# 11.5 EAST MORMON MOUNTAIN

## 11.5.1 Background and Summary of Impacts

### 11.5.1.1 General Information

The proposed East Mormon Mountain SEZ is located in Lincoln County in southern Nevada (Figure 11.5.1.1-1). The SEZ has a total area of 8,968 acres (36 $km^2$). In 2008, the county population was 4,643, while adjacent Clark County to the south had a population of 1,879,093. The towns of Mesquite and Bunkerville are approximately 13 mi (21 km) southeast of the SEZ; the larger, Mesquite, had a population of approximately 9,300 at the 2000 Census. The Las Vegas metropolitan area is approximately 62 mi (100 km) to the southwest of the SEZ.

The nearest major road access to the proposed SEZ is I-15, which runs southwest–northeast approximately 11 mi (18 km) to the southeast of the East Mormon Mountain SEZ. The UP Railroad passes about 20 mi (32 km) west of the SEZ; the closest railroad stop is in Moapa, approximately 25 mi (40 km) to the southwest. The nearest public airport is the Mesquite Airport, a small airport in the vicinity of the SEZ near I-15. The nearest airport with scheduled passenger service is the St. George Municipal Airport, 43 mi (69 km) to the northeast in St. George, Utah.

A 500-kV transmission line is adjacent to the southeast corner of the SEZ; there are two additional transmission lines within designated corridors adjacent to the site. It is assumed that an existing transmission line could potentially provide access from the SEZ to the transmission grid (see Section 11.5.1.2).

Applications for ROWs that have been submitted to the BLM include eight pending solar projects, three pending authorizations for wind site testing, and two authorized projects for wind site testing that would be located within 50 mi (80 km) of the East Mormon Mountain SEZ. These applications are discussed in Section 11.5.22.2.1. There are currently no ROW applications for solar projects within the SEZ.

The proposed East Mormon Mountain SEZ is located in the Lower Virgin River Valley. The Mormon and East Mormon Mountains and Tule Spring Hills are located to the northwest of the SEZ, and the Beaver Dam Mountains (in Utah and Arizona) are to the northeast. The Muddy Mountains and Black Mountains are to the southwest; the Southern Virgin Mountains and Virgin Mountains (Arizona) are to the southeast.

The proposed East Mormon Mountain SEZ and other relevant information are shown in Figure 11.5.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar energy development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 $km^2$). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions).

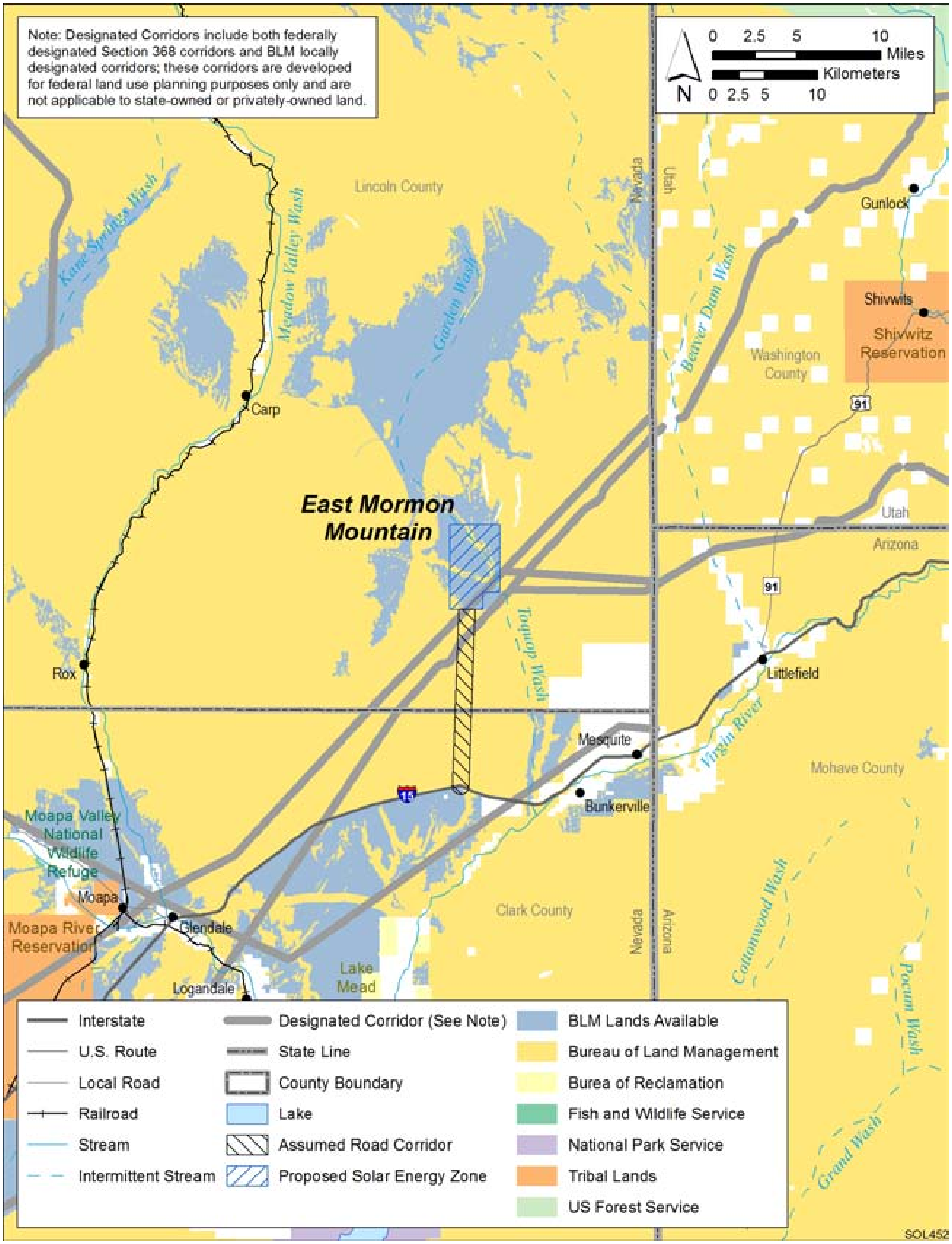


**FIGURE 11.5.1.1-1 Proposed East Mormon Mountain SEZ**

Although these classes of restricted lands were excluded from the proposed East Mormon Mountain SEZ, other restrictions might be appropriate. The analyses in the following sections evaluate the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed East Mormon Mountain SEZ encompassed 7,418 acres (30 $km^2$). Subsequent to the study area scoping period, the boundaries of the proposed East Mormon Mountain SEZ were altered somewhat to facilitate the BLM's administration of the SEZ area. Some higher slope areas internal to and at the borders of the site were added to the SEZ; particularly significant was the addition of the Toquop Wash area to acreage. Although included in the SEZ, these higher slope areas would not likely be utilized for solar facilities. Additionally, borders with irregularly shaped boundaries were adjusted to match the section boundaries of the Public Lands Survey System (PLSS) (BLM and USFS 2010c). The revised SEZ is approximately 1,550 acres (6.3 $km^2$) larger than the original SEZ area as published in June 2009.

### 11.5.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the East Mormon Mountain SEZ is assumed to be 80% of the SEZ area over a period of 20 years, a maximum of 7,174 acres (29 $km^2$). These values are shown in Table 11.5.1.2-1, along with other development assumptions. Full development of the East Mormon Mountain SEZ would allow development of facilities with an estimated total of

**TABLE 11.5.1.2-1 Proposed East Mormon Mountain SEZ—Assumed Development Acreages, Solar MW Output, Access Roads, and Transmission Line ROWs**

| Total Acreage and Assumed Developed Acreage (80% of Total) | Assumed Maximum SEZ Output for Various Solar Technologies | Distance to Nearest State, U.S., or Interstate Highway | Distance and Capacity of Nearest Existing Transmission Line | Area of Assumed Transmission Line ROW and Road ROW | Distance to Nearest Designated Corridor[d] |
|---|---|---|---|---|---|
| 8,968 acres and 7,174 acres[a] | 797 MW[b] and 1,435 MW[c] | I-15 11 mi[d,e] | Adjacent, 500 kV | 0 acres and 80 acres | 0 mi |

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

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

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

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

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

797 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 $km^2$/MW) of land required, and an estimated 1,435 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 $km^2$/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 500-kV line that runs adjacent to the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 500-kV capacity of that line would likely be inadequate for 797 to 1,435 MW of new capacity (a 500-kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, it is likely that new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed East Mormon Mountain SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in the PEIS, it was assumed that the existing 500-kV transmission line which runs adjacent to the proposed SEZ, could provide initial access to the transmission grid, and thus no additional acreage for transmission line access was assessed. Access to the existing transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different off-site grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

I-15 lies 11 mi (18 km) to the south of the proposed East Mormon Mountain SEZ. Assuming construction of a new access road to reach I-15 would be needed to support construction and operation of solar facilities, approximately 80 acres (0.3 $km^2$) of land disturbance would occur (a 60-ft [18.3-m] wide ROW was assumed).

#### 11.5.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 11.5.2 through 11.5.21 for the proposed East Mormon Mountain SEZ are summarized in tabular form. Table 11.5.1.3-1 is a comprehensive list of impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 11.5.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed East Mormon Mountain SEZ are included in Sections 11.5.2 through 11.5.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

