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

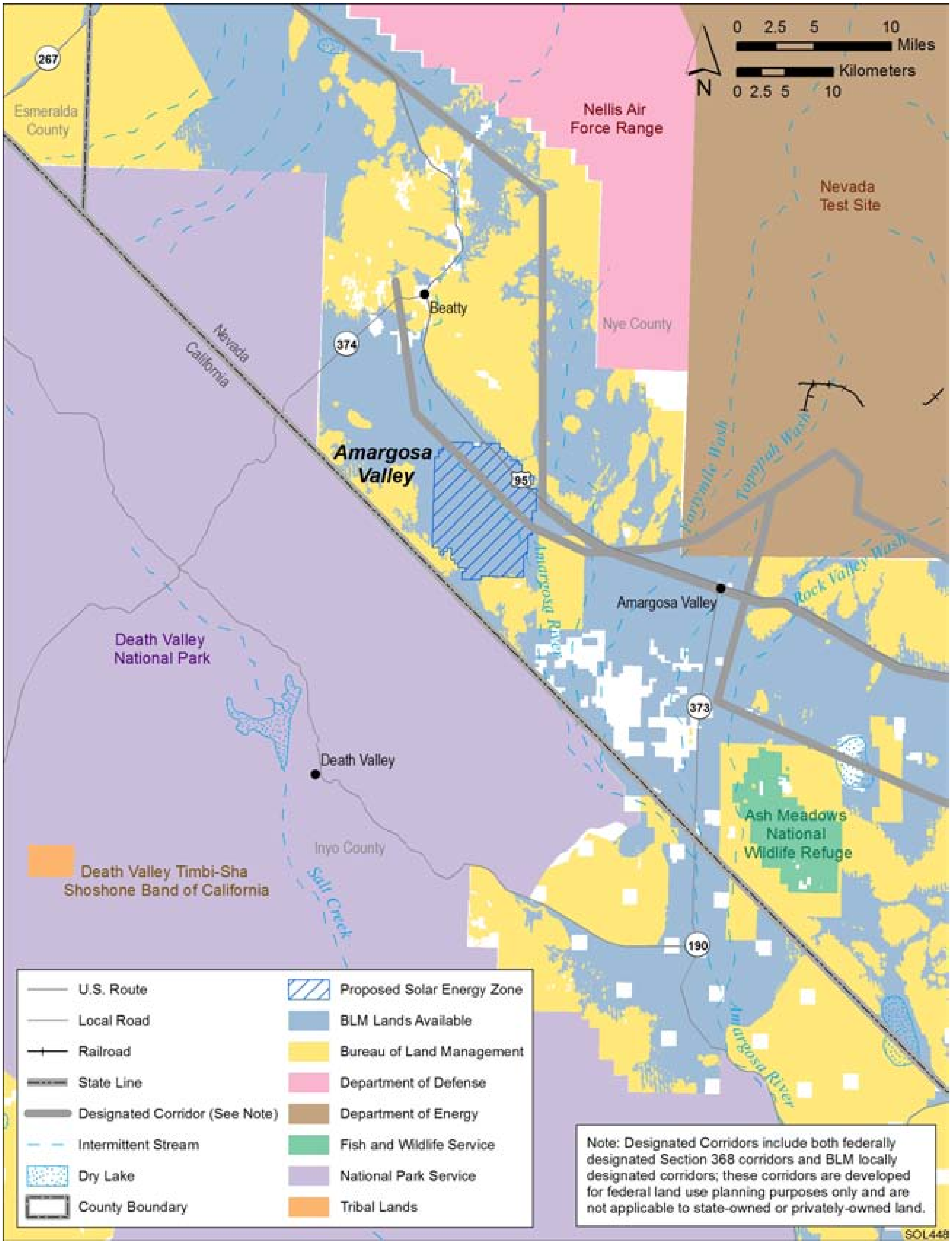

FIGURE 11.1.1.1-1 Proposed Amargosa Valley SEZ

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.

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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

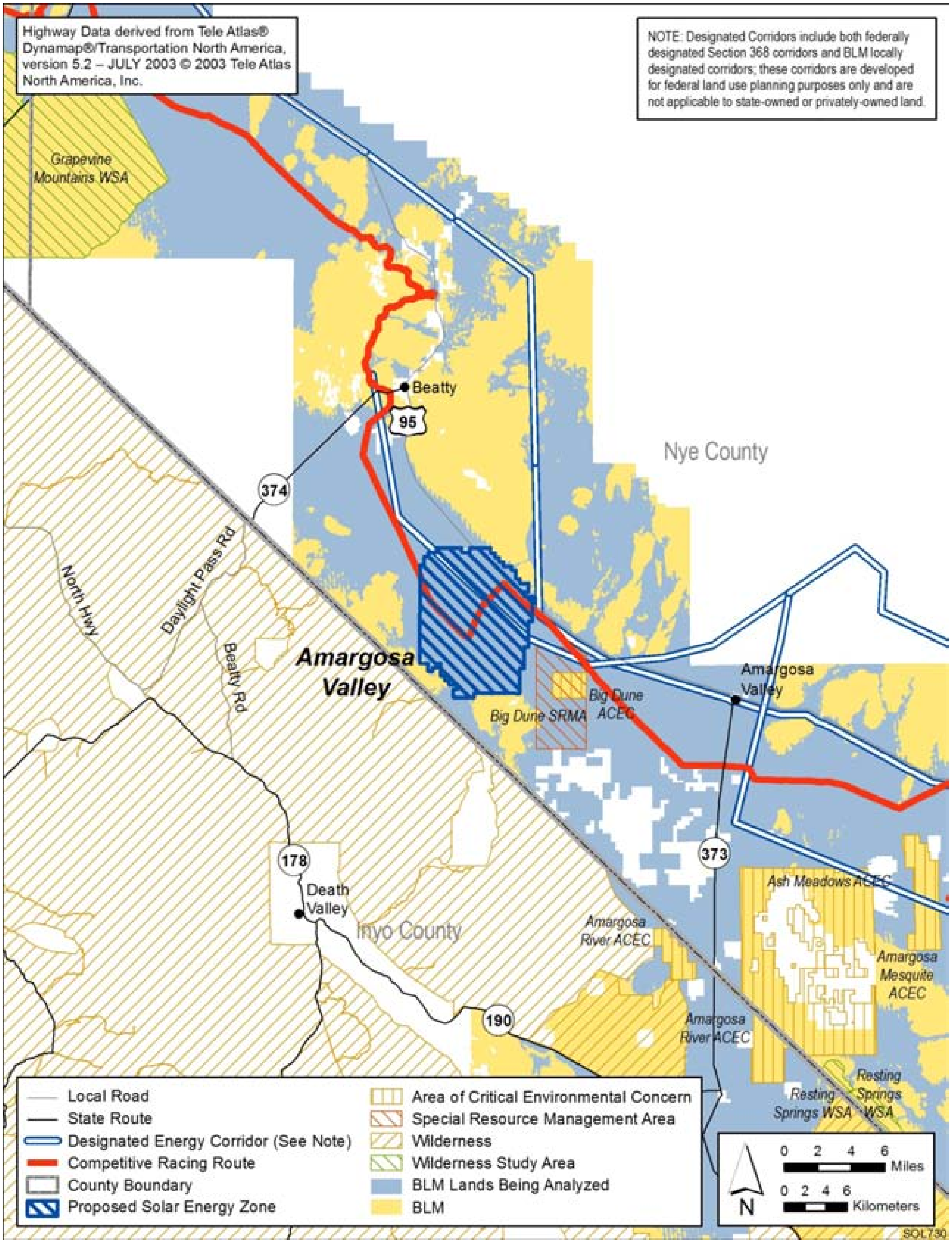

FIGURE 11.1.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Amargosa Valley SEZ

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,

[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

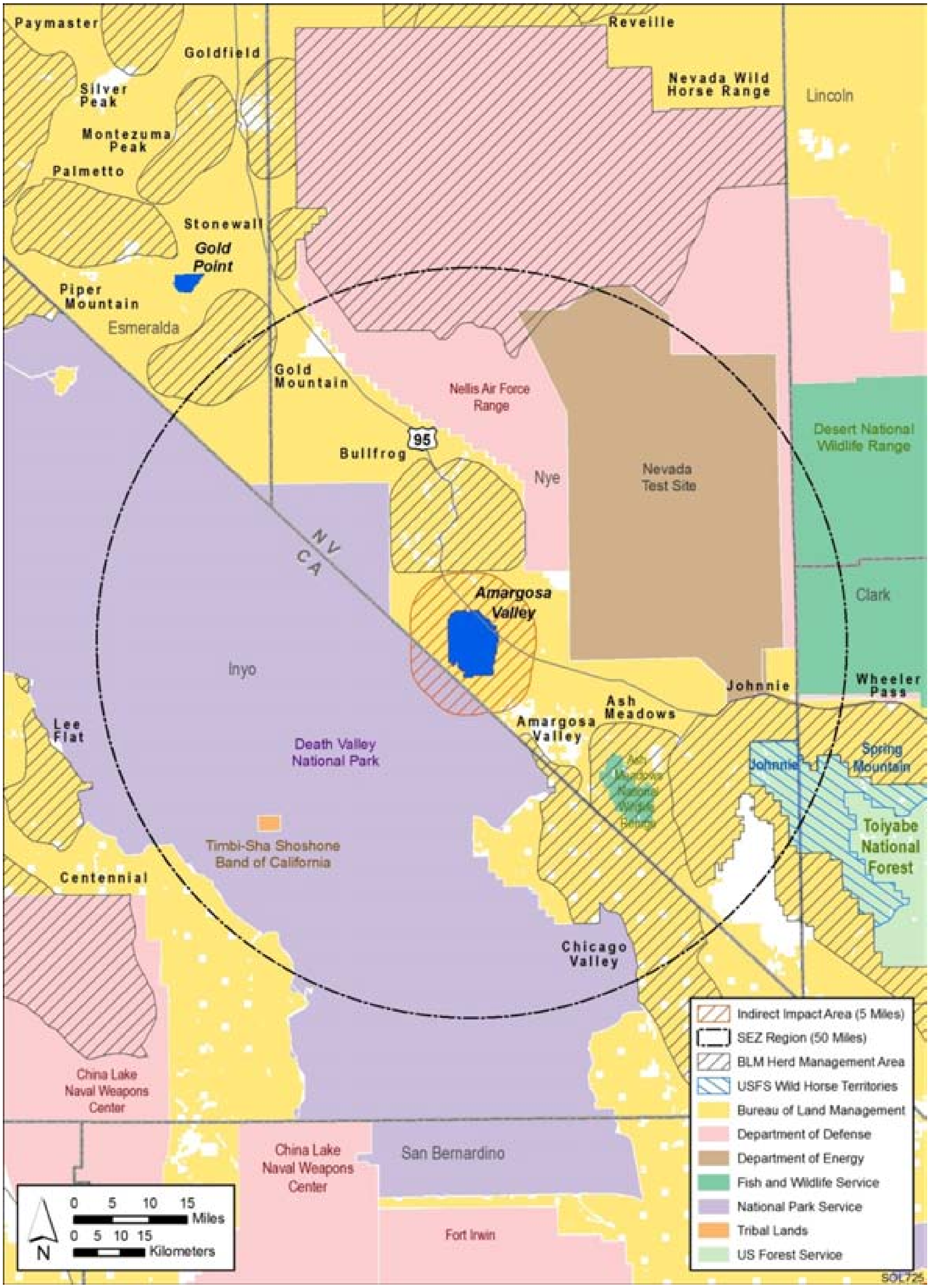

FIGURE 11.1.4.2-1 Wild Horse and Burro Herd Management Areas and Territories within the Analysis Area for the Proposed Amargosa Valley SEZ (Sources: BLM 2009e; USFS 2007).

