.13 Visual Resources

The proposed Millers SEZ is located in a flat treeless plain in the Big Smoky Valley. The SEZ is bounded by mountain ranges on the east, south and west, with open views to the northeast and southwest (Section 11.7.14.1). The area is sparsely inhabited, remote, and rural in character. Currently, there is a low level of cultural disturbance, including from existing transmission lines, fences and roads. Construction of utility-scale solar facilities on the SEZ and associated transmission lines outside the SEZ would significantly alter the natural scenic quality of the area. Other potential solar, wind, and geothermal projects and related roads and transmission lines outside the proposed SEZ would cumulatively affect the visual resources in the area. Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area. There is currently only one foreseeable fast-track solar facility application, about 3 mi (5 km) east of the SEZ, and several pending solar, wind and geothermal applications within 50 mi (80 km) of the SEZ (Figure 11.7.22.2-1). While the contribution to cumulative impacts in the area of foreseeable and potential projects would depend on the location of facilities that are actually built, it may be concluded that the general visual character of the landscape within this distance could be significantly altered by the presence of solar facilities, transmission lines, and other new infrastructure. Because of the topography of the region, such projects, located in basin flats, would be visible at great distances from surrounding mountains, which include sensitive viewsheds. Given the proximity of the foreseeable fast-track solar project 3 mi (5 km) east of the proposed SEZ, it is possible that two or more facilities would be viewable from a single location. In addition, facilities would be located near major roads and thus would be viewable by motorists, who would also be viewing transmission lines, towns, and other infrastructure, as well as the road system itself.

As additional facilities are added, several projects might become visible from one location, or in succession, as viewers move through the landscape, as by driving on local roads. In general, the new projects would not be expected to be consistent in terms of their appearance and, depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Considering the above in light of the fact that relatively few foreseeable and potential solar, wind, and geothermal projects have been identified, small cumulative visual impacts could occur within the geographic extent of effects from future solar, wind, geothermal, and other existing and future projects.

11.7.22.4.14 Acoustic Environment

The areas around the proposed Millers SEZ are relatively quiet. The existing noise sources around the SEZ include road traffic, aircraft flyover, and cattle grazing. Other noise sources are associated with current land use around the SEZ, including OHV use.
The construction of solar energy facilities could increase the noise levels periodically for up to 3 years per facility, but there would be little or no noise during the operation of solar facilities, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES, which could also minimally affect nearby residences due to considerable separation distances.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZs are described in Section 11.7.22.2. Because proposed projects and the nearest residents are relatively far from the SEZ with respect to noise impacts and the area is sparsely populated, cumulative noise effects during the construction or operation of solar facilities are unlikely.

11.7.22.4.15 Paleontological Resources

The proposed Millers SEZ has unknown, but potentially high, potential for the occurrence of significant fossil material in 94% of its area, mainly lacustrine deposits, and low potential in about 6% of its area, mainly alluvial deposits (Section 11.7.16.1). Surveys of the lacustrine and playa deposits would likely be needed prior to project approval. Any paleontological resources encountered would be mitigated to the extent possible. No significant cumulative impacts on paleontological resources are expected, but such a determination would depend on the results of future paleontological investigations.

11.7.22.4.16 Cultural Resources

The proposed Millers SEZ is rich in cultural history, with settlements dating as far back as 12,000 years. The area covered by the SEZ has the potential to contain significant cultural resources. At least 4 surveys have been conducted within the boundaries of the SEZ, and 49 additional surveys have been conducted within 5 mi (8 km) of the SEZ, resulting in the recording of 30 sites within SEZ and at least 100 sites located within 5 mi (8 km) of the SEZ (Section 11.7.17.1). Areas with potential for significant sites within the proposed SEZ include dune areas near the former Lake Tonopah, related to exploitation of lacustrine resources, and historic resources associated with the Millers town site. It is possible that the development of utility-scale solar energy projects in the SEZ, when added to other potential projects likely to occur in the area, could contribute cumulatively to cultural resource impacts occurring in the region. However, the amount of potential and foreseeable development is low, including one fast-track solar project and four authorized geothermal leases within the 25-mi (40-km) geographic extent of effects (Section 11.7.22.2). While any future solar projects would disturb large areas, the specific sites selected for future projects would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Nevada SHPO and appropriate Native American Tribes, it is likely that many adverse effects on significant resources in the region could be mitigated to some degree. Because the proposed Millers SEZ occupies the area of a Late Pleistocene lakebed, it is possible that development of this SEZ could cumulatively cause an irretrievable loss of information on significant sites pertaining to this prehistoric lake system. Pre-disturbance surveys for cultural sites would identify areas for potential use or avoidance.