**TABLE 11.5.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed East Mormon Mountain SEZ and SEZ-Specific Design Features[a]**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Lands and Realty | Full development of the proposed East Mormon Mountain SEZ could disturb up to 7,174 acres (29 $km^2$). Development of the SEZ for utility-scale solar energy production would establish a large, isolated industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. | None. |
| | Solar development could sever existing roads and trails (including dry washes) that access the SEZ, making it difficult to access undeveloped public lands within and to the west of the SEZ. | None. |
| Specially Designated Areas and Lands with Wilderness Characteristics | Wilderness characteristics in about 3,143 acres (13 $km^2$) or 2% of the Mormon Mountains WA within 5 mi (8 km) from the SEZ would be adversely affected and likely would not be completely mitigated. Depending on the visibility and elevation above the SEZ, wilderness characteristics could be adversely affected at distances up to 11 mi (18 km) in an additional 12,166 acres (49 $km^2$) or 7.7% of the area. | Design features for visual resources should be applied to minimize adverse visual impacts. |
| | A new access road would pass through the Mormon Mesa ACEC and designated critical habitat for desert tortoise, causing fragmentation of the ACEC and creating additional hazards for desert tortoises. Road construction would disturb an additional 80 acres (0.3 $km^2$) that would adversely affect tortoise habitat and would create a barrier to tortoise movement. | The access road to the SEZ should be designed and built to minimize impacts on desert tortoise and tortoise habitat within the Mormon Mesa ACEC. |
| Rangeland Resources: Livestock Grazing | The Gourd Springs allotment has been previously reduced in size by about 40%, and would lose an additional 9.1% of the allotment. Because the SEZ would occupy the best remaining grazing land in the allotment, it is likely that the grazing operation would become economically infeasible and all 3,458 AUMs currently authorized would be lost. | None. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Rangeland Resources: Wild Horses and Burros | None. | None. |
| Recreation | Recreational use would be eliminated from portions of the SEZ that would be developed for solar energy production. There may be some loss of wilderness recreation opportunities in up to 9.7% of the Morman Mountains WA. | Design features for visual resources should be applied to minimize adverse impacts on wilderness recreation use. |
| | Construction of solar energy facilities could sever access to undeveloped public lands in and around the SEZ. | None. |
| Military and Civilian Aviation | *Military*: The military has indicated that solar technologies with structures higher than 200 ft (61 m) above ground level would intrude into military airspace and would present safety concerns for military aircraft. | None. |
| | *Civilian*: There would be no effect on civilian aviation. | None. |
| Geologic Setting and Soil Resources | Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase. Impacts would include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation). | None. |
| Minerals (fluids, solids, and geothermal resources) | None. | None. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Water Resources | Ground-disturbance activities (affecting 33% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills.<br><br>Construction activities may require up to 1,492 ac-ft (1.8 million $m^3$) of water during the peak construction year.<br><br>Construction activities would generate as high as 74 ac-ft (91,300 $m^3$) of sanitary wastewater.<br><br>Assuming full development of the SEZ, operations would use the following amounts of water:<br><br>• For parabolic trough facilities (1,435-MW capacity), 1,025 to 2,172 ac-ft/yr (1.3 million to 2.7 million $m^3$/yr) for dry-cooled systems; 7,195 to 21,543 ac-ft/yr (8.9 million to 27 million $m^3$/yr) for wet-cooled systems.<br><br>• For power tower facilities (797-MW capacity), 567 to 1,205 ac-ft/yr (700,000 to 1.5 million m3/yr) for dry-cooled systems; 3,995 to 11,966 ac-ft/yr (5 million to 14.8 million $m^3$/yr) for wet-cooled systems. For dish engine facilities (797-MW capacity), 408 ac-ft/yr (503,500 $m^3$/yr).<br><br>• For PV facilities (797-MW capacity), 41 ac-ft/yr (50,600 $m^3$/yr).<br><br>• Assuming full development of the SEZ, operations would generate up to 20 ac-ft/yr (24,700 $m^3$/yr) of sanitary wastewater and up to 408 ac-ft/yr (503,500 $m^3$/yr) of blowdown water. | Water resources analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures.<br><br>Land-disturbance activities should minimize impacts on the ephemeral stream channels found within the SEZ, including but not limited to Toquop Wash and South Fork Toquop Wash, as well as alluvial fan features throughout the SEZ.<br><br>Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters.<br><br>Groundwater rights must be purchased and transferred through coordination with the NDWR and current water rights holders.<br><br>Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection.<br><br>Groundwater monitoring and production wells should be constructed in accordance with state standards.<br><br>Water for potable uses would have to meet or be treated to meet water quality standards in accordance with the *Nevada Administrative Code*. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Vegetation[b] | Up to 80% (7,174 acres [29 $km^2$]) of the SEZ would be cleared of vegetation; re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and might require extended periods of time.<br><br>Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation.<br><br>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.<br><br>Vegetation communities associated with playa habitats, riparian habitats, desert dry washes, or other intermittently flooded areas within or downgradient from solar projects could be affected by ground-disturbing activities.<br><br>The use of groundwater within the proposed East Mormon Mountain SEZ for technologies with high water requirements, such as wet-cooling systems, could disrupt the groundwater flow pattern and adversely affect wetland communities associated with springs in the vicinity of the SEZ. | An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of desert scrub and other affected habitats, and to minimize the potential for the spread of invasive species such as Mediterranean grass. Invasive species control should focus on biological and mechanical methods, where possible, to reduce the use of herbicides.<br><br>All desert dry wash, playa, riparian, and Joshua tree communities within the SEZ and access road corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. Any Joshua trees, other yucca species, cacti, or succulent plant species in areas of direct impacts that cannot be avoided should be salvaged. A buffer area should be maintained around dry wash, playa, and riparian habitats to reduce the potential for impacts.<br><br>Appropriate engineering controls should be used to minimize impacts on dry wash, playa, wetland, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Vegetation[b] *(Cont.)* | | Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetlands associated with springs, such as Tule Spring and Abe Spring. Potential impacts on springs should be determined through hydrological studies. |
| Wildlife: Amphibians and Reptiles[b] | Direct impacts from SEZ development would be small for all representative amphibian and reptile species (i.e., loss of ≤1% of potentially suitable habitats). With implementation of design features, indirect impacts are expected to be negligible. | Development in wash, playa and rock outcrop habitats should be avoided. |
| Wildlife: Birds[b] | Direct impacts on all representative bird species would be small (i.e., loss of ≤1% of potentially suitable habitats).<br><br>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.<br><br>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.<br><br>Playa, wash, and rock outcrop habitats should be avoided. |
| Wildlife: Mammals[b] | Direct impacts on all representative mammal species would be small (i.e., loss of ≤1% of potentially suitable habitats).<br><br>Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These impacts are expected to be negligible with the implementation of design features. | The fencing around the solar energy development should not block the free movement of mammals, particularly big game species.<br><br>Playa, wash, and rock outcrop habitats should be avoided. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Aquatic Biota[b] | There are no perennial streams or lakes present within the East Mormon SEZ or the area of indirect effects. Intermittent and ephemeral washes are present, and these features may be directly affected by ground disturbance (SEZ only), contaminant inputs, and sedimentation from runoff and fugitive dust. However, the washes are typically dry, and impacts on aquatic habitat and communities are not likely to occur. Aquatic habitat and biota potentially found in springs present within the area of indirect effects could be affected by fugitive dust associated with solar energy development within the SEZ. However, more site specific data on these springs are needed. There is the potential for sediments and contaminants deposited in the washes to affect aquatic habitat and communities in the perennial Virgin River. However, the distance of the SEZ to the Virgin River (>12 mi [19 km]) and the infrequency of flooding reduces the chance for sediment to reach the aquatic habitat. Dry and wet cooling is not likely to be possible with local water resources, so water withdrawals and subsequent effects on aquatic habitat and biota would be minimal. | Ground disturbance and contaminant spills near Toquop Wash and the other unnamed washes within the SEZ should be minimized.<br><br>Appropriate engineering controls should be implemented to minimize the amount of surface water runoff and fugitive dust reaching springs, Toquop Wash and unnamed washes in the SEZ and in the area of indirect effects.<br><br>The impact of groundwater withdrawals on surface water features near the SEZ (such as Tule Spring, Abe Spring, Gourd Spring and Peach Spring) should be eliminated or minimized. |
| Special Status Species[b] | Potentially suitable habitat for 32 special status species occurs in the affected area of the East Mormon Mountains SEZ. For all special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects. | Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible for some species, translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Special Status Species[b] *(Cont.)* | | Avoiding or minimizing disturbance to desert wash, playa, rocky cliffs, and outcrop habitats could reduce or eliminate impacts on 17 special status species.<br><br>Consultation with the USFWS and the NDOW should be conducted to address the potential for impacts on the desert tortoise. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.<br><br>Coordination with the USFWS and the NDOW should be conducted for the Las Vegas buckwheat, a candidate species for listing under the ESA. Coordination would identify an appropriate survey protocol and mitigation requirements, which may include avoidance, minimization, translocation, or compensation.<br><br>Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Air Quality and Climate | *Construction*: Temporary exceedances of AAQS for 24-hour and annual $PM_{10}$ and 24-hour $PM_{2.5}$ concentration levels would occur at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. These concentrations would decrease quickly with distance. Modeling indicates that emissions from construction activities are not anticipated to exceed the Class I PSD $PM_{10}$ increments at the nearby federal Class I area (Zion NP, Utah). In addition, construction emissions from the engine exhaust of heavy equipment and vehicles could affect AQRVs (e.g., visibility and acid deposition) at nearby federal Class I areas.<br><br>*Operations*: Positive impact due to avoided emissions of air pollutants from combustion-related power generation: 3.7 to 6.6% of total emissions of $SO_2$, $NO_x$, Hg, and $CO_2$ from electric power systems in the state of Nevada avoided (up to 3,547 tons/yr $SO_2$, 3,042 tons/yr $NO_x$, 0.020 ton/yr Hg, and 1,952,000 tons/yr $CO_2$). | None. |
| Visual Resources | The SEZ is in an area of low scenic quality. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads.<br><br>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.<br><br>The SEZ is located 2.4 mi (3.9 km) from Mormon Mountains WA. Because of the close proximity of the WA to the SEZ, and the elevated viewpoints in the WA, strong visual contrasts could be observed by WA visitors. | The development of power tower facilities should be prohibited within the SEZ. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Acoustic Environment | *Construction:* For construction of a solar facility located near the southern SEZ boundary, estimated noise levels at the nearest residences located about 9 mi (14.5 km) from the SEZ boundary would be about 17 dBA, which is well below the typical daytime mean rural background level of 40 dBA. In addition, an estimated 40 dBA $L_{dn}$ at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA $L_{dn}$ for residential areas.<br><br>*Operations:* For operation of a parabolic trough or power tower facility located near the southeastern SEZ boundary, the predicted noise level would be about 22 dBA at the nearest residences, which is well below the typical daytime mean rural background level of 40 dBA. If the operation were limited to daytime, 12 hours only, a noise level of about 40 dBA $L_{dn}$ (i.e., no contribution from facility operation) would be estimated for the nearest residences, which is well below the EPA guideline of 55 dBA $L_{dn}$ for residential areas. However, in the case of 6-hour TES, the estimated noise level at the nearest residences would be 32 dBA, which is somewhat higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 41 dBA $L_{dn}$, which is still well below the EPA guideline of 55 dBA $L_{dn}$ for residential areas.<br><br>If 80% of the SEZ were developed with dish engine facilities, the estimated noise level at the nearest residences would be about 33 dBA, which is lower than the typical daytime mean rural background level of 40 dBA. On the basis of 12-hour daytime operation, the estimated 40 dBA $L_{dn}$ at these residences (i.e., no contributions from dish engines) would be well below the EPA guideline of 55 dBA $L_{dn}$ for residential areas. | None. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Paleontological Resources | Few, if any, impacts on significant paleontological resources are likely in the proposed East Mormon Mountain SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. | The need for SEZ-specific design features would depend on the results of future paleontological investigations, especially along a potential new access road corridor; however, based on the current level of information, a need for mitigation of areas potentially classified as PFYC Class 2 or lower is not anticipated. |
| Cultural Resources | Direct impacts on significant cultural resources could occur in the proposed East Mormon Mountain SEZ; however, further investigation is needed. Areas near Toquop Wash and South Fork have considerable potential for containing significant sites. Visual impacts on the Old Spanish National Historic Trail are possible, as well as visual and auditory effects on nearby rock art sites.<br><br>A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP. | Avoidance of South Fork and Toquop Wash areas is recommended.<br><br>Coordination with the Trail Administration for the Old Spanish Trail and Old Spanish Trail Association is recommended to identify potential mitigation strategies for avoiding or minimizing potential impacts, if impacts are identified in future studies, on the congressionally designated Old Spanish National Historic Trail.<br><br>Other SEZ-specific design features would be determined through consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations. |
| Native American Concerns | While no comments specific to the proposed East Mormon Mountain SEZ have been received from Native American Tribes to date, the proposed SEZ does include plants and animals traditionally important to Native Americans. As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concern over water resources and potential visual, acoustic, and other effects of solar energy development within the SEZ on specific resources, including culturally important landscapes. | The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes. |