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

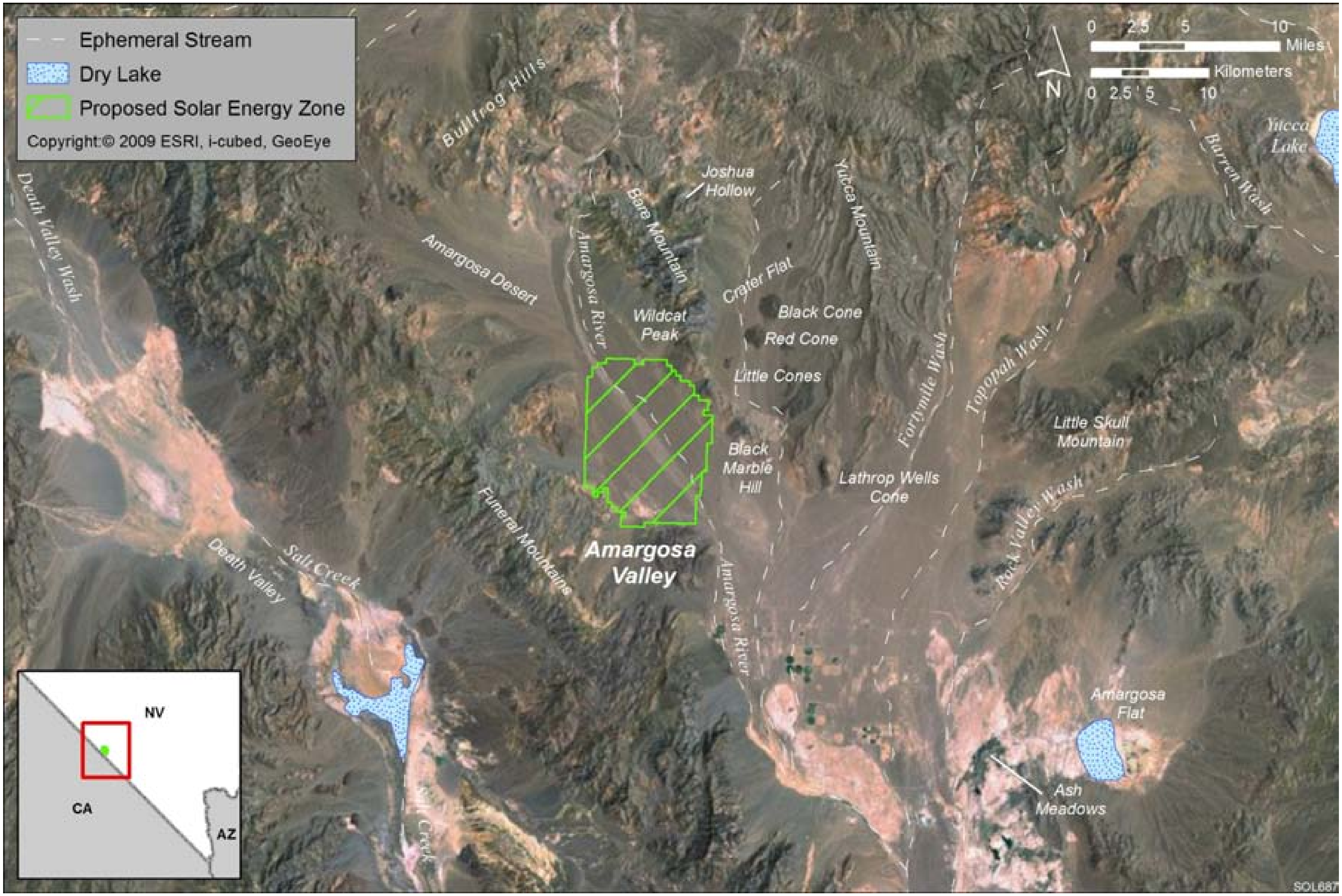

FIGURE 11.1.7.1-1 Physiographic Features of the Amargosa Desert Region

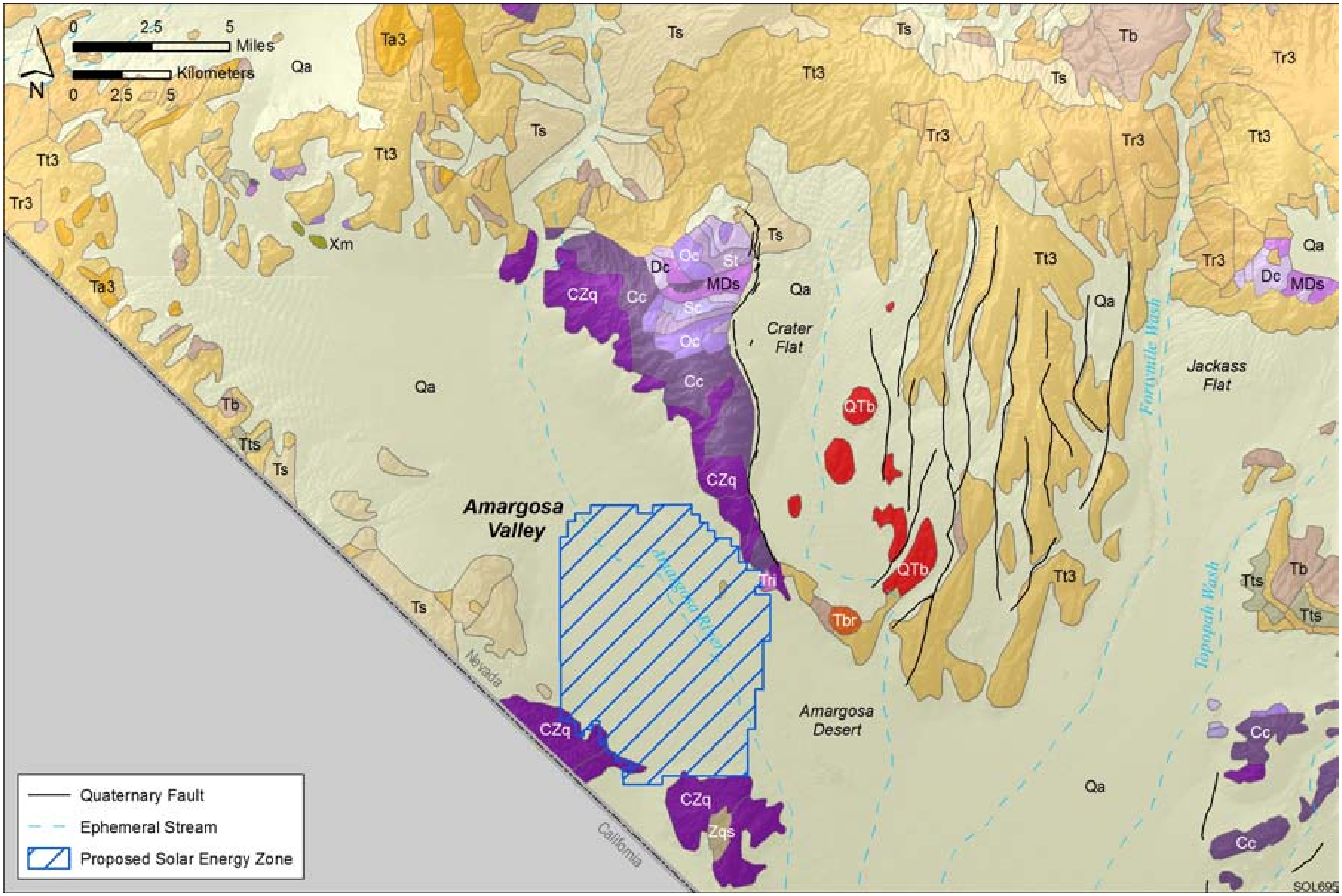

FIGURE 11.1.7.1-2 Geologic Map of the Amargosa Desert Region (Sources: Ludington et al. 2007; Stewart and Carlson 1978)

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).

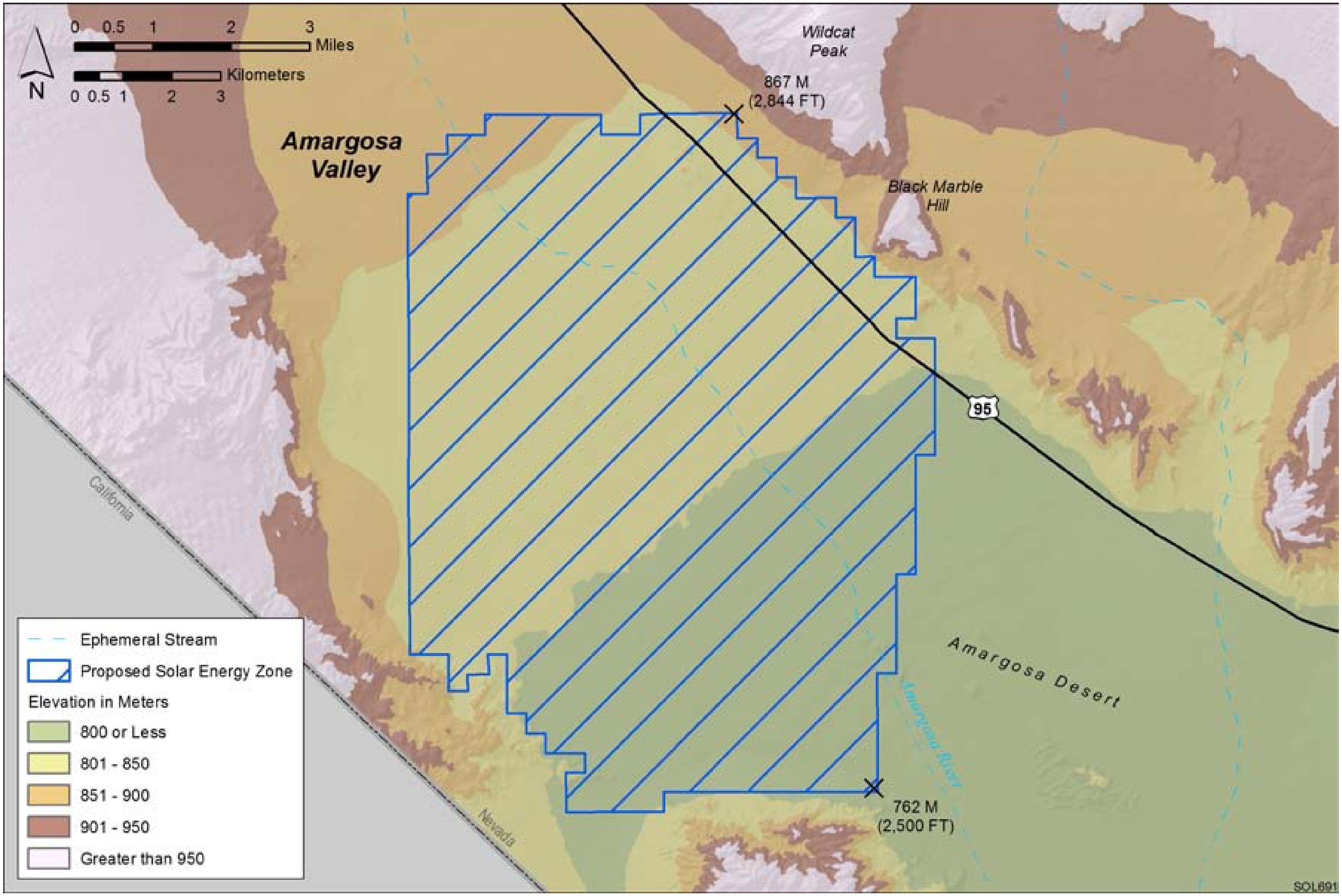

FIGURE 11.1.7.1-3 General Terrain of the Proposed Amargosa Valley SEZ

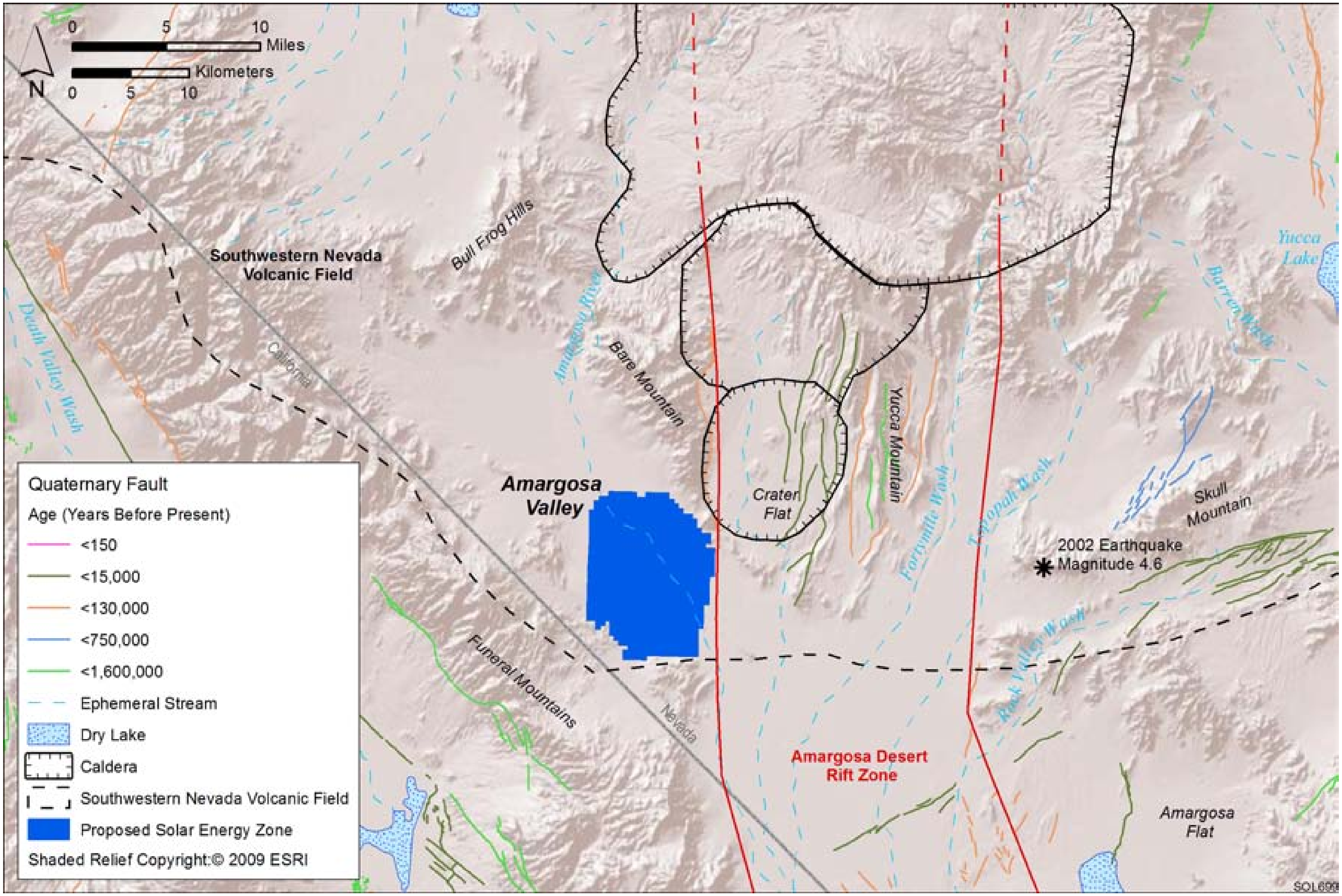

FIGURE 11.1.7.1-4 Quaternary Faults in Amargosa Valley Region (USGS and NBMG 2010; USGS 2010c)

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

[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).

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

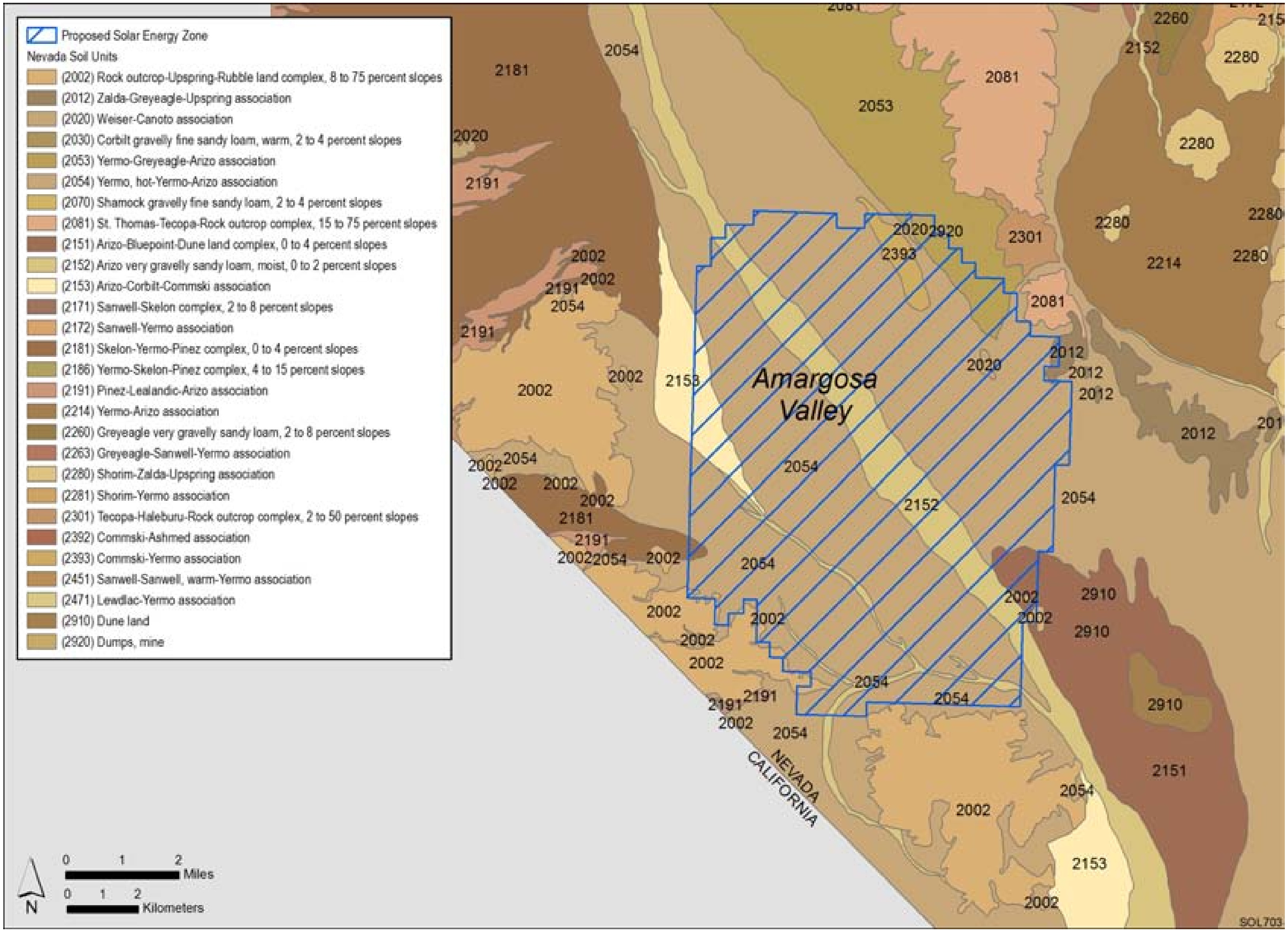

FIGURE 11.1.7.1-5 Soil Map for the Proposed Amargosa Valley SEZ (Source: NRCS 2008)

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)

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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).