11.7.22.4.17 Native American Concerns

Major Native American concerns in arid portions of the Great Basin include water, culturally important plant and animal resources, and culturally important landscapes. The development of utility-scale solar energy facilities within the proposed Millers SEZ in combination with the foreseeable development in the surrounding area could cumulatively contribute to effects on these resources. Development of the SEZ would result in the removal of plant species from the footprint of the facility during construction. This would include some plants of cultural importance. However, the primary species that would be affected are abundant in the region; thus the cumulative effect would likely be small. Likewise, habitat for important species, such as the black-tailed jack rabbit, would be reduced; however, extensive habitat is available in the area, reducing the cumulative effect. The cultural importance of the mountains surrounding the SEZ is as yet undetermined. If culturally important, the view from these features can be an important part of their cultural integrity. The degree of impact on these resources of development at specific locations must be determined in consultation with the Native American Tribes whose traditional use area includes the proposed SEZ. In general, Tribes prefer that development occur on previously disturbed land, and this SEZ is largely undeveloped. Government-to-government consultation is under way with federally recognized Native American Tribes with possible traditional ties to the Millers area. All federally recognized Tribes with Western Shoshone, Northern Paiute, or Owens Valley Paiute roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. To date, no specific concerns have been raised to the BLM regarding the proposed Millers SEZ. However, the Big Pine Paiute Tribe of the Owens Valley has commented on the scope of this PEIS, recommending that already disturbed lands be preferred for solar development while preserving undisturbed lands. Potential impacts on existing water supplies are also of concern to tribes (Section 11.7.18.2). Continued discussions with the area Tribes through government-to-government consultation is necessary to effectively consider and address the Tribes' concern tied to solar energy development in the proposed Millers SEZ.

11.7.22.4.18 Socioeconomics

Solar energy development projects in the proposed Millers SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services in combination with temporary workers involved in other new projects in the area, including other renewable energy development. Local, county, and state roads could be affected by traffic loads. The number of workers involved in the construction of solar projects in the peak construction year (including the transmission lines) could range from about 250 to 3,300 depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 350 (solar PV) to as high as 4,600 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-year or more solar development period.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-year duration, and could combine with those from other new projects in the area, including from the fast-track Crescent Dunes Solar Energy Project, which would be located 3 mi (5km) east of the proposed SEZ. The number of workers needed at the solar facilities in the SEZ would be in the range of 30 to 600 with approximately 40 to 800 total jobs created in the region, assuming full build-out of the SEZ (Section 11.7.19.2.2). Population increases would contribute to general upward trends in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

11.7.22.4.19 Environmental Justice

Any impacts from solar development could have cumulative impacts on minority and low-income populations within 50 mi (80 km) of the proposed SEZ in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual impacts, noise, and exposure to fugitive dust. Actual impacts would depend on where low-income populations are located relative to solar and other proposed facilities and on the geographic range of effects. Overall, effects from facilities within the SEZ are expected to be small, while other foreseeable and potential actions would not likely combine with effects from the SEZ on minority and low-income populations. However, no minority or low-income populations have been identified within the 50-mi (80-km) region of interest around the SEZ (Section 11.7.20.2). Thus, it is not expected that the proposed Millers SEZ would contribute to cumulative impacts on minority and low-income populations.

11.7.22.4.20 Transportation

U.S. 95/U.S. 6 runs along the southern border of the proposed Millers SEZ. The nearest public airport is the Tonopah Airport, about 23 mi (37 km) east of the SEZ, and the closest railroad access is the UP Railroad stop at Thorne, 90 mi (145 km) northwest of the SEZ. During construction of utility-scale solar energy facilities, there could be up to 1,000 workers commuting to the construction site at the SEZ, which could increase the AADT on these roads by 2,000 vehicle trips for each facility under construction. With as many as two facilities assumed under construction at the same time, traffic on U.S. 95/U.S. 6 could experience slowdowns in the area of the SEZ (Section 11.7.21.2). This increase in highway traffic from construction workers could likewise have moderate cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area, including from construction of the fast-track Crescent Dunes Solar Energy 3 mi (5 km) east of the SEZ, should construction schedules overlap. Local road improvements may be necessary on portions of U.S. 95/U.S. 6 near the SEZ. Any impacts during construction activities would be temporary. The impacts can also be mitigated to some degree by staggered work schedules and ride-sharing programs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate the solar facilities and would have little contribution to cumulative impacts.

11.7.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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