**TABLE 11.5.1.3-1 (Cont.)**

| Resource Area | Environmental Impacts—Proposed East Mormon Mountain SEZ | SEZ-Specific Design Features |
|---|---|---|
| Socioeconomics | *Construction:* A total of 444 to 4,438 jobs would be added; ROI income would increase by \$28.1 million to \$268.7 million.<br><br>*Operations:* A total of 21 to 496 annual jobs would be added; ROI income would increase by \$0.7 million to \$18.9 million.<br><br>Construction of new access road: 234 jobs; \$9.1 million income in ROI. | None. |
| Environmental Justice | As defined in CEQ guidelines, no minority or low income populations occur within the 50-mi (80-km) radius around the boundary of the SEZ; thus, there would be no disproportionately high and adverse human health or environmental effects on low-income or minority populations. | None. |
| Transportation | The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The volume of traffic on I-15 to the southeast of the East Mormon Mountain SEZ would represent an increase in traffic of about 12%. | None. |

Abbreviations: AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; AQRV = air quality–related value; BLM = Bureau of Land Management; BMP = best management practice; CEQ = Council on Environmental Quality; $CO_2$ = carbon dioxide; dBA = A-weighted decibel; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; $L_{dn}$ = day-night average sound level; MTR = military training route; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NNHP = Nevada Natural Heritage Program; $NO_x$ = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; PEIS = programmatic environmental impact statement; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 μm or less; $PM_{10}$ = particulate matter with an aerodynamic diameter of 10 μm or less; PSD = prevention of significant deterioration; PV= photovoltaic; ROI = region of influence; ROW = right-of-way; SEZ = solar energy zone; SHPO = State Historic Preservation Office; $SO_2$ = sulfur dioxide; SRMA = Special Recreation Management Area; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; WA = Wilderness Area.

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

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 11.5.10 through 11.5.12.

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## 11.5.2 Lands and Realty

### 11.5.2.1 Affected Environment

The proposed East Mormon Mountain SEZ is a small but well-blocked area of BLM-administered land that is very isolated and is accessible currently only by travel over 10 to 15 mi (16 to 24 km) of dirt or gravel roads. The character of the land in the SEZ is undeveloped and rural with only a few roads/trails (including dry washes) present within the area. There are two designated 368b (of the Energy Policy Act of 2005) transmission corridors that pass adjacent to the area that contain a total of three major transmission lines and one large natural gas pipeline. There is also a locally designated corridor that heads southeast from the SEZ toward Mesquite, Nevada.

Authorization is being sought for a new natural gas–fueled power generating station, the Toquop Energy Project, located adjacent to the southeastern corner of the SEZ. Water for the proposed energy project would be provided via a pipeline for which the BLM has issued a ROW. The pipeline ROW is located within the proposed SEZ (Linnell 2010).

As of February 2010, there were no ROW applications for solar energy facilities within the SEZ.

### 11.5.2.2 Impacts

#### *11.5.2.2.1 Construction and Operations*

Full development of the proposed East Mormon Mountain SEZ could disturb up to 7,174 acres (29 $km^2$) (Table 11.5.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and isolated, utility-scale solar energy development would be a new and highly discordant land use to the area. If the Toquop Energy Project (Section 11.5.22.2.2**)**, were built, the area would have a much more industrial nature.

The existing water pipeline ROW on the SEZ would not be affected by solar energy development since it is a prior right. The area of the pipeline would not be available for construction of solar energy facilities. Should the proposed area be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights issued for solar energy development. Because the area is adjacent to three transmission corridors, it is not anticipated that approval of solar energy development in the SEZ would have a significant impact on the availability of land for ROWs in the area.

Existing dirt roads and washes used for travel within the SEZ would be closed wherever solar development facilities were constructed, and access to public lands not developed for solar energy could be affected. This could adversely affect public land users wanting to access any areas isolated by solar development unless provision of alternate access is retained or provided.

##### *11.5.2.2.2 Transmission Facilities and Other Off-Site Infrastructure*

An existing 500-kV transmission line runs adjacent to the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

To provide adequate road access to the SEZ, about 11 mi (18 km) of new or upgraded road would be required to connect to I-15. This could create an additional 80 acres (0.3 $km^2$) of surface disturbance. See Section 11.5.1.2 regarding development assumptions for the SEZ.

Power lines and roads would be constructed within the SEZ as part of solar energy development.

#### 11.5.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions may be (1) development of the SEZ would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity, and (2) existing dirt roads and washes within the SEZ would be closed wherever solar development facilities were constructed, and access to public lands not developed for solar energy could be adversely affected.

### 11.5.3 Specially Designated Areas and Lands with Wilderness Characteristics

#### 11.5.3.1 Affected Environment

There are 20 specially designated areas within 25 mi (40 km) of the proposed East Mormon Mountain SEZ that potentially could be affected by solar energy development within the SEZ, principally from impacts on scenic, recreation, biological, and/or wilderness resources. The potential area of impact for the SEZ includes parts of Nevada, Utah, and Arizona; thus some of the listed areas are located in more than one BLM District. The state(s) in which the area is located is noted after the name of the area. The areas include (see Figure 11.5.3.1-1) the following:

- National Monument
  - Grand Canyon Parashant (Arizona)

- National Recreation Area
  - Lake Mead (Nevada)

- National Natural Landmark
  - Joshua Tree Natural Area (Utah)

- National Designated Historic Trail
  - Old Spanish Trail (Arizona, Nevada, and Utah)

- National Conservation Area
  - Beaver Dam Wash (Utah)

- Wilderness Areas
  - Mormon Mountains (Nevada)
  - Meadow Valley Range (Nevada)
  - Clover Mountains (Nevada)
  - Beaver Dam Mountains (Arizona and Utah)
  - Paiute (Arizona)

- Wilderness Study Area
  - Joshua Tree Instant Study Area (Utah)

- Areas of Critical Environmental Concern
  - Mormon Mesa, both Ely and Las Vegas Districts (Nevada)
  - Virgin River (Nevada)
    Virgin Mountains (also known as Gold Butte Part A) (Nevada)
  - Beaver Dam Slope (Nevada, Utah, and Arizona)
  - Lower Meadow Valley Wash (Nevada)
  - Virgin River Corridor (Arizona)
  - Virgin Slope (Arizona)

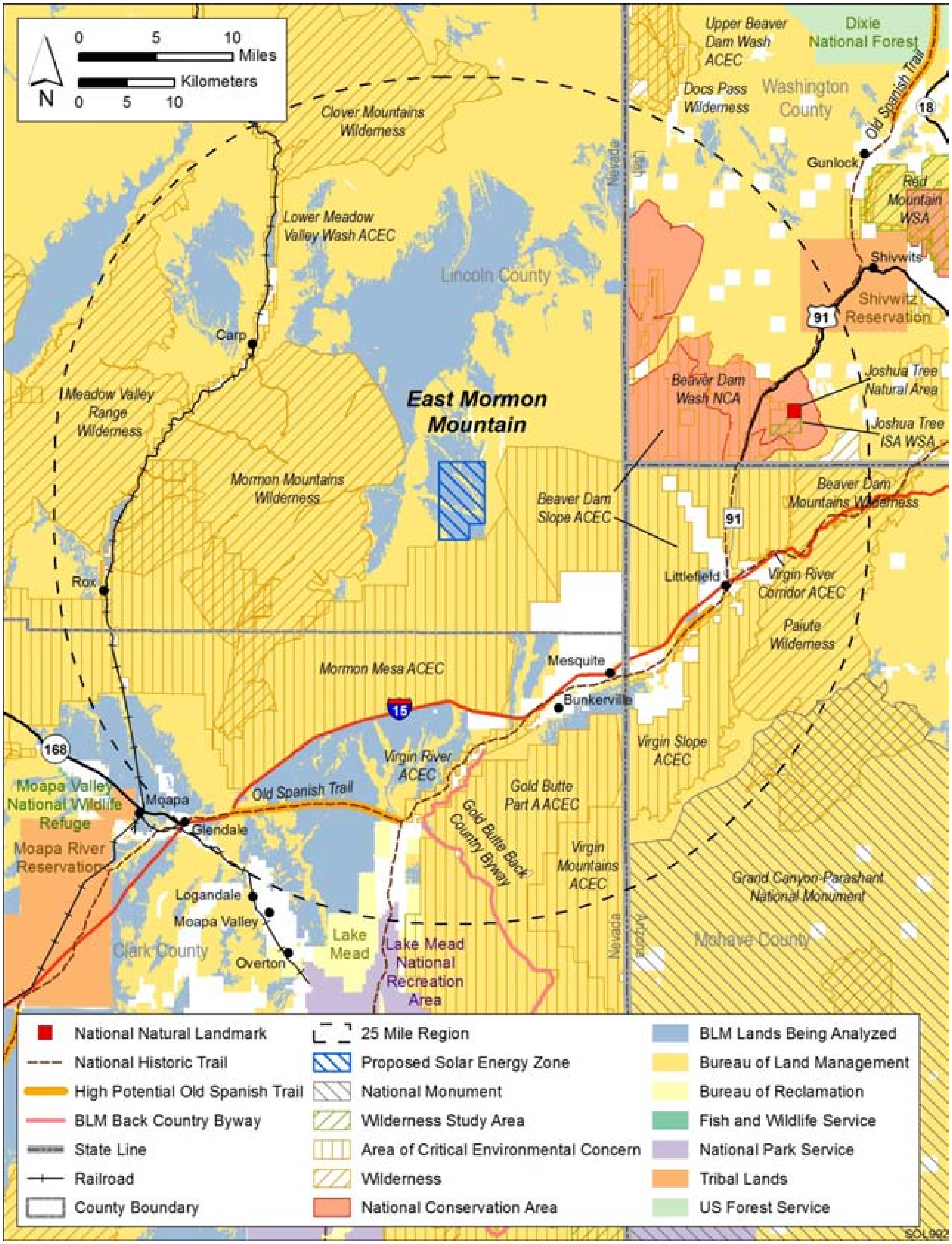


**FIGURE 11.5.3.1-1 Specially Designated Areas in the Vicinity of the Proposed East Mormon Mountain SEZ**

- Backcountry Byway
  - Gold Butte

Both Lake Mead NRA and Grand Canyon-Parashant National Monument are being dropped from further consideration since both are 23 to 24 mi (37 to 39 km) from the SEZ and less than 1% of their areas would have possible visibility of facilities within the SEZ. No impact on these areas is anticipated.