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,

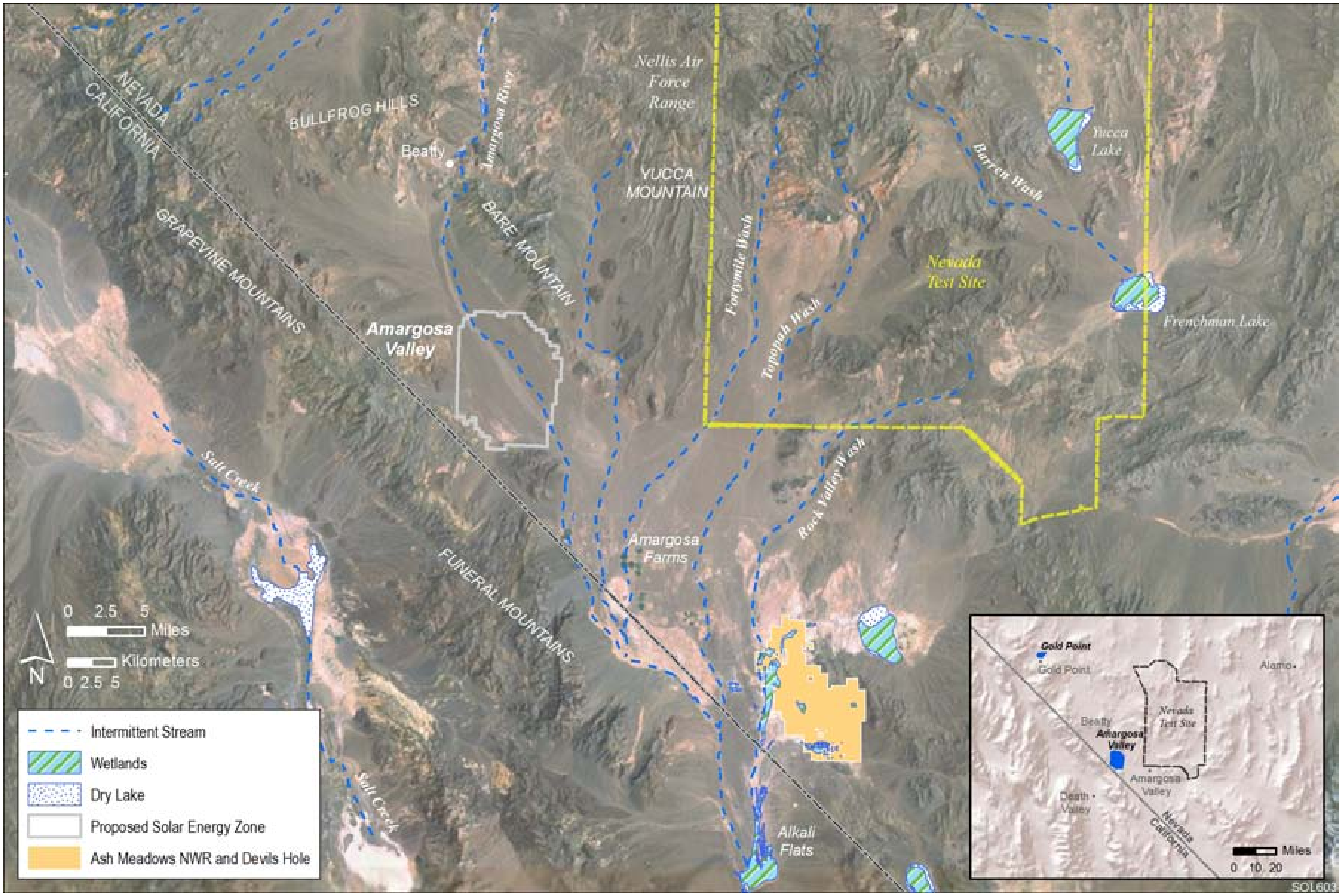

FIGURE 11.1.9.1-1 Surface Water Features near the Proposed Amargosa Valley SEZ

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

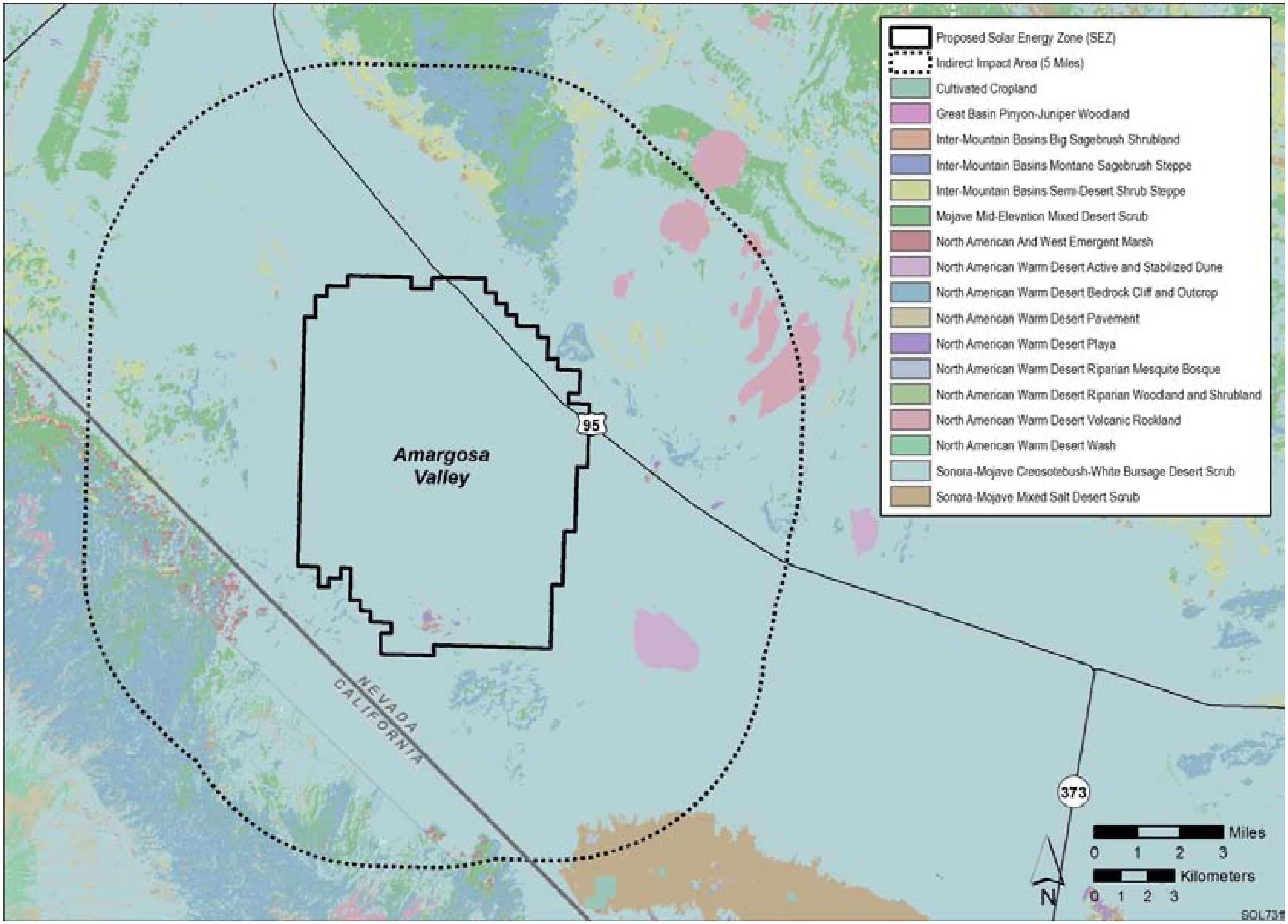

FIGURE 11.1.10.1-1 Land Cover Types within the Proposed Amargosa Valley SEZ (Source: USGS 2004)

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.)

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]
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.)

	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]
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.

1

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]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
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.

> **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).

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.

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]: 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 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.

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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				
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]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
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]: 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 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]: 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 4,385,200 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]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
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]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
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.

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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.

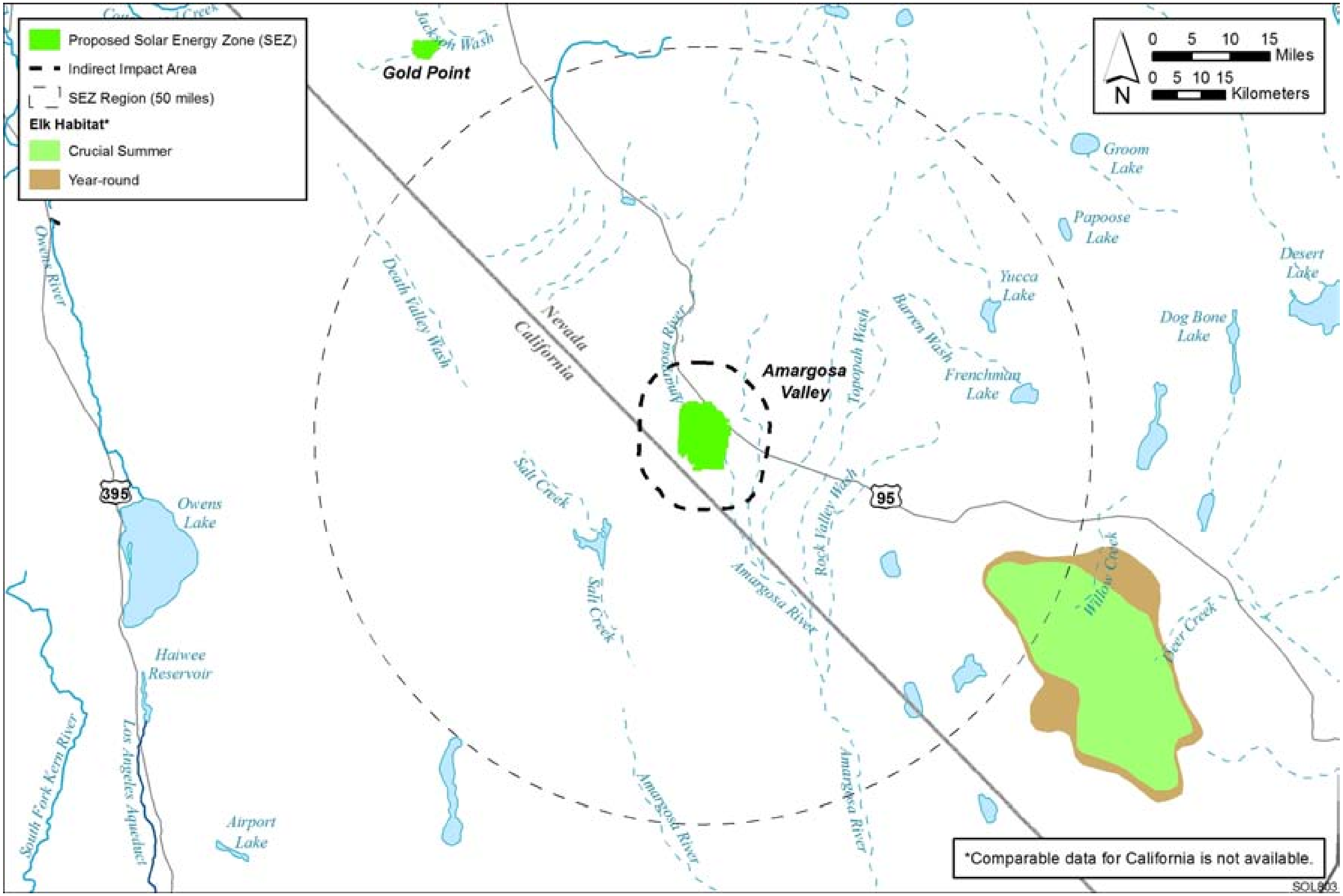

FIGURE 11.1.11.3-1 Location of the Proposed Amargosa Valley SEZ Relative to the Mapped Range of Elk (Source: NDOW 2010)

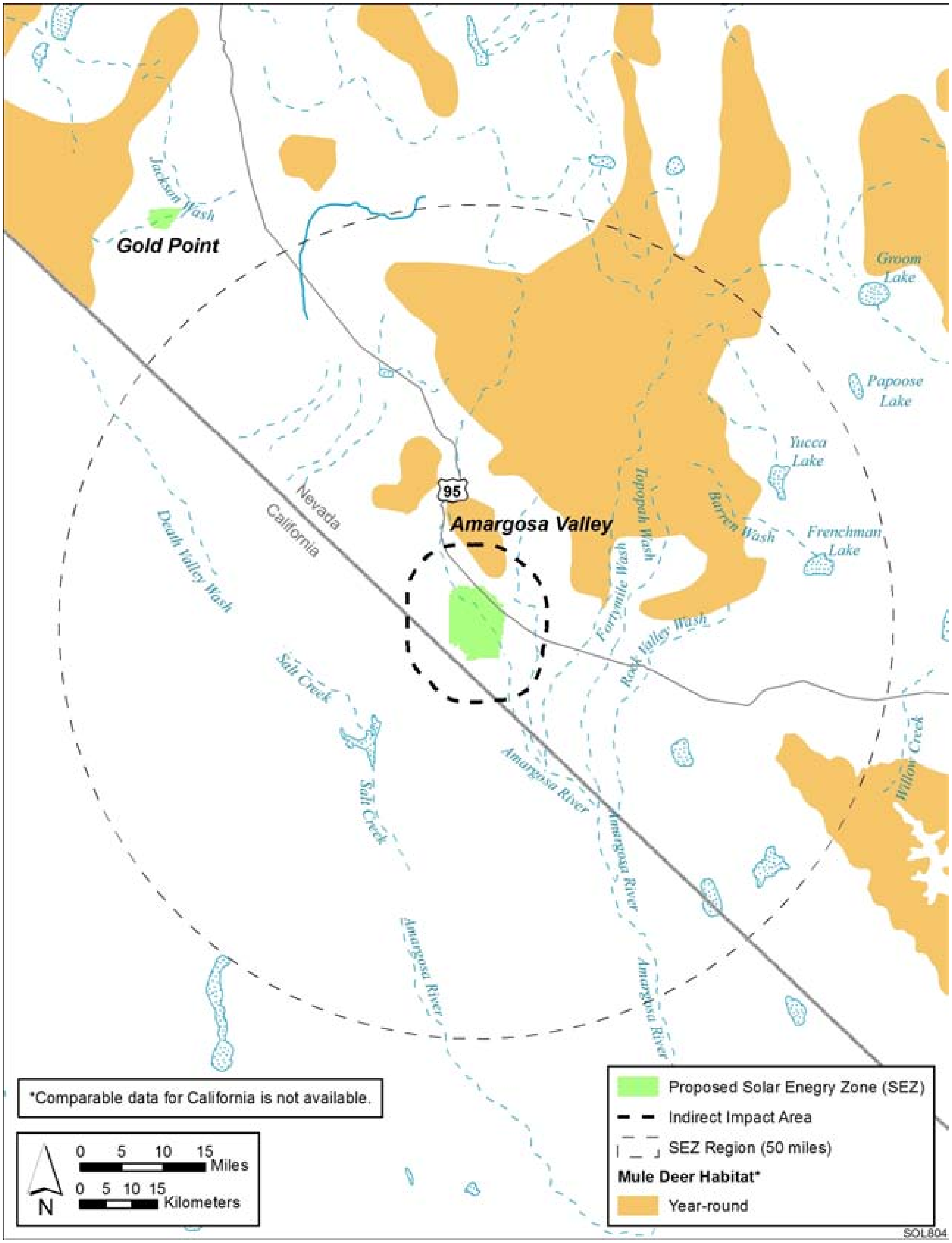

FIGURE 11.1.11.3-2 Location of the Proposed Amargosa Valley SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)

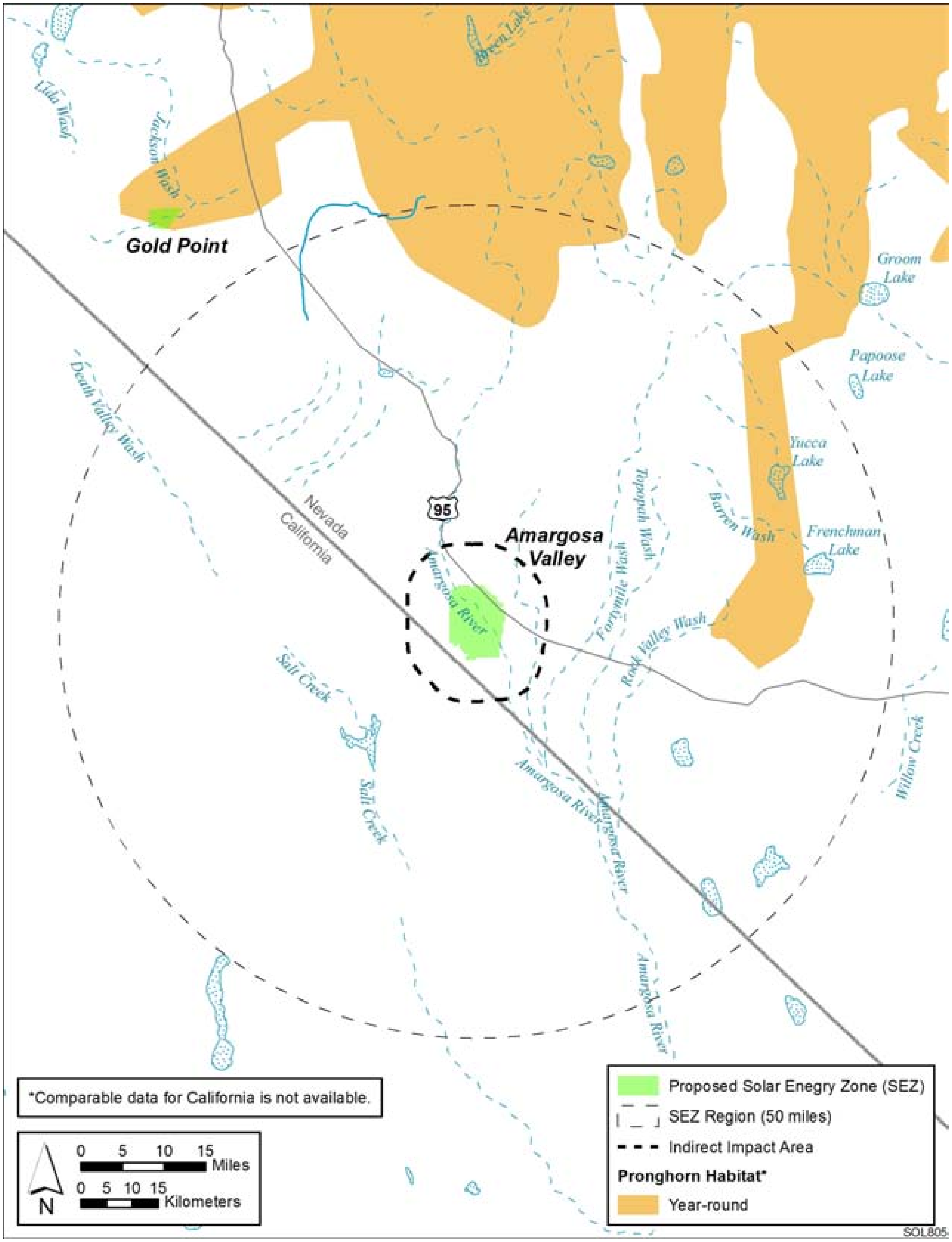

FIGURE 11.1.11.3-3 Location of the Proposed Amargosa Valley SEZ Relative to the Mapped Range of Pronghorn (Source: NDOW 2010)

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).

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]: 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 4,360,800 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]: 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				
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]: 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				
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] 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				
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]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
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.

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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.

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

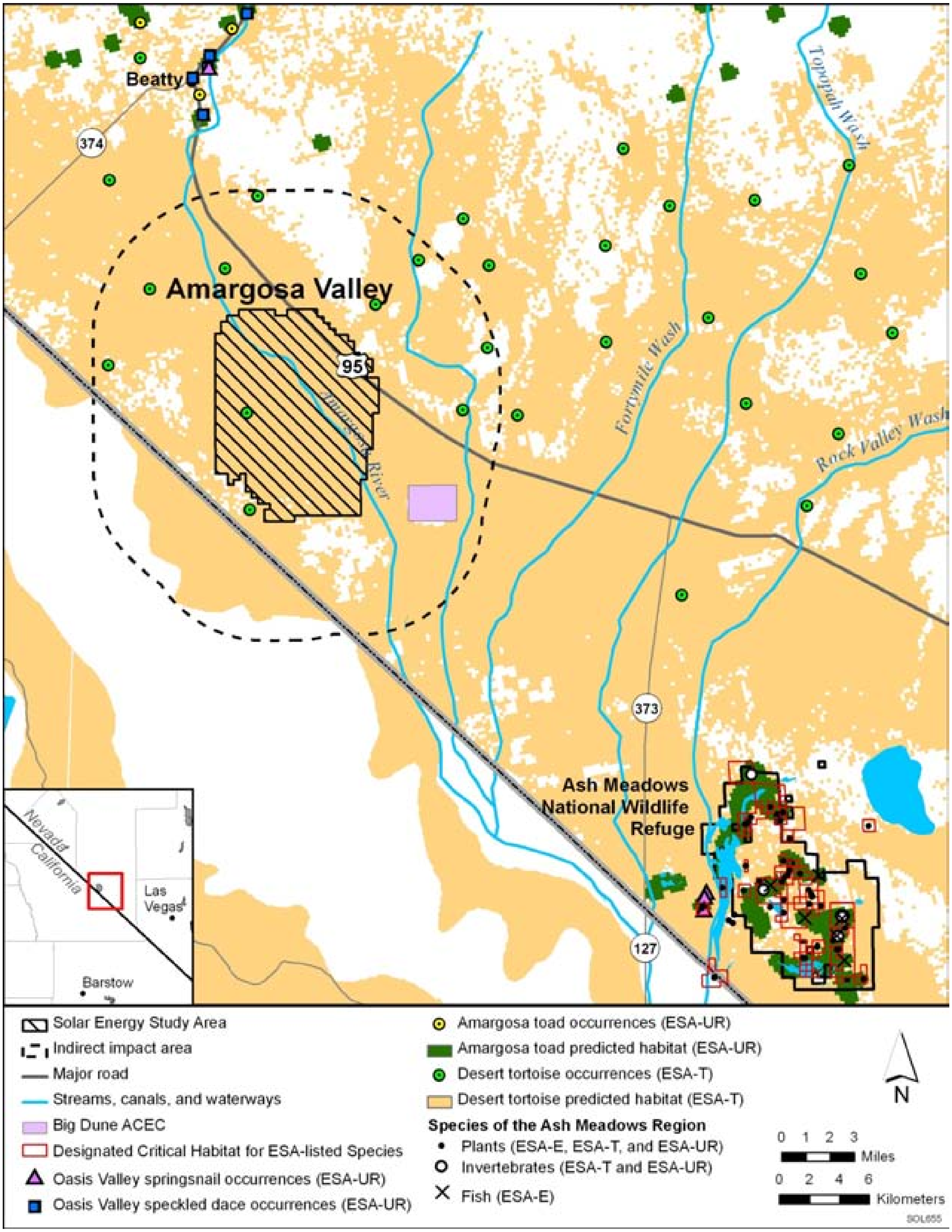

FIGURE 11.1.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA or Species under Review for ESA Listing in the Affected Area of the Proposed Amargosa Valley SEZ (Sources: Miskow 2009; USFWS 2010a; USGS 2007)

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

				Maximum Area of Potential Habitat Affected[c]		
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	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]: 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						
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.)

[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.

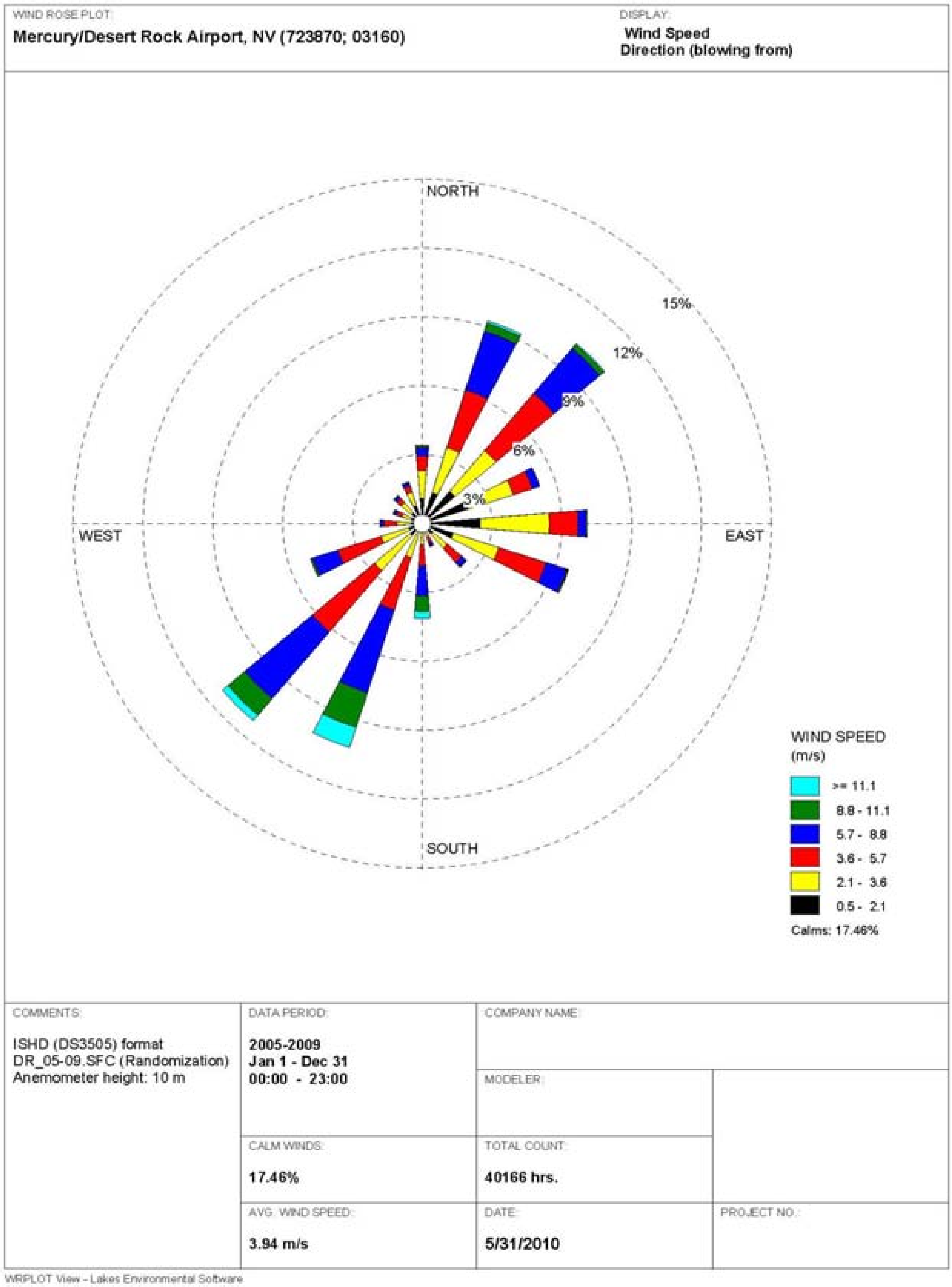

FIGURE 11.1.13.1-1 Wind Rose at 33 ft (10 m) at Mercury/Desert Rock Airport, Nevada, 2005 to 2009 (Source: NCDC 2010b)

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.