Less than 5% of the area of the Clover Mountains and Meadow Mountain Range WAs would have any visibility of solar development in the SEZ; the WAs are between 15 and 25 mi (24 and 40 km) from the SEZ. Consequently, no impact on the wilderness characteristics of these areas is anticipated; thus they are not considered further.

Of the listed ACECs, only the Virgin Mountains and the Virgin River Corridor have a scenic component included as part of the rationale for the ACEC designation. Of the remaining ACECs, only portions of the Mormon Mesa in the Ely District and Beaver Dam Slope in Nevada, Utah, and Arizona, which abut the SEZ, may incur impacts from solar development of the proposed SEZ. The remaining four ACECs are not anticipated to be adversely affected by solar development in the SEZ and are not considered further.

There are no lands near the SEZ and outside of designated WAs or WSAs that have been identified by the BLM to be managed to protect wilderness characteristics.

### 11.5.3.2 Impacts

#### *11.5.3.2.1 Construction and Operations*

The primary potential impact on 10 of the 12 remaining specially designated areas near the SEZ would be from visual impacts of solar energy development that could affect scenic, recreational, or wilderness characteristics of the areas. The remaining 2 areas are ACECs designated primarily to protect desert tortoise habitat. The primary potential impact on these areas would come from increased human activity and vehicle traffic, which could increase tortoise mortality.

The visual impact on specially designated areas is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be a factor in the viewshed from portions of these specially designated areas, as summarized in Table 11.5.3.2-1. The data provided in the table assume the use of 650-ft (198.1-m) power tower solar energy technology, which because of the potential height of these facilities, could be visible from the largest amount of land of the technologies being considered in the PEIS. Viewshed analysis for this SEZ has shown that the visual impacts of shorter solar energy facilities would be slightly less than for power tower technology that is used for the analysis (see Section 11.5.14 for more detail on all viewshed analysis discussed in this section). Assessment of the visual impact

**TABLE 11.5.3.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi Viewshed of the Proposed East Mormon Mountain SEZ[a]**

| | | Feature Area or Highway Length[c] | | |
|---|---|---|---|---|
| | | | Visible between | |
| Feature Type | Feature Name (Total Acreage/Highway Length)[b] | Visible within 5 mi | 5 mi and 15 mi | 15 mi and 25 mi |
| WAs | Beaver Dam Mountains (18,635 acres) | 0 acres | 0 acres | 2,748 acres (15%) |
| | Mormon Mountains (157,645 acres) | 3,143 acres (2%) | 15,309 acres (9.7%) | 15,304 acres (9.7%) |
| | Paiute (87,908 acres) | 0 acres | 0 acres | 15,359 acres (17.5%) |
| | Joshua Tree ISA (1,047 acres) | 0 acres | 0 acres | 744 acres (71%) |
| ACECs | Virgin River Corridor (Arizona) (2,065 acres) | 0 acres | Undetermined | Undetermined |
| | Virgin Mountains (Nevada) (35,826 acres) | 0 acres | 0 acres | 6,257 acres (17.5%) |
| | Beaver Dam Slope (Nevada, Utah, Arizona) (137,029 acres) | 13,046 acres (9.5%) | 42,888 acres (31.3%) | 73,249 acres (53.5%) |
| | Mormon Mesa – Ely (110,275 acres) | 19,705 acres (17.9%) | 25,118 acres (22.8%) | 25,118 acres (22.8%) |
| National Conservation Area | Beaver Dam Wash (72,040 acres)[d] | 0 acres | 12,664 acres (17.5%) | 33,860 acres (47%) |
| National Natural Landmark | Joshua Tree Natural Area (1,015 acres) | 0 acres | 0 acres | 1,015 acres (100%) |
| National Trail | Old Spanish Trail | 11 mi | 0 mi | 1 mi |
| Scenic Byway | Gold Butte (62 mi) | 0 mi | 0 mi | 7 mi |

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

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

[c] Percentage of total feature acreage or road length viewable.

[d] This includes public, state, and private lands. Public lands total about 63,488 acres (257 $km^2$).

of solar energy projects must be conducted on a site-specific and technology-specific basis to accurately identify impacts.

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

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

**Wilderness Areas**

***Beaver Dam Mountains.*** This WA encompasses lands within both Utah and Arizona, and its nearest boundary to the SEZ is about 19 mi (31 km) east of the SEZ. Almost all of the 2,748 acres (11 $km^2$) with visibility of the SEZ are on the western slopes of the Beaver Dam Mountains. Although there would be a long-distance view of facilities in the SEZ from the WA, because the viewing angle would be very low, the portion of the horizontal field of view filled by the SEZ would be small, and the distance so great, the contrast caused by solar facilities would be very weak; it is anticipated that solar development would have no impact on wilderness characteristics within the area.

***Mormon Mountains.*** This WA is located about 2 mi (3 km) west of the SEZ at the nearest point, and solar facilities within the SEZ could be visible from the summits and east-facing slopes of some of the mountains in the eastern part of the WA, at distances from about 3 to 11 mi (5 to 18 km) west from the SEZ's western boundary. From many locations within the WA, views of solar facilities within the SEZ would be largely screened by the intervening East Mormon Mountains, or limited to views of taller solar facilities, or both, but there is a substantial portion of the WA with open or nearly open views of the SEZ. These views are generally through two gaps in the East Mormon Mountains, one directly west of the central portion of the SEZ, and another northwest of the northwest corner of the SEZ. These views of the SEZ are the most open, and from some viewpoints (generally closer to the SEZ) expected contrast levels would be moderate to strong. At lower elevations, the East Mormon Mountains screen more of the SEZ from view, and contrast levels are generally much lower. It is anticipated that the wilderness characteristics in 3,143 acres (12.7 $km^2$) of the WA with a view of the SEZ within 5 mi (8 km) from the SEZ would be adversely affected, and depending on the visibility and height above the SEZ, wilderness characteristics could be adversely affected at somewhat longer distances. Based on viewshed analysis, a total of 15,309 acres (62 $km^2$), or 9.7%, of the WA within about 11 mi (18 km) would have visibility of solar facilities in the SEZ.

***Paiute.*** The Paiute WA is located in Arizona, with the nearest boundary of the SEZ about 19 mi (31 km) northwest of the area. Like the Beaver Dam Mountains WA, most of the area with visibility of the SEZ is on the western slopes of the mountains. In this case, however, about 15,359 acres (62 $km^2$), or about 17% of the WA, would have long-distance views of solar development in the SEZ. Because the viewing angle of the SEZ would be very low, the portion of the horizontal field of view filled by the SEZ would be small, and the distance so great, the contrast caused by solar facilities would be very weak; it is anticipated that development within the SEZ would have no impact on wilderness characteristics of the area.

***Joshua Tree ISA and the Joshua Tree National Natural Landmark.*** The NNL is included within the boundaries of the ISA (BLM 2010b), so the areas are discussed together. Both are also included within the congressionally designated Beaver Dam Wash NCA. The Joshua Tree ISA is a small area located about 19 mi (31 km) east of the SEZ, on the upper slopes of the Beaver Dam Mountains. Much of the ISA and NNL would have open views of the distant SEZ. Despite elevations more than 2,800 ft (853 m) higher than the SEZ in some locations, because of the long distance to the SEZ the vertical angle of view is low, and the SEZ would occupy a small portion of the horizontal field of view. Weak contrast levels would be expected from solar facilities within the SEZ as viewed from the ISA and would not affect wilderness characteristics in the area.

**Areas of Critical Environmental Concern**

***Virgin River Corridor.*** This ACEC is located in Arizona and follows the path of the Virgin River. The ACEC at its nearest approach is about 13.5 mi (22 km) from the southeastern border of the SEZ and actually extends to the northeast past the 25-mi (40-km) analysis area for the SEZ. A review of the viewshed overlay for the area (not a viewshed analysis) indicates that the river appears to be incised and largely topographically screened; thus it is likely solar development would not be visible from within the ACEC. In some areas, dense vegetation would also hinder views outside of the river corridor itself. If solar facilities were visible, the view would only be of the top of sufficiently tall power towers. On the basis of this review, it is anticipated that there would be no impact on the ACEC.

***Virgin Mountains.*** This ACEC is located in Nevada about 19 mi (31 km) southeast of the SEZ. The area was also known as Gold Butte ACEC Part 2 in the BLM's 1998 Las Vegas RMP (BLM 1998b) and was established to protect wildlife, scenic, and botanical resources. About

6,257 acres (25 $km^2$), or 17.5%, of the area would have potential visibility of solar facilities within the SEZ. The area of potential visibility extends to about 24 mi (39 km) from the boundary of the SEZ and primarily includes higher elevations on the northwest side of the Virgin Mountains. Portions of the ACEC are about 2,500 ft (762 m) above the elevation of the SEZ and would have views of development in the area. The views, however, would be from a long distance, at a low vertical angle, and the SEZ would occupy only a small portion of the horizontal field of view. Weak contrast levels would be expected from solar facilities within the SEZ, as viewed from within the ACEC, and would not affect the values for which the ACEC was established. It is also anticipated that there would be no impact on recreational use of the area.

***Beaver Dam Slope and Mormon Mesa.*** These ACECs are very large and were established for the protection of desert tortoise habitat. The ACECs are also designated as critical habitat for desert tortoise by the USFWS. Relatively small portions of both of these areas are adjacent to the SEZ. The major concern would be for any adverse effects associated with human presence and traffic within these areas associated with development of the SEZ, including increased possibilities for wildfire. Access to the SEZ would need to be dramatically improved to support construction and operation of a solar facility, leading to higher speed driving and much heavier volumes of traffic than at present. Whether mitigation measures would be successful in preventing adverse impacts on tortoise populations and habitat is not known. Section 11.5.12 provides additional information on potential sensitive species impacts.

**National Conservation Area**

***Beaver Dam Wash.*** This NCA was created by an Act of Congress in 2009 "to conserve, protect and enhance…the ecological, scenic, wildlife, recreational, cultural historical, natural, educational, and scientific resources" (BLM 2010b) of about 63,488 acres (257 $km^2$) of public lands located in the southwestern corner of Utah. There are diverse recreational opportunities in the area, including casual, dispersed camping; OHV riding; rock climbing; horseback trail riding; and hunting for game birds, mule deer, and desert bighorn sheep. Annual visitation is estimated at 20,000 visitor use days in 2009 (BLM 2010b)

The western boundary of the NCA is about 9 mi (14 km) east of the nearest boundary of the SEZ, and some areas within the NCA would have visibility of solar development out to about 22 mi (35 km). The nearest portions of the SEZ are slightly lower in elevation than the NCA, but views of solar facilities would be at a very low angle, which would result in low contrast between the facilities and the surrounding area. Higher elevations farther east would have long-distance views of development in the SEZ, but the distance would also cause a lack of contrast and detail. While facilities within the SEZ would be visible from about 33,860 acres (137 $km^2$), or 47%, of the NCA, it is anticipated that there would be no adverse impacts on scenic values of the NCA or on recreational use of the area.

#### National Trail

***Old Spanish National Historic Trail.*** Almost 18 mi (29 km) of the Old Spanish National Historic Trail are within the SEZ viewshed to the south and to the east of the SEZ. The SEZ would be visible from the trail in a number of places, but the largest segment with visibility is a 12-mi (19-km) stretch closely paralleling U.S. 91 and oriented in a north–south direction between 16 and 19 mi (26 and 31 km) east of the SEZ. Within the southernmost 7 mi (11 km) of this trail segment, visibility would be limited to the upper portions of sufficiently tall power towers within the SEZ, and expected visual contrast levels in this portion of the segment would be minimal. The northern 5 mi (8 km) of the segment would have open views of the SEZ, but at distances exceeding 16 mi (26 m), the SEZ would occupy a very small portion of the horizontal field of view, and the vertical angle of view would be very low. Visual contrast levels would be expected to be very weak. The SEZ would be visible from another 6 mi (10 km) of the Old Spanish National Historic Trail, with four segments of the trail ranging in size from 0.3 mi to 2.8 mi (0.5 to 4.5 km) at a distance of about 18 mi (29 km) from the SEZ. For nearly all of these segments, visibility of solar facilities within the SEZ would be limited to the upper portions of tall power towers, and the expected visual contrast levels would be minimal. Because of the expected low level of visual contrast, it is anticipated that there would be no impact on future management of trail segments or on visitors attempting to re-trace travel on the trail. Section 11.5.17 provides more information on the trail.

#### Scenic Byway

***Gold Butte Backcountry Byway.*** The northern end of this 62-mi (100-km) BLM-administered backcountry byway is located about 14 mi (22 km) south of the nearest boundary of the SEZ. Viewshed analysis indicates that visitors on most of the byway would have no views of solar development within the SEZ. There is, however, a 7-mi (11-km) portion of the route where the trail runs in a northwest–southeast direction as it leaves the Virgin River and crosses the Virgin Mountains where intermittent views of facilities in the SEZ from distances of about 18 to 23 mi (29 to 37 km) might be possible. From these distances, contrast caused by solar facilities would be weak and are expected to have no impact on visitor use of the trail. About 7 mi (11 km) of the byway before it enters the Muddy Mountains is within the viewshed of the SEZ. Views of solar development within the SEZ from the byway would be generally very low angle. No impact on the use of the byway from the construction of solar facilities within the SEZ is anticipated.

##### *11.5.3.2.2 Transmission Facilities and Other Off-Site Infrastructure*

Because of the availability of a major transmission line in the SEZ, assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of such activities outside of the SEZ was conducted (see Section 11.5.1.2).

To provide adequate road access to the SEZ, about 11 mi (18 km) of new or upgraded road would be required to connect to I-15. The assumed road alignment would pass through the Mormon Mesa ACEC and designated desert tortoise critical habitat, causing fragmentation of the ACEC and creating additional hazards for desert tortoise. Road construction would disturb an additional 80 acres (0.3 $km^2$) that would adversely affect tortoise habitat and create a barrier to tortoise movement. Section 11.5.1.2 provides development assumptions for the SEZ, and Section 11.5.12 gives detailed information on potential sensitive species impacts.

#### 11.5.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide some mitigation for identified impacts. The exceptions may be (1) wilderness characteristics in about 3,143 acres (13 $km^2$), or 2%, of the Mormon Mountains WA within 5 mi (8 km) from the SEZ would be adversely affected and wilderness characteristics could be adversely affected at distances up to 11 mi (18 km) in an additional 12,166 acres (49 $km^2$), or 7.7%, of the area; and (2) road construction would adversely affect desert tortoise habitat and create a barrier to tortoise movement.

Proposed design features specific to the proposed East Mormon Mountain SEZ include the following:

- Design features for visual resources as described in Section 11.5.14 should be applied to minimize adverse visual impacts.

- The access road to the SEZ should be designed and built to minimize impacts on desert tortoise and tortoise habitat within the Mormon Mesa ACEC.

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## 11.5.4 Rangeland Resources

Rangeland resources managed by the BLM on BLM-administered lands include livestock grazing and habitat for wild horses and burros. These resources and possible impacts on them from solar development within the proposed East Mormon Mountain SEZ are discussed in Sections 11.5.4.1 and 11.5.4.2.

### 11.5.4.1 Livestock and Grazing

#### *11.5.4.1.1 Affected Environment*

Portions of two grazing allotments—Gourd Springs and Summit Spring—overlap the proposed SEZ. The Gourd Springs allotment contains 57,700 acres (234 $km^2$) and has an active authorization of 3,458 AUMs. A total of 8,773 acres (36 $km^2$), or 9.1%, of the allotment is located within the SEZ. This allotment was previously reduced in size by 38,262 acres (155 $km^2$), or 40%, in September 2000 by the Caliente Management Framework Plan Amendment and Record of Decision for the Management of Desert Tortoise Habitat, which created the Mormon Mesa ACEC. Further restrictions on the grazing season of use were placed on the desert tortoise critical habitat portions of the Gourd Springs and Summit Spring allotments in the Programmatic Biological Opinion for the BLM's Ely District Resource Management Plan in July 2008. Large portions of both allotments were burned by the Southern Nevada Complex Fires in 2005. The location of the SEZ covers most of the Gourd Springs allotment's prime forage as well as some water sources. The primary water sources for this allotment are also approximately 1 mi (1.6 km) west of the SEZ. Development of the SEZ would make these waters unusable because it covers a majority of the land serviced by these waters.

The Summit Spring allotment contains 18,035 acres (73 $km^2$) and has an active authorization of 715 AUMs. A total of 195 acres (0.8 $km^2$), or 1.1%, of the allotment is located within the SEZ.

#### *11.5.4.1.2 Impacts*

**Construction and Operations**

Should utility-scale solar development occur in the East Mormon Mountain SEZ, grazing would be excluded from the areas developed, as provided for in the BLM grazing regulations (43 CFR Part 4100). The regulations provide for reimbursement of permittees for their portion of the value for any range improvements in the area removed from the grazing allotment. The impact of this change in the grazing permits would depend on several factors, including (1) how much of an allotment the permittee might lose to development, (2) how important the specific land lost is to the permittee's overall operation, and (3) the amount of actual forage production that would be lost by the permittee.

Since only about 1% of the Summit Spring allotment overlaps the SEZ, the loss of this small amount of area is anticipated to have no impact on this allotment, and any loss of use likely could be absorbed elsewhere in the allotment.

Quantification of the impact on the Gourd Springs allotment would require, at a minimum, consideration of the three factors identified above; however, the allotment has already been reduced in size by about 40%, and the area that would be occupied by the SEZ includes most of the rest of the best grazing land left in the allotment. It is likely that with the loss of the land in SEZ, the allotment would cease to be a feasible economic operation and the total authorized grazing use of 3,458 AUMs would be lost. This would be a large impact on the grazing permittee.

On the basis of an assumed loss of a total of 3,458 AUMs, as described above, the impact on livestock use within the Caliente Field Office from solar development of the SEZ would be small. This conclusion is based on the comparison of the loss of the 3,458 AUMs with the total BLM-authorized AUMs in the field office for grazing year 2009, which totaled 54,199 AUMs (BLM 2009b). This loss is 6.4% of the total authorized use.

**Transmission Facilities and Other Off-Site Infrastructure**

Because of the availability of a major transmission line adjacent to the SEZ, and assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of electrical transmission facilities outside of the SEZ was conducted (see Section 11.5.1.2).

Although a new road would be required to connect to I-15, the assumed road alignment would pass through the portion of the Gourd Springs allotment that was removed from grazing in 2008. Thus there would be no additional impacts on livestock grazing from this construction.

#### *11.5.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness*

No SEZ-specific design features are proposed to mitigate impacts on livestock grazing. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide mitigation for some identified impacts. The exception would be the potential adverse economic impacts on the Gourd Springs permittee.

### 11.5.4.2 Wild Horses and Burros

#### *11.5.4.2.1 Affected Environment*

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nearly 100 wild horse and burro herd management areas (HMAs) occur within Nevada (BLM 2009c). Two of the Nevada HMAs and one Utah HMA are partially located within the 50-mi (80-km) SEZ region for the proposed East Mormon Mountain SEZ (Figure 11.5.4.2-1). None of the HMAs occur within the SEZ or indirect impact area of the SEZ. The Gold Butte HMA is the closest HMA. It occurs about 32 mi (51.5 km) south of the SEZ (Figure 11.5.4.2-1).

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). All of the territories are more than 50 mi (80 km) from the East Mormon Mountain SEZ.

#### *11.5.4.2.2 Impacts*

Because the proposed East Mormon Mountain SEZ is about 32 mi (51.5 km) or more from any wild horse and burro HMA managed by the BLM and more than about 50 mi (80 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly or indirectly affect wild horses and burros that are managed by these agencies.

#### *11.5.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness*

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

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## 11.5.5 Recreation

### 11.5.5.1 Affected Environment

The site of the proposed East Mormon Mountain SEZ is accessible via a 10- to 15-mi (16- to 24-km) drive on dirt and gravel roads, depending on the chosen access route. The SEZ is generally flat, although it is dissected by several well-developed washes and has a small number of roads and trails (including the dry wash bottoms) that provide access into the area. Although there are no recreation data available, the area appears to offer limited opportunities for recreation with backcountry driving, dispersed camping, and hunting being the most likely uses. OHV use in the SEZ and surrounding area has been designated as "Limited to travel on designated roads and trails" (BLM 2008a).