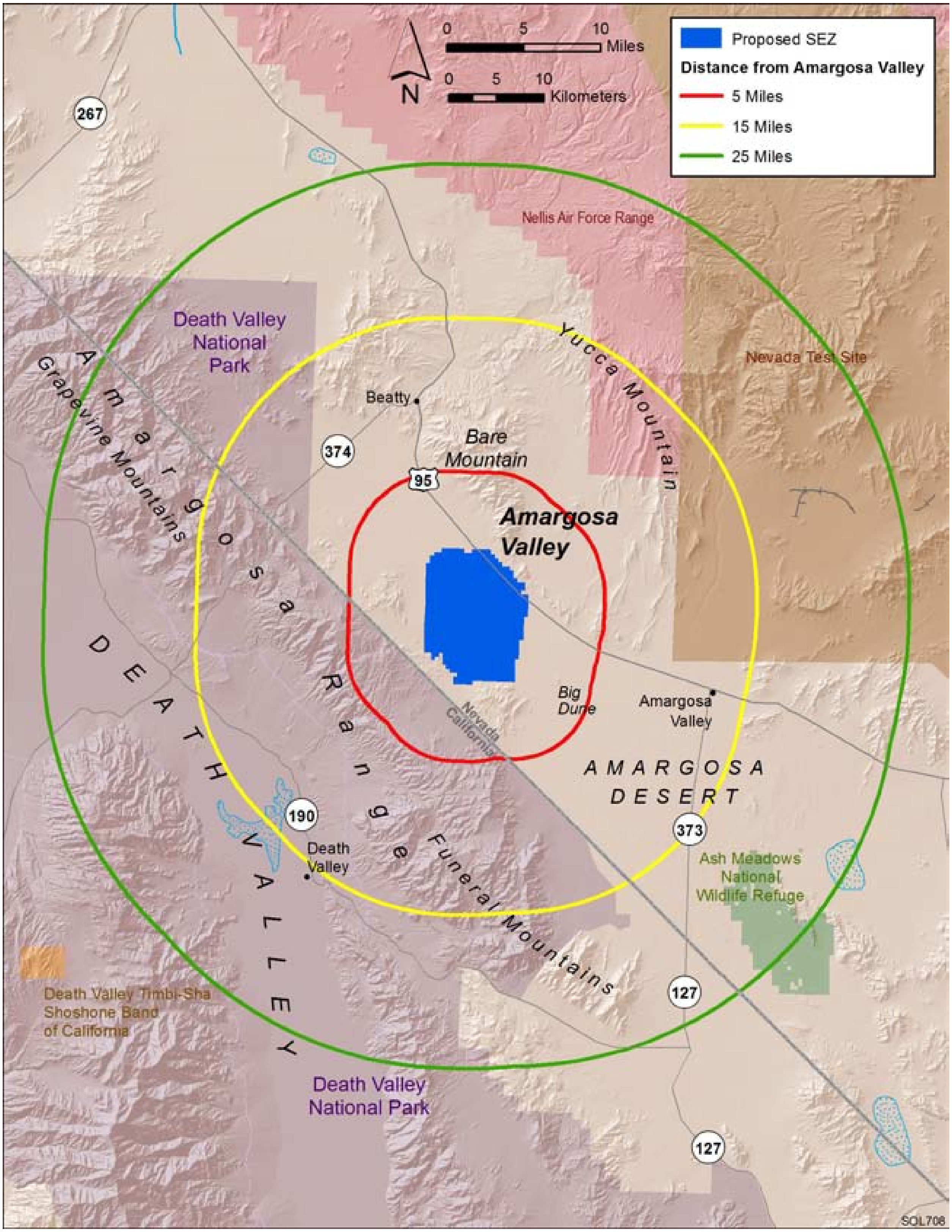

FIGURE 11.1.14.1-1 Proposed Amargosa Valley SEZ and Surrounding Lands

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

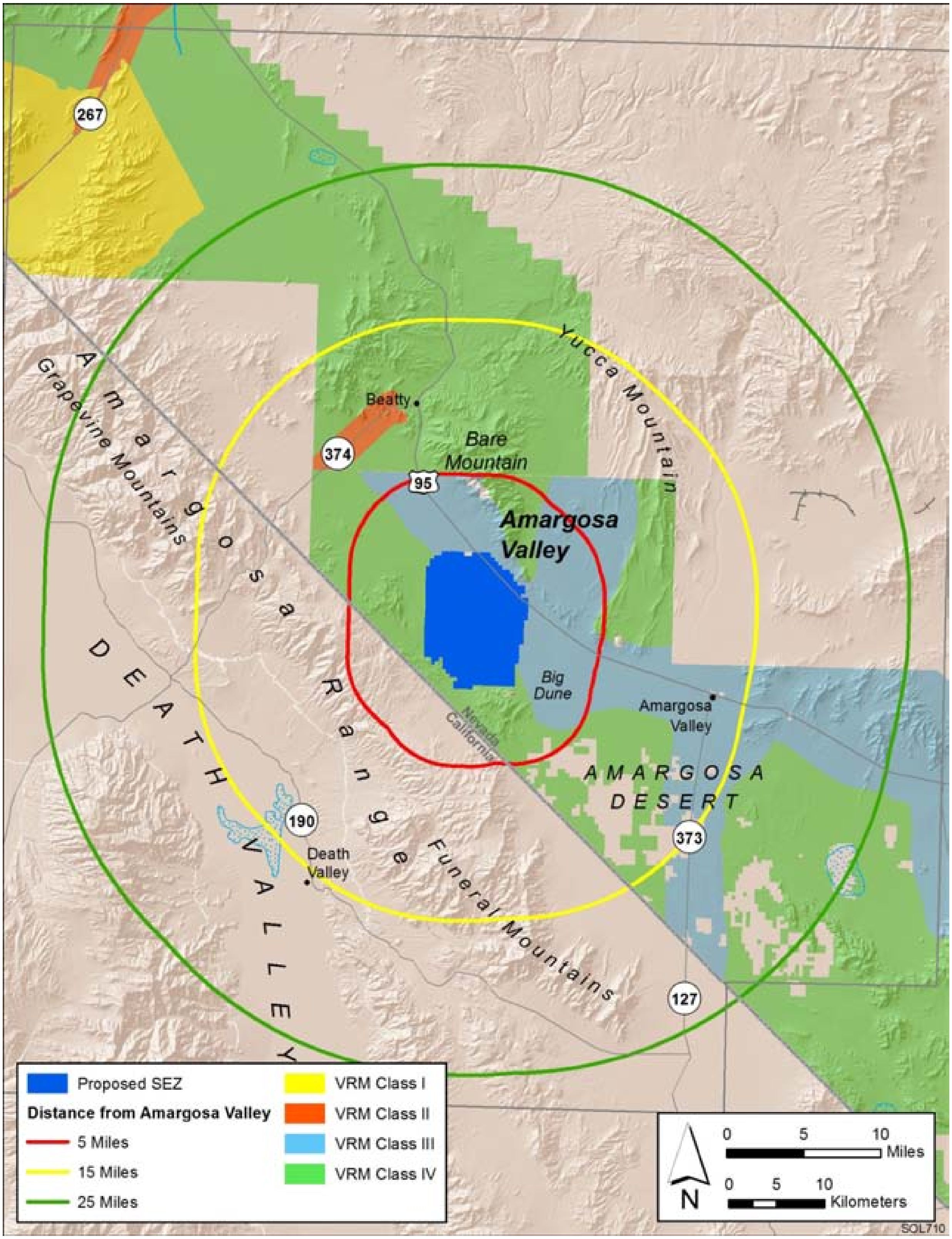

FIGURE 11.1.14.1-5 Visual Resource Management Classes for the Proposed Amargosa Valley SEZ and Surrounding Lands

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

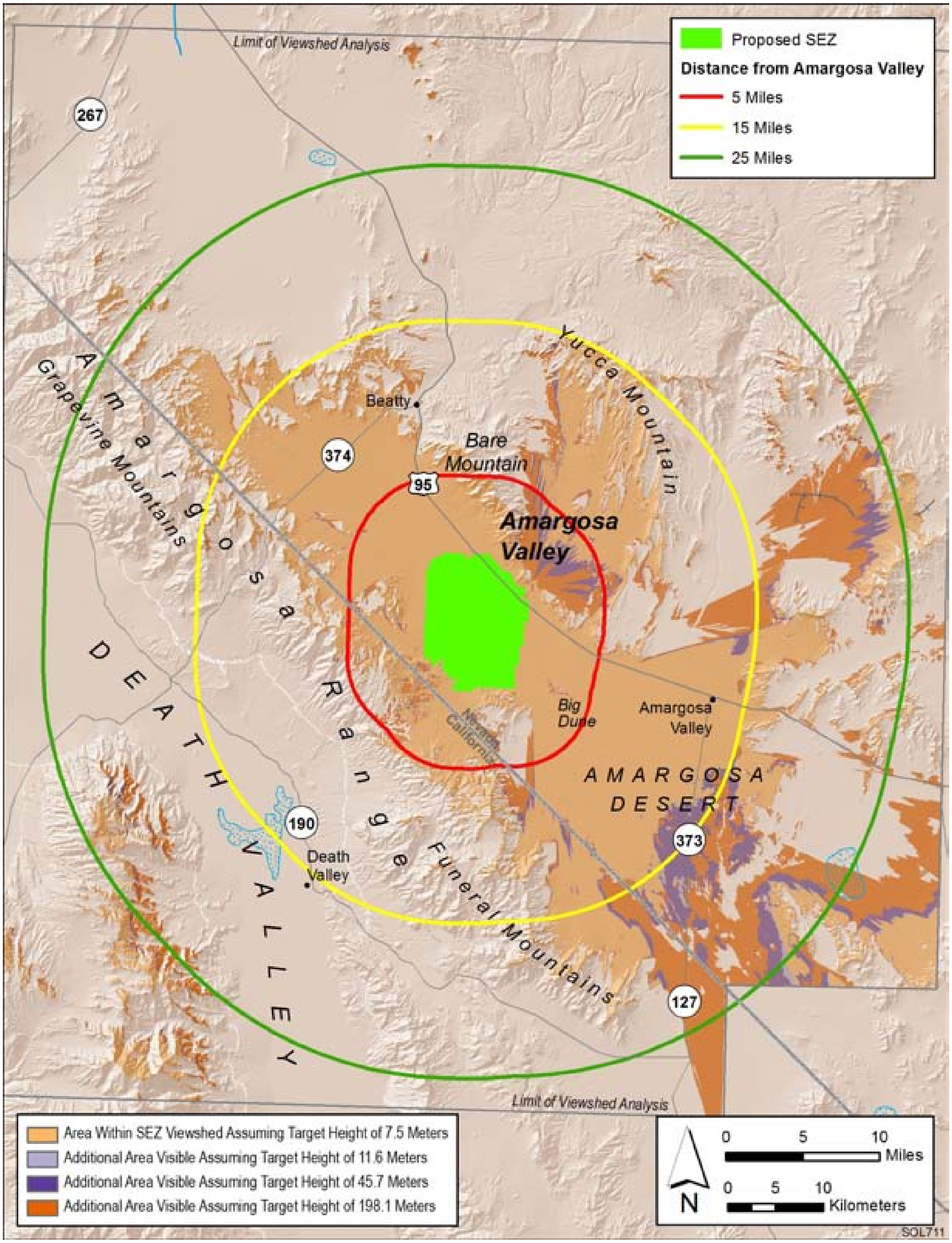

FIGURE 11.1.14.2-1 Viewshed Analyses for the Proposed Amargosa Valley SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

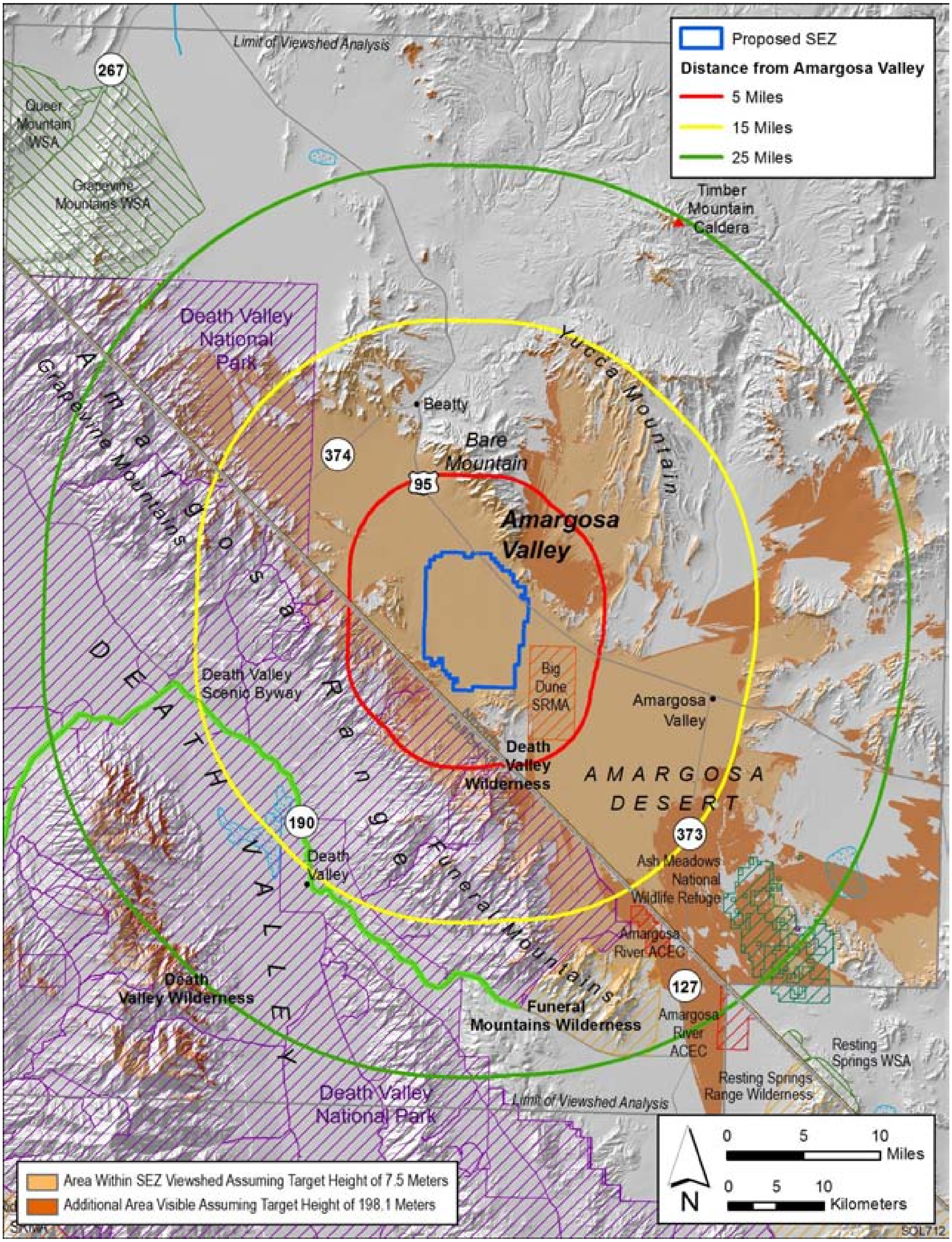

FIGURE 11.1.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Amargosa Valley SEZ

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.

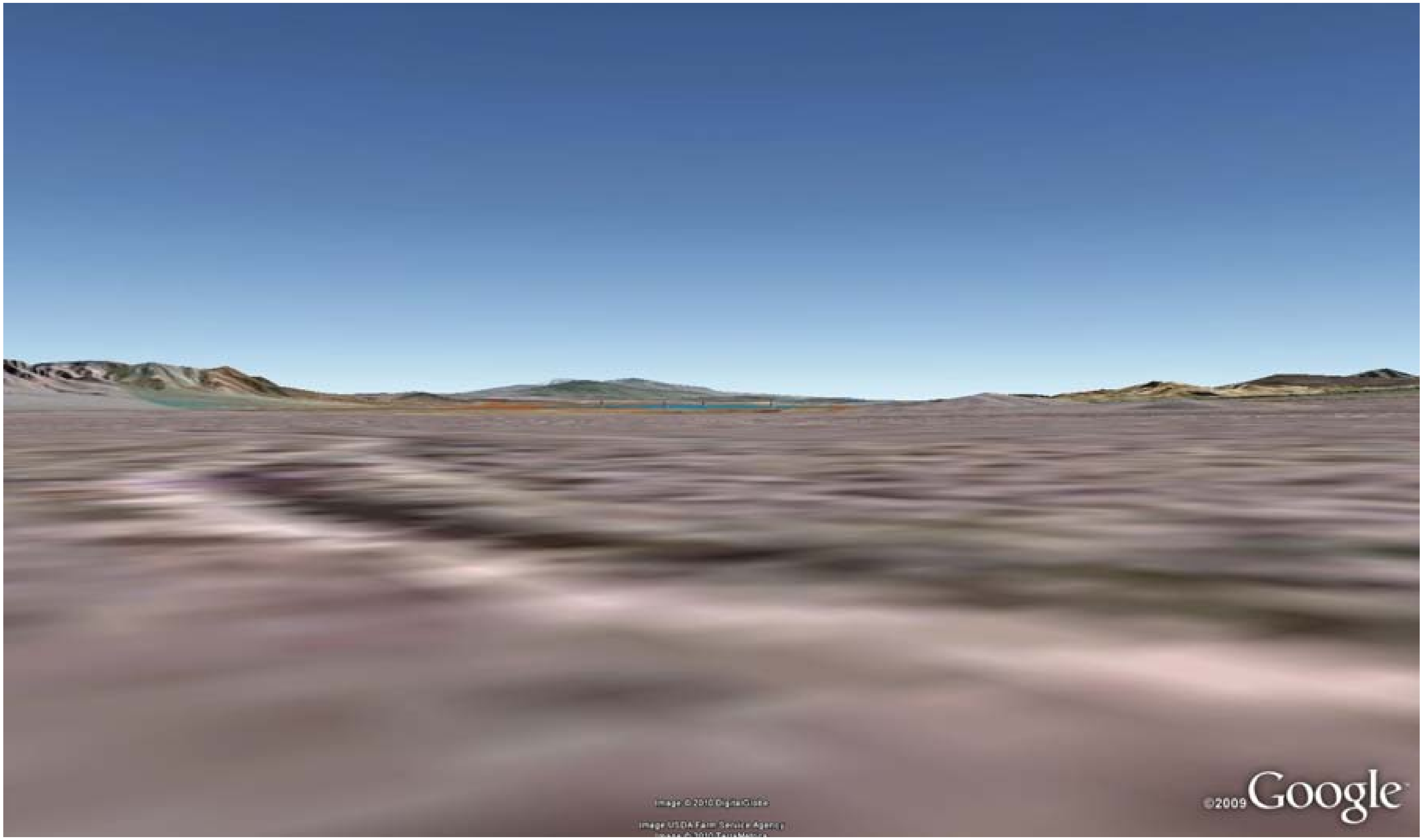

FIGURE 11.1.14.2-3 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on State Route 374, at Entrance to Death Valley NP

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

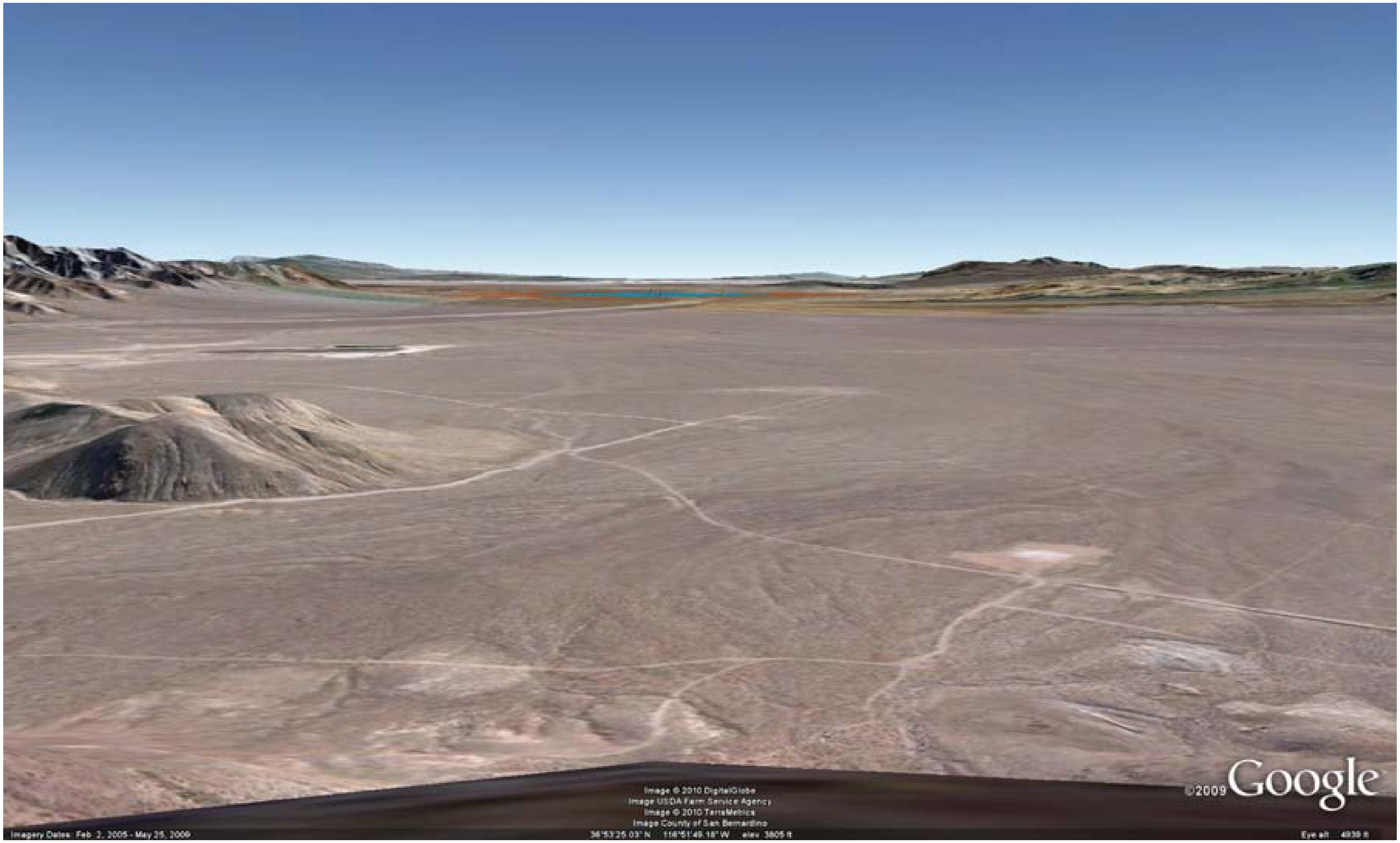

FIGURE 11.1.14.2-4 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on Bullfrog Mountain within Death Valley NP

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

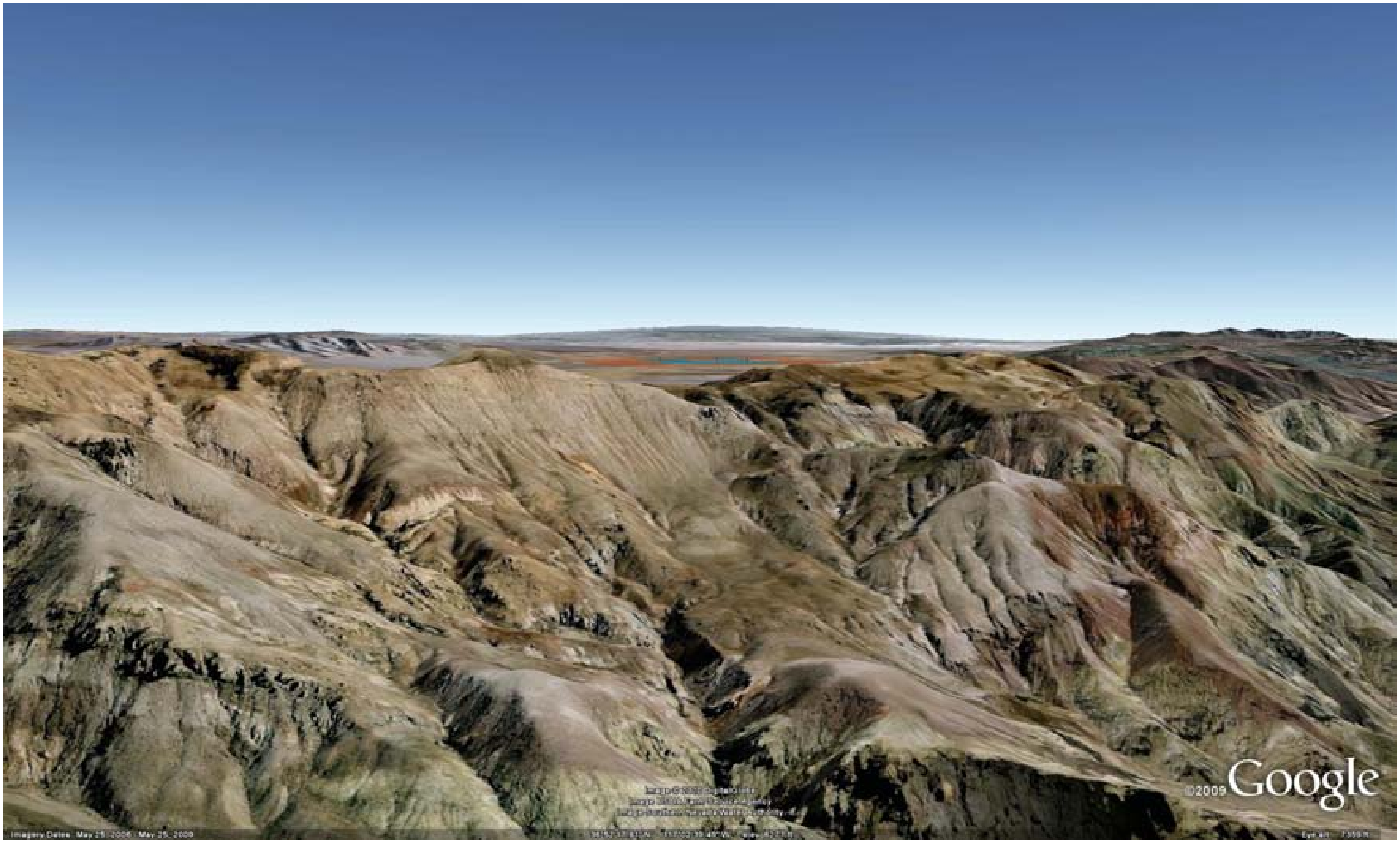

FIGURE 11.1.14.2-5 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Northern Portion of the Amargosa Range in Death Valley NP

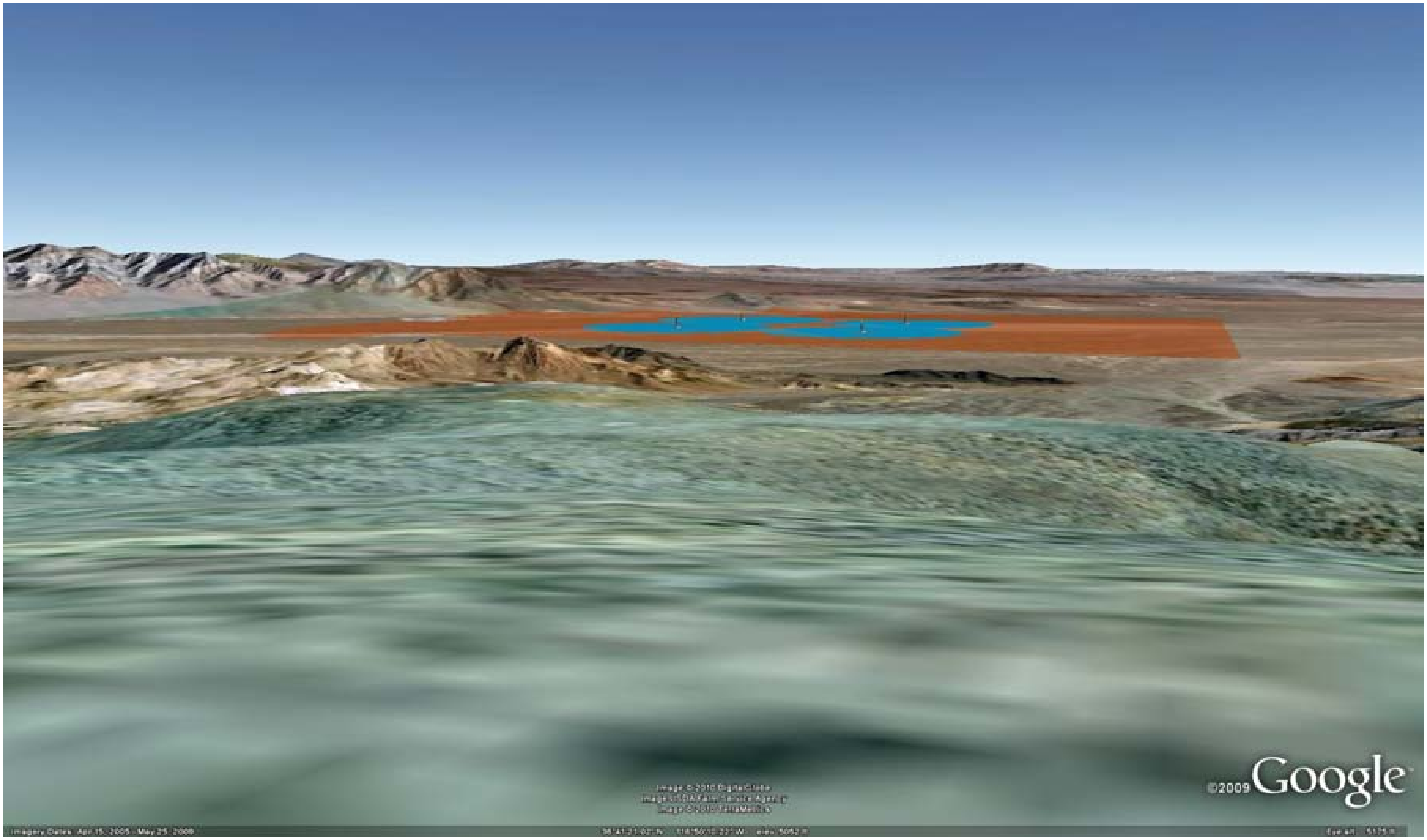

FIGURE 11.1.14.2-6 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Central Portion of the Amargosa Range in Death Valley NP

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.