### 11.5.5.2 Impacts

#### *11.5.5.2.1 Construction and Operations*

Recreational use would be eliminated from portions of the SEZ developed for solar energy production, and existing recreational users would be displaced. The area is not a major recreation destination, and it is not anticipated that the loss of recreational opportunities would be significant. The area contains a few dirt roads and dry washes that may be designated as open to travel that access areas in and around the SEZ, and the potential exists for these roads to be closed because of solar development. If open OHV routes within the SEZ were identified during project-specific analyses, these routes would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated). This could adversely affect access to undeveloped areas within the SEZ and areas outside the SEZ. Whether recreational visitors would continue to use any remaining undeveloped portions of the SEZ, or how the use of areas surrounding the SEZ would change, is unknown.

The boundary of the Mormon Mountains WA is within 2 to 3.5 mi (3 to 6 km) of the SEZ, and solar development within the SEZ would be very visible from about 15,309 acres (62 km$^2$), or 9.7%, of the WA. Whether the presence of solar development in the SEZ would affect recreational use of these areas is unknown, but about 3,143 acres (12.7 km$^2$), or about 2%, of the area is located within 0 to 5 mi (0 to 8 km), the most sensitive visual zone surrounding the proposed SEZ. It is anticipated that some wilderness visitors to this area of the WA may be displaced and there is potential for wilderness recreation use to be reduced within the 15,309 acres (62 km$^2$) with visibility of the SEZ.

#### *11.5.5.2.2 Transmission Facilities and Other Off-Site Infrastructure*

Because of the availability of an existing transmission line, no additional construction of transmission facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional recreation impacts. See Section 11.5.1.2 for the development assumptions underlying this analysis.

The 11 mi (18 km) of new or upgraded road connecting the SEZ to I-15 would be visible from portions of the Morman Mountains WA, but because of the small size of the road and the distance from the SEZ, it is not anticipated that there would be any significant additional impact on wilderness characteristics caused by road construction and use.

#### 11.5.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide some mitigation for some identified impacts. The exceptions may be the loss of recreation use within developed portions of the SEZ and in up to 15,309 acres (62 $km^2$) of the Morman Mountains WA.

A proposed design feature specific to the proposed East Mormon Mountain SEZ includes the following:

- Design features for visual resources as described in Section 11.5.14 should be applied to minimize adverse impacts on wilderness recreation use.

### 11.5.6 Military and Civilian Aviation

#### 11.5.6.1 Affected Environment

The proposed East Mormon Mountain SEZ is located under two MTRs. One of these is a visual flight route that can be used down to 200 ft (61 m) AGL, and the other is an instrument route that can be used down to 400 ft (122 m) AGL. The area is located 5 mi (8 km) east of the very large Military Operating Area that extends across southern Nevada just north of Las Vegas. The SEZ is also located within a zone identified in BLM land records as a mandatory DoD Consultation Area.

The nearest public airport is in Mesquite, Nevada, about 12 mi (19 km) southeast of the SEZ, which does not have scheduled commercial passenger service.

#### 11.5.6.2 Impacts

The military has indicated that solar technologies with structures higher than 200 ft (61 m) AGL would intrude into military airspace and would present safety concerns for military aircraft use of the airspace.

The Mesquite Airport is located far enough away from the proposed SEZ that there would be no impact on airport operations.

#### 11.5.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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## 11.5.7 Geologic Setting and Soil Resources

### 11.5.7.1 Affected Environment

#### *11.5.7.1.1 Geologic Setting*

**Regional Setting**

The proposed East Mormon Mountain SEZ is located along the northern edge of the Virgin River depression, a large structural basin within the Basin and Range physiographic province in southeastern Nevada. The depression is predominantly in Nevada but extends into Utah and Arizona to the east. It is bounded on the northwest by the Mormon and East Mormon Mountains and Tule Spring Hills and on the northeast by the Beaver Dam Mountains (in Utah and Arizona). The Muddy Mountains and Black Mountains are to the southwest; the Southern Virgin Mountains and Virgin Mountains (Arizona) are to the southeast. The basin is bisected by the Virgin River, a tributary of the Colorado River, which flows to the southwest toward Lake Mead (Figure 11.5.7.1-1). The Virgin River depression extends across Arizona, Nevada, and Utah and is about 371,000 acres (1,500 $km^2$) in area. It is divided by a north-northeast trending buried ridge into two deep basins—the Mormon basin, to the east (below Mormon Mesa), and the Mesquite basin, to the west (below the town of Mesquite). The East Mormon Mountain SEZ sits above the northern edge of the Mesquite basin, an east-tilting half graben bounded by normal faults to the east, southeast, and west. The basin contains as much as 3.7 mi (6 km) of sedimentary (basin) fill above a sequence of Mesozoic and Paleozoic sedimentary rocks and Precambrian basement rocks (Bohannon et al. 1993; Forrester 2009).

Basin fill consists of the Muddy Creek Formation, the Red Sandstone unit, and the Horse Spring Formation (all Tertiary). The Muddy Creek Formation is the oldest and thickest unit that crops out in the Mesquite basin; its composition is laterally variable, but typically comprises a basal conglomerate unit overlain by a conglomerate bed of the Toquop Wash, siltstone and claystone, and an upper conglomerate unit (as well as minor evaporites and basalt flows); it constitutes an important producing aquifer in the region. Seismic studies indicate that the Muddy Creek Formation is up to 0.6 to 1.2 mi (1 to 2 km) deep in the Mesquite basin. It unconformably overlies the rocks of the Red Sandstone unit and the Lovell Wash Member of the Horse Spring Formation (Bohannon et al. 1993; Langenheim et al. 2000; Dixon and Katzer 2002).

Exposed sediments near the proposed SEZ consist mainly of modern alluvial and colluvium deposits (Qa) and tuffaceous sedimentary rocks of Tertiary age (Ts) (Muddy Creek Formation [Crafford 2007]) (Figure 11.5.7.1-2). The surrounding mountains are composed predominantly of Paleozoic carbonates (limestone and dolomite) and Mesozoic continental and marine deposits of siltstone, sandstone, and limestone. The oldest rocks in the region are the Precambrian metamorphic rocks (Xm) exposed in the East Mormon Mountains to the south of the proposed SEZ.