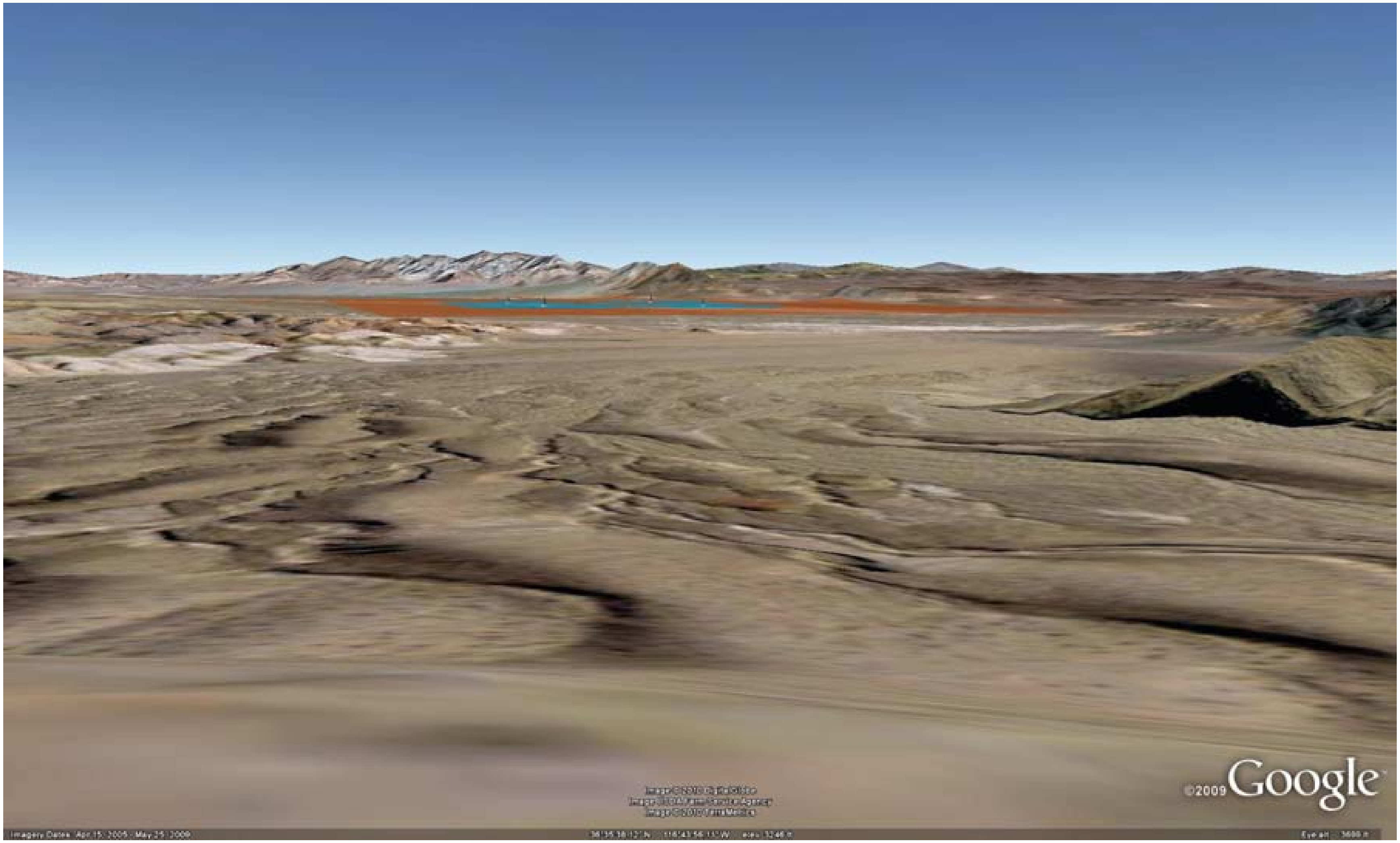

FIGURE 11.1.14.2-7 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Southern Portion of the Amargosa Range in Death Valley NP

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.

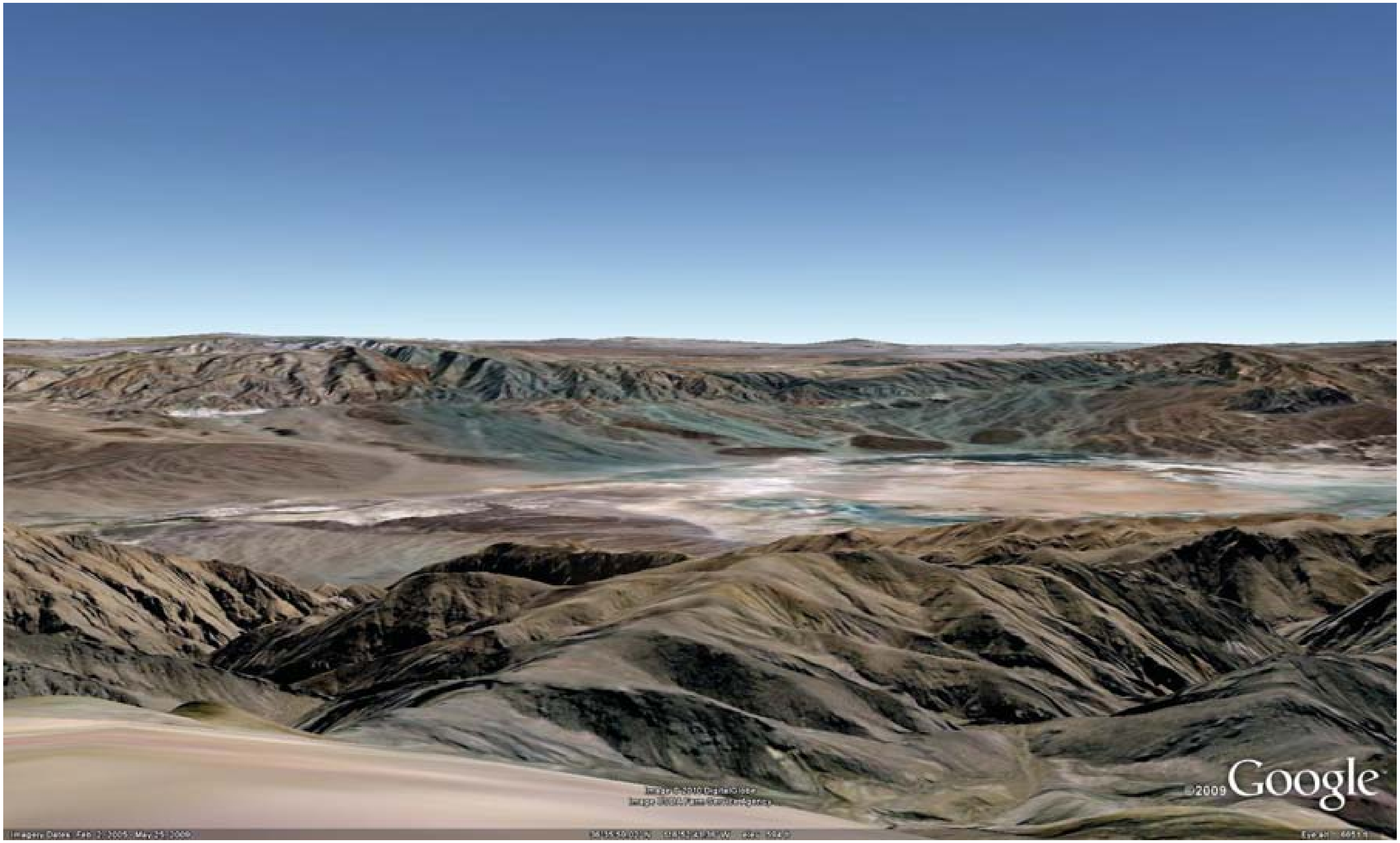

FIGURE 11.1.14.2-8 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on Tucki Mountain within Death Valley NP

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

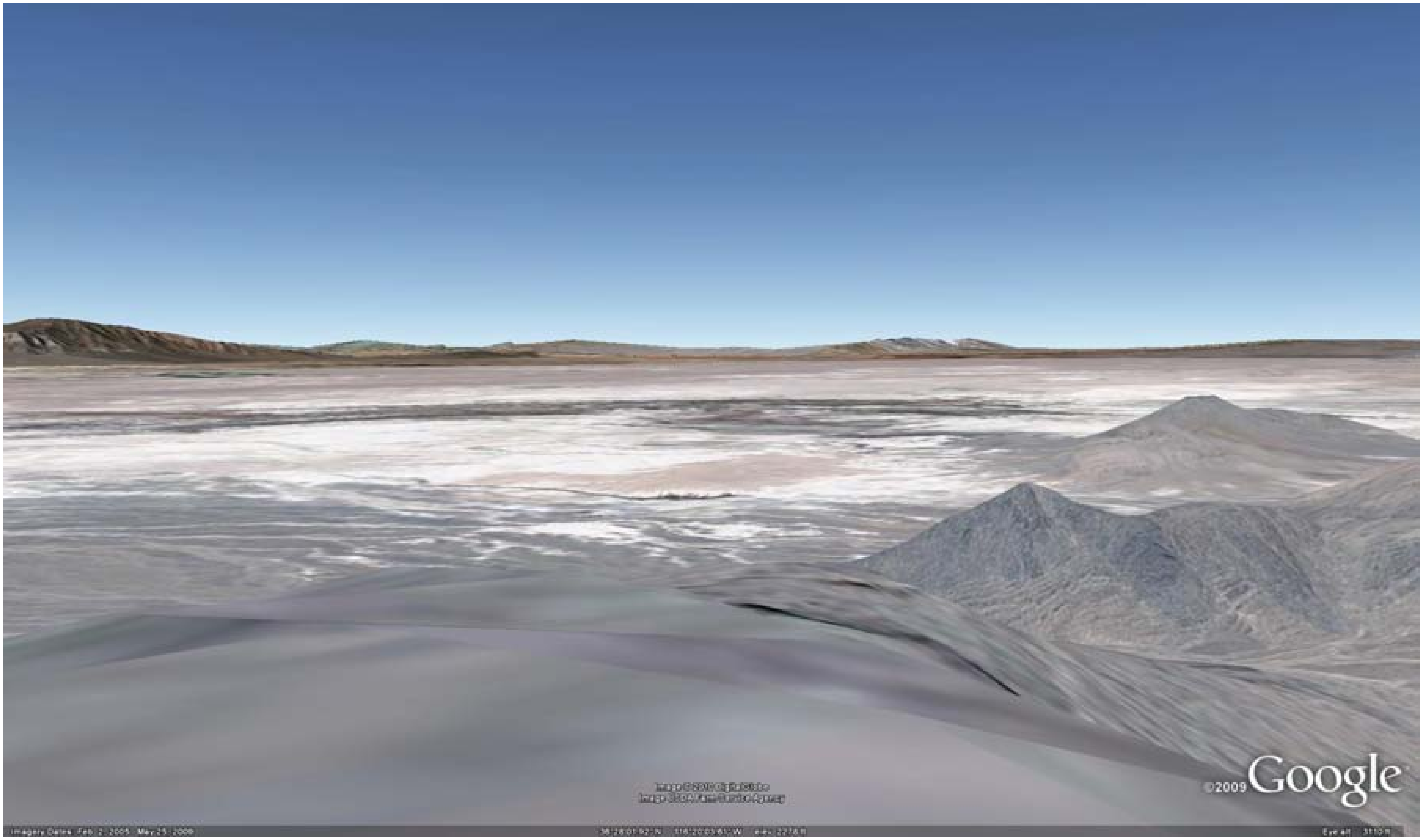

FIGURE 11.1.14.2-10 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Ash Meadows NWR

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

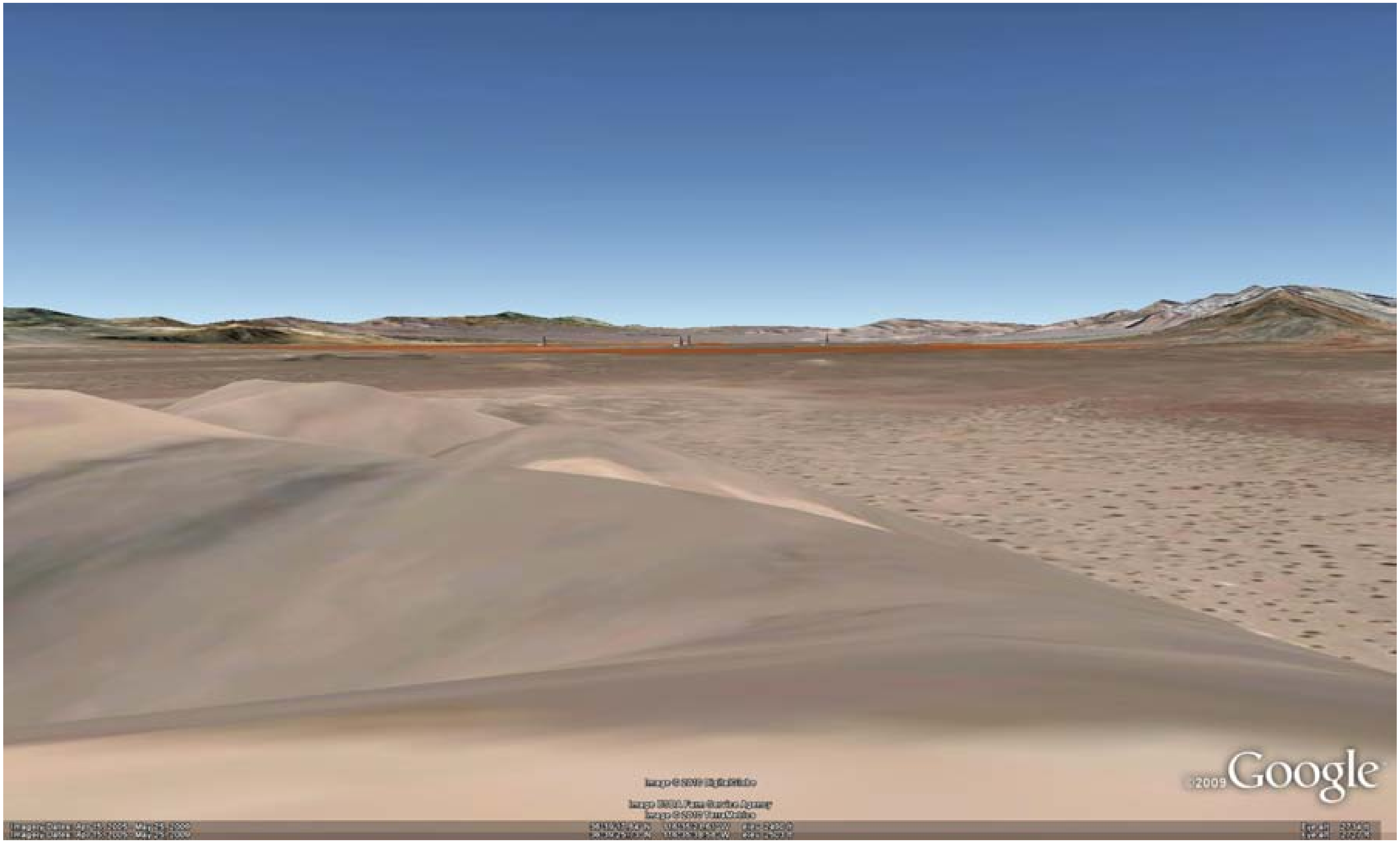

FIGURE 11.1.14.2-11 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Big Dune SRMA