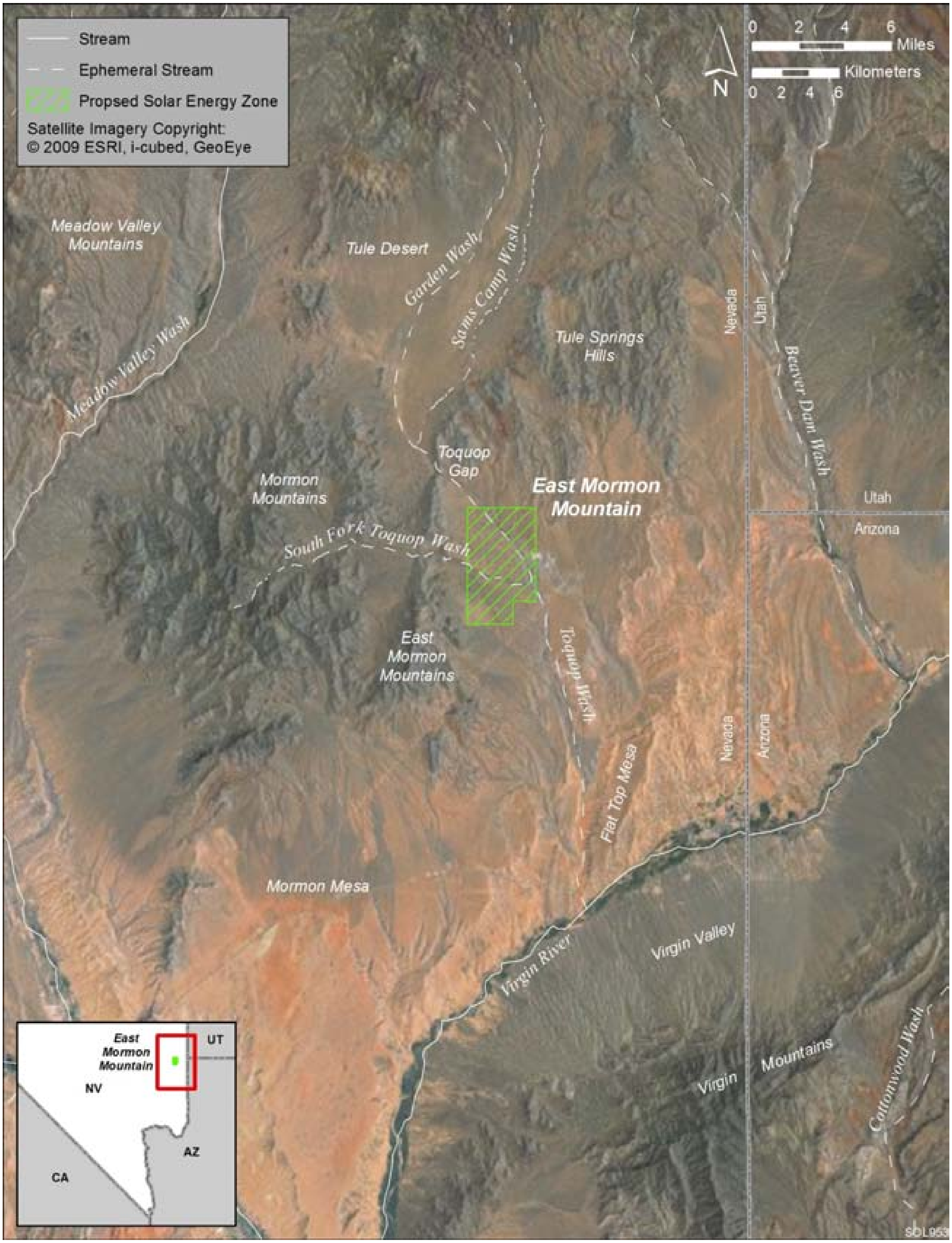


**FIGURE 11.5.7.1-1 Physiographic Features of the East Mormon Mountain Region**

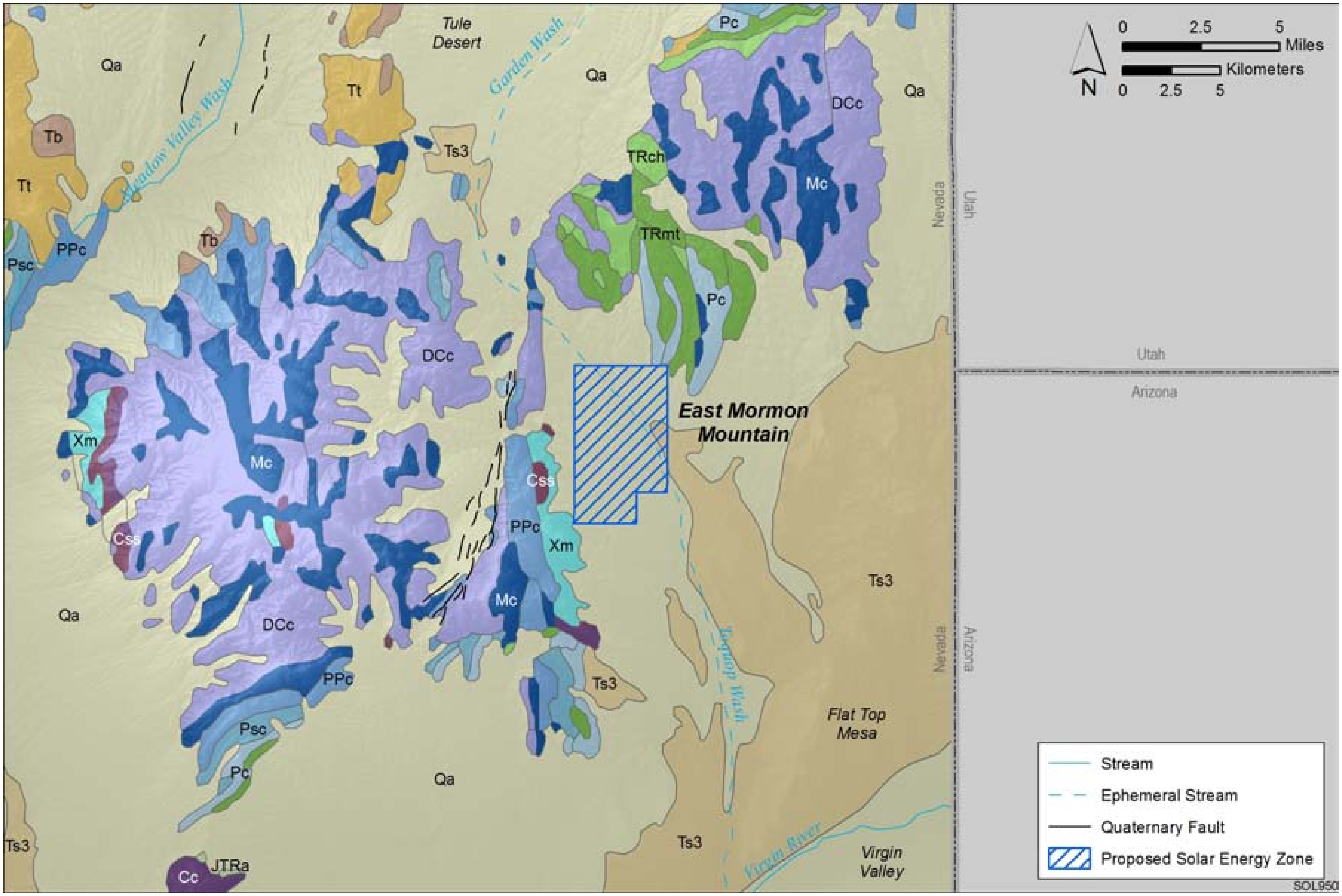


FIGURE 11.5.7.1-2 Geologic Map of the East Mormon Mountain Region (Ludington et al. 2007; Stewart and Carlson 1978)

Cenozoic (Quaternary, Tertiary)

- Qa Alluvial deposits; locally includes beach and sand dune deposits
- Tt Welded and nonwelded silicic ash-flow tuffs
- Tb Volcanic rocks; basalt flows
- Ts3 Tuffaceous sedimentary rocks; locally includes minor amounts of tuff

Mesozoic

- JTRa Aztec Sandstone (Triassic - Jurassic)
- TRch Chinle Formation (bentonitic claystone, siltstone and clayey sandstone; ledge-forming sandstone; and red siltstone)
- TRmt Moenkopi and Thaynes Formations (marine deposits of siltstone, limestone and sparse conglomerate)

Paleozoic

- Pc Cherty limestone and sparse dolomite, shale and sandstone
- Psc Siltstone, sandstone, limestone, dolomite and gypsum
- PPc Limestone and sparse dolomite, siltstone and sandstone (Permian - Pennsylvanian)
- Mc Limestone and minor amounts of dolomite and shale
- DCc Dolomite and limestone (Lower Paleozoic)
- Cc Dolomite and limestone (mostly Cambrian)
- Css Sandstone and quartzite (includes Tapeats sandstone) above Precambrian metamorphics

Precambrian

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

SOL950

**FIGURE 11.5.7.1-2 (Cont.)**

### Topography

The proposed East Mormon Mountain SEZ is located in the Mesquite basin (within the northern part of the Virgin River depression), just east of the East Mormon Mountains and south of Tule Springs Hills (Figure 11.5.7.1-3). Its terrain slopes gently to the southeast, generally following the course of the Toquop Wash. Elevations range from greater than 2,800 ft (850 m) along the western boundary (toward the base of the East Mormon Mountains) to about 2,405 ft (730 m) at the southeastern end where the South Fork Toquop Wash and Toquop Wash merge and exit the SEZ.

### Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Section 5.7.3. The following sections provide a preliminary assessment of these hazards at the proposed East Mormon Mountain SEZ. Solar project developers may need to conduct a geotechnical investigation to identify and assess geologic hazards locally to better identify facility design criteria and site-specific mitigation measures to minimize their risk.

***Seismicity.*** The southeastern corner of Lincoln County lies immediately south of the Southern Nevada Seismic Belt (also called the Pahranagat Shear Zone), a south-southwest–trending zone of seismic activity characterized mainly by background earthquakes (i.e., earthquakes not associated with surface expression) (dePolo and dePolo 1999). Although the region is seismically active, there are no Quaternary faults within or immediately adjacent to the proposed East Mormon Mountain SEZ. The nearest Quaternary fault is the Carp Road fault, a north-striking fault that occurs along the western edge of the East Mormon Mountains a few miles west of the SEZ. A series of discontinuous faults making up the Littlefield Mesa fault system is located in Arizona about 15 mi (23 km) to the southeast (Figure 11.5.7.1-4).

The Carp Road fault is a normal fault that forms an abrupt boundary between the down-dropped block to the west and the east-tilting block of the East Mormon Mountains to the east. No detailed field studies of the fault have been made, but maps based on aerial photos show discontinuous fault traces expressed as scarps on surficial deposits and erosional surfaces of Quaternary age along the mountain base. However, these studies do not provide sufficient stratigraphic detail to constrain the date of the most recent movement along the fault more precisely than within the past 1.6 million years. Slip rates along the fault are estimated to be less than 0.2 mm/yr (Anderson 1998).

The Littlefield Mesa faults consist of a group of short, north-striking faults that transect upper Pliocene to middle Pleistocene basin floor sediments and river gravels to the southeast of the East Mormon Mountain SEZ, placing the most recent movement along the faults at less than 750,000 years ago. Scarps are readily seen in the field, showing vertical displacements that range from 30 to 120 ft (10 to 36 m). Slip rates along the faults are estimated to be less than 0.2 mm/yr (Pearthree 1997).

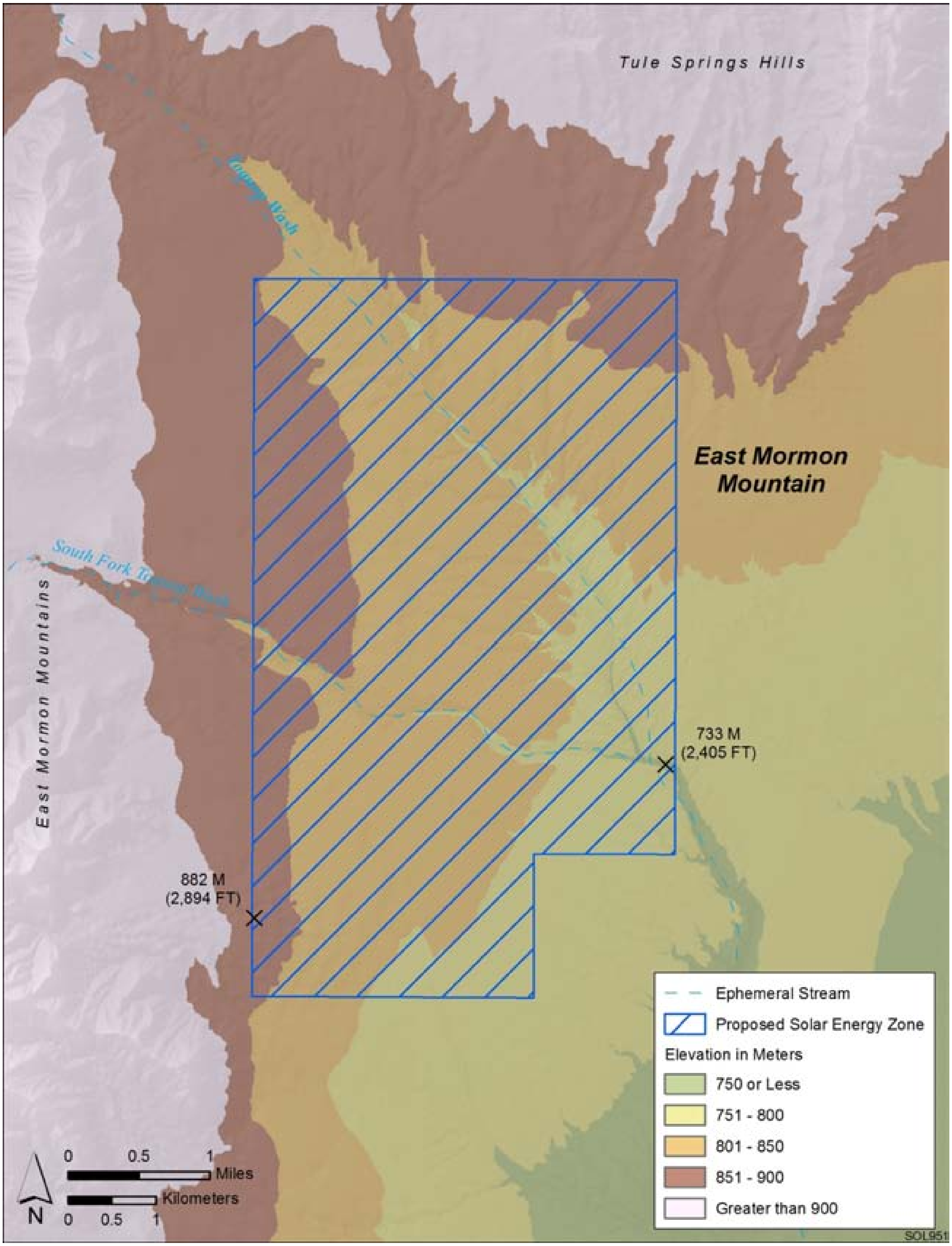


**FIGURE 11.5.7.1-3 General Terrain of the Proposed East Mormon Mountain SEZ**

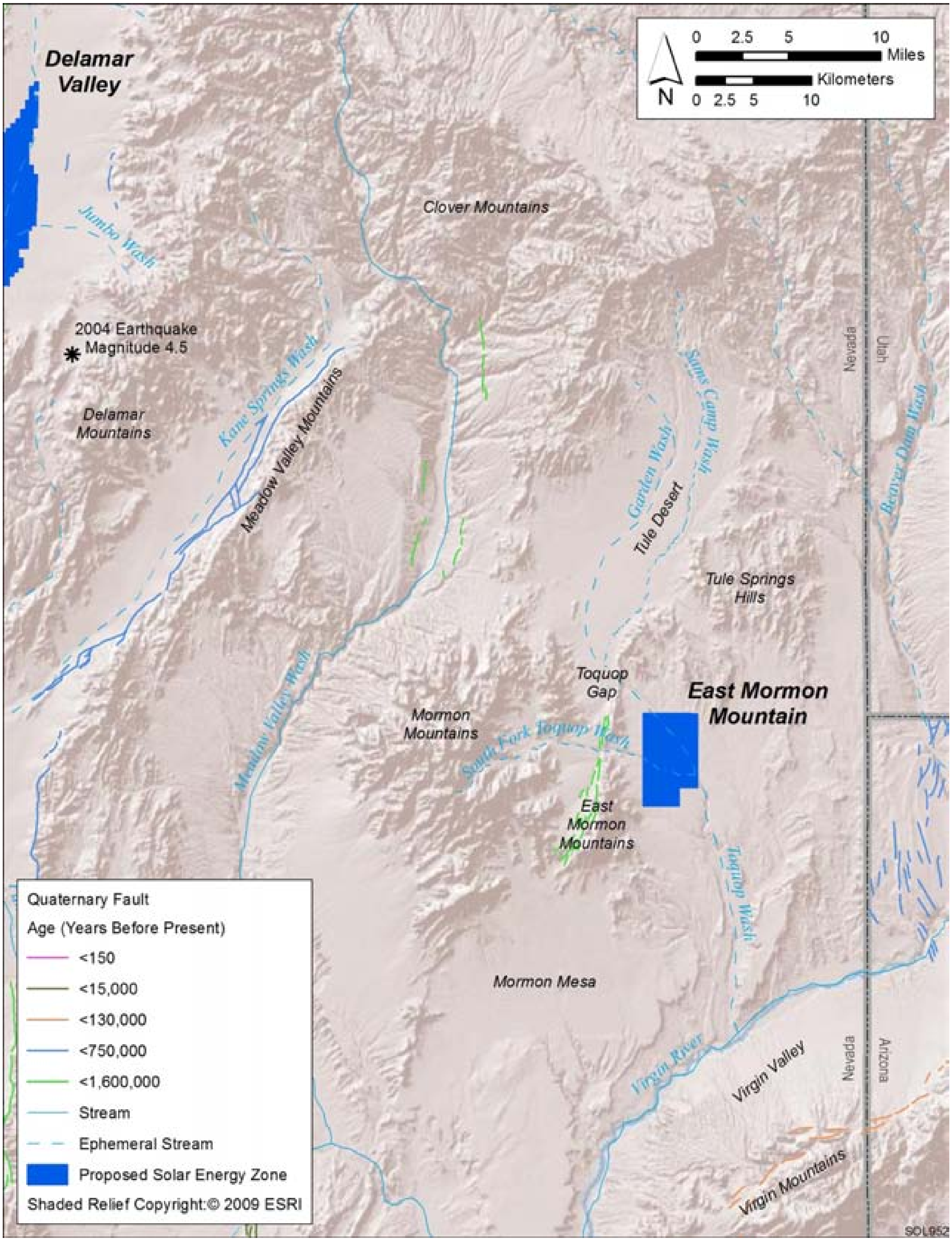


**FIGURE 11.5.7.1-4 Quaternary Faults in the East Mormon Mountain Region (USGS and NBMG 2010; USGS 2010a)**

Several other inactive faults may occur near or within the proposed East Mormon Mountain SEZ, including the Toquop Wash fault, which parallels the course of the Toquop Wash near the site. This fault is not listed in the USGS Quaternary fault and fold database, but appears as an inferred fault on the Nevada Bureau of Mines and Geology online Quaternary faults interactive map (dePolo et al. 2009).

From June 1, 2000, to May 31, 2010, 64 earthquakes were recorded within a 61-mi (100-km) radius of the proposed East Mormon Mountain SEZ (USGS 2010a). The largest earthquake during that period occurred on May 16, 2004. It was located about 40 mi (60 km) to the northwest of the SEZ in the Gregerson Basin (near the Delamar Mountains) and registered a Richter scale magnitude[1] (ML) of 4.5 (Figure 11.5.7.1-4). During this period, 36 (56%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0; none were greater than 4.5 (USGS 2010a). The most significant earthquake in the region occurred on September 22, 1996, near Caliente, Nevada, about 45 mi (72 km) to the north-northeast of the East Mormon Mountain SEZ; it registered a magnitude of 6.1 (von Seggern and Brune 2000).

***Liquefaction.*** The proposed East Mormon Mountain SEZ lies in an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.07 and 0.08 g. Shaking associated with this level of acceleration is generally perceived as moderate; however, the potential damage to structures is light (USGS 2008). Given the low intensity of ground shaking estimated for the area and the low incidence of historical seismicity in the region, the potential for liquefaction in sediments within and around the SEZ is likely to be low.

***Volcanic Hazards.*** Several calderas in southern Nevada are the sources of voluminous and widespread Tertiary volcanic deposits throughout the region. These include the Indian Peak caldera complex to the northeast of Delamar Valley, between the Highland Range and the Nevada–Utah border; the Caliente caldera complex, to the north, in the northern Delamar and Clover Mountains and extending into western Utah; the smaller Kane Springs Wash caldera in the southern Delamar Mountains; and the Central Nevada caldera complex to the northwest of Delamar Valley (Scott et al. 1992). Tertiary volcanism overlaps periods of extension in southern Nevada and occurred as recently as 2.6 million years ago (late Pliocene) (Noble 1972); however, there is no evidence of more recent volcanic activity associated with these complexes.

The East Mormon Mountain region is located about 80 mi (130 km) due east of the southwestern Nevada volcanic field, which consists of volcanic rocks (tuffs and lavas) of the Timber Mountain-Oasis Valley caldera complex and Silent Canyon and Black Mountain calderas. The area has been studied extensively because of its proximity to the NTS and Yucca Mountain repository. Two types of fields are present in the region: (1) large-volume, long-lived

[1] Richter scale magnitude (ML) was the original magnitude defined by Richter and Gutenberg for local earthquakes in 1935. It was based on the maximum amplitude recorded on a Wood-Anderson torsion seismograph but is currently calculated for earthquakes with magnitudes ranging from 2 to 6, using modern instruments with adjustments (USGS 2010b).

fields with a range of basalt types associated with more silicic volcanic rocks produced by melting of the lower crust, and (2) small-volume fields formed by scattered basaltic scoria cones during brief cycles of activity, called rift basalts because of their association with extensional structural features. The basalts of the region typically belong to the second group; examples include the basalts of Silent Canyon and Sleeping Butte (Byers et al. 1989; Crowe et al. 1983).

The oldest basalts in the region were erupted during the waning stages of silicic volcanism in the southern Great Basin in the Late Miocene and are associated with silicic volcanic centers like Dome Mountain (the first group). Rates of basaltic volcanic activity in the region have been relatively constant but generally low. Basaltic eruptions occurred from 1.7 million to 700,000 years ago, creating the cinder cones within Crater Flat (Stuckless and O'Leary 2007). The most recent episode of basaltic eruptions occurred at the Lathrop Wells Cone complex about 80,000 years ago, a few miles east of the proposed Amargosa SEZ (Stuckless and O'Leary 2007; see Section 11.1.7). There has been no silicic volcanism in the region in the past 5 million years. Current silicic volcanic activity occurs entirely along the margins of the Great Basin (Crowe et al. 1983).

Crowe et al. (1983) determined that the annual probability of a volcanic event for the region is very low ($3.3 \times 10^{-10}$ to $4.7 \times 10^{-8}$), similar to the probability of $1.7 \times 10^{-8}$ calculated for the proposed Yucca Mountain repository (Cline et al. 2005). The volcanic risk in the region is associated only with basaltic eruptions; the risk of more explosive silicic volcanism is negligible. Perry (2002) cites new hypotheses and geologic data that point to a possible increase in the recurrence rate (and thus the probability of disruption) of volcanism in the region. These include hypotheses of anomalously high strain rate episodes in the region and the presence of a regional mantle hot spot; and new aeromagnetic data that suggest as many as 12 previously unrecognized volcanoes may be buried in the alluvial-filled basins in the region.

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

No land subsidence monitoring has taken place in the East Mormon Mountain region to date; however, earth fissures have been documented in the Las Vegas Valley around Las Vegas, about 70 mi (110 km) southwest of the proposed East Mormon Mountain SEZ. The fissures are likely the result of land subsidence caused by compaction of unconsolidated alluvial sediments due to groundwater withdrawal. Spatial distribution of fissures in the valley suggests that fissures are preferentially located near and along Quaternary faults, with 80% of fissures within 1,150 ft (350 m) of a known fault. The maximum subsidence measured for the period between 1963 and 1987 was about 5 ft (1.5 m). Since then, subsidence rates have declined by as much as 50 to 80%. The reduction in subsidence rates has been attributed to the effects of the artificial recharge program (using water from Lake Mead) started in the 1990s, which has generally increased water levels in the region (Bell et al. 2002; Burbey 2002; Galloway et al. 1999).

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

Alluvial fan surfaces, such as those found in the valley surrounding the Toquop Wash, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) will depend on the specific morphology of the fan (National Research Council 1996). Section 11.5.9.1.1 provides further discussion of flood risks within the East Mormon Mountain SEZ.

#### *11.5.7.1.2 Soil Resources*

Soils within the proposed East Mormon Mountain SEZ are predominantly fine sandy loams of the Mormon Mesa association, which covers about 84% of the site (Figure 11.5.7.1-5). Soil map units within the SEZ are described in Table 11.5.7.1-1. These level to gently sloping soils are derived from alluvium from sedimentary rocks (mainly carbonates). They are predominantly shallow (above a hardpan layer) and well drained. Most of the soils on the site have a high surface runoff potential and moderately rapid permeability. The natural soil surface is suitable for roads, with a slight to moderate erosion hazard when used as roads or trails. The water erosion potential is low for all soils at the site. The susceptibility to wind erosion is moderate for most soils, with as