(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

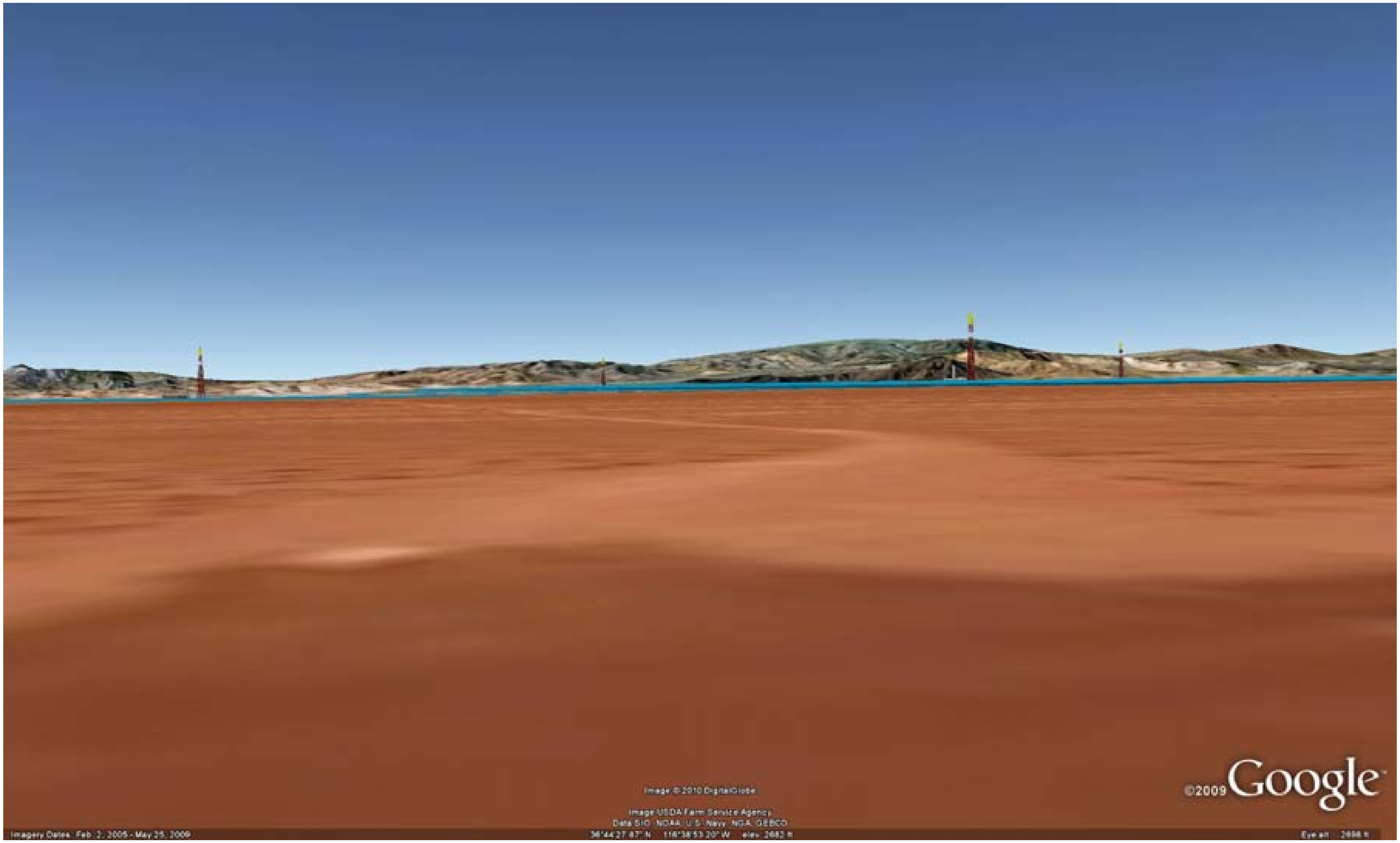

FIGURE 11.1.14.2-12 Google Earth Visualization of the Proposed Amargosa Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on U.S. 95 within the SEZ

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).

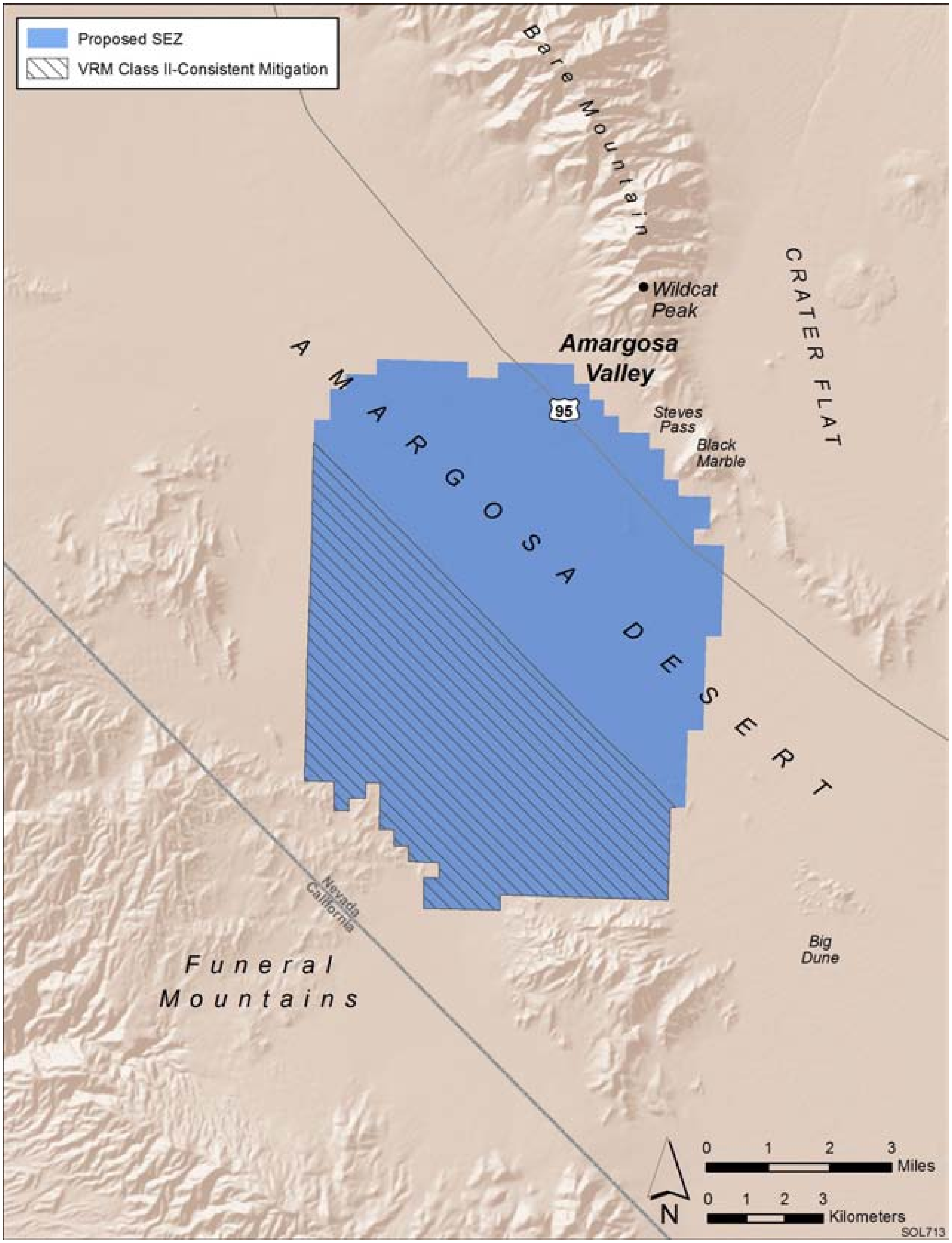

FIGURE 11.1.14.3-1 Areas within the Proposed Amargosa Valley SEZ Affected by SEZ-Specific Distance-Based Visual Impact Design Features

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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

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[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

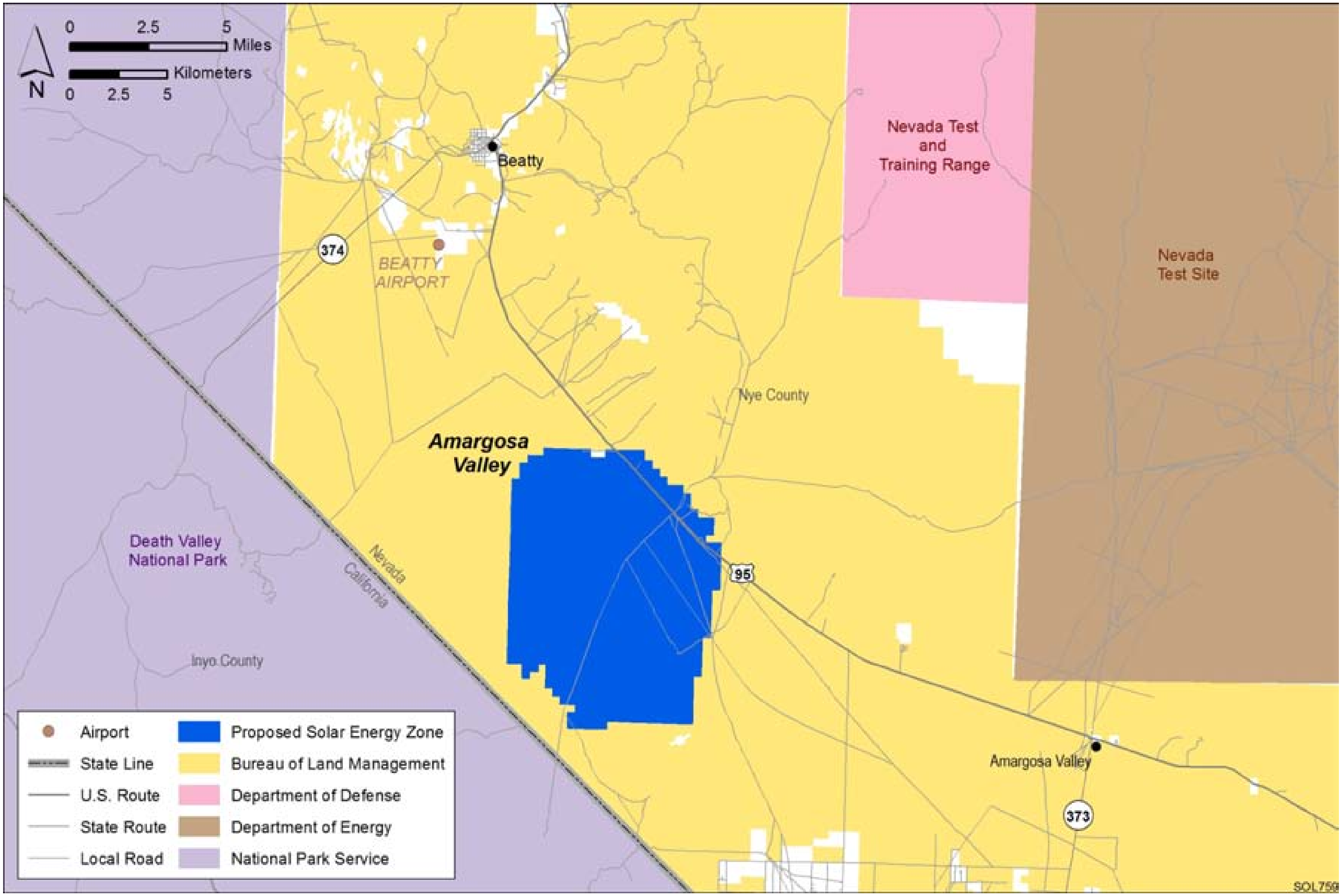

FIGURE 11.1.21.1-1 Local Transportation Network Serving the Proposed Amargosa Valley SEZ

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).

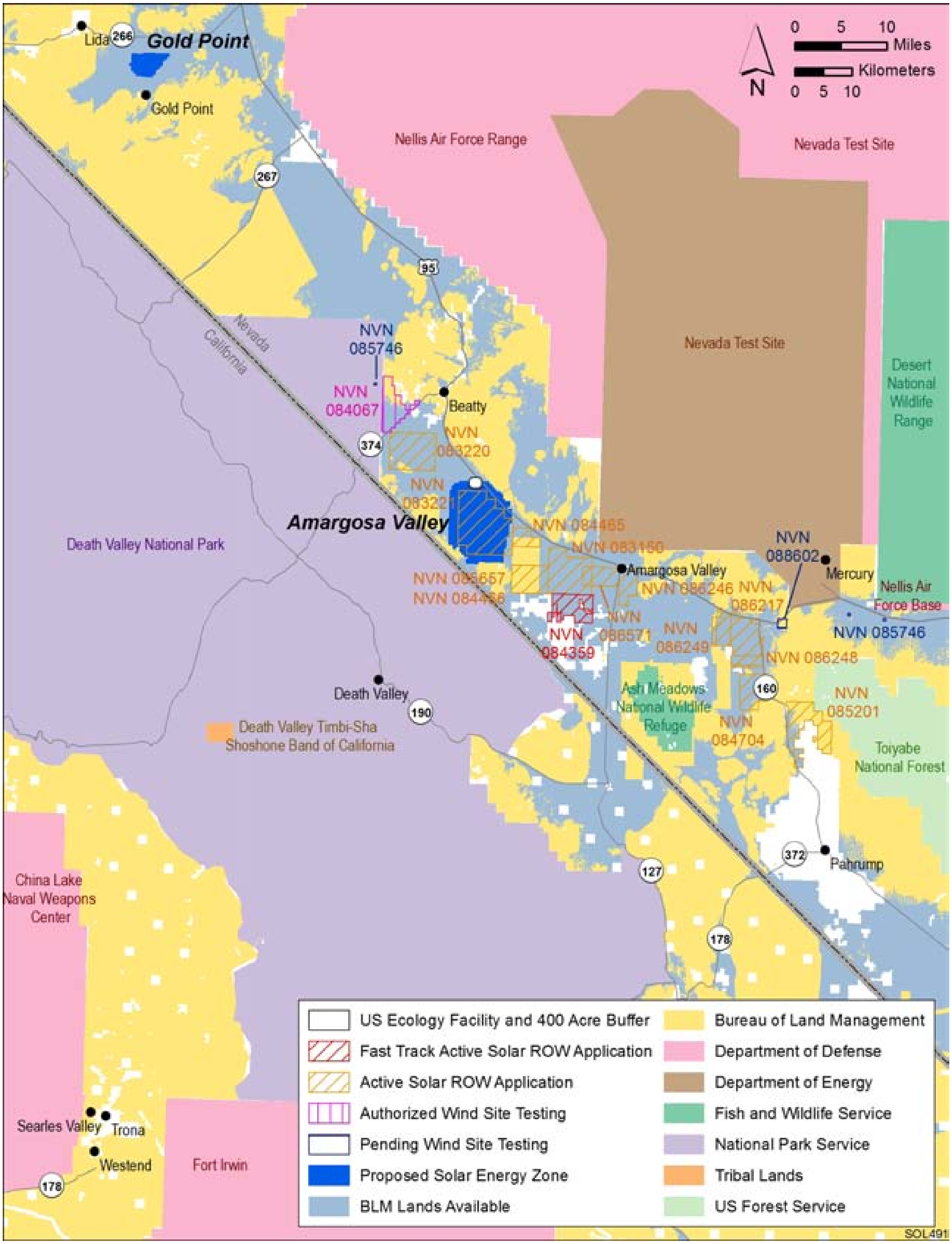

FIGURE 11.1.22.2-1 Locations of Renewable Energy Proposals on Public Land within a 50-mi (80-km) Radius of the Proposed Amargosa Valley SEZ

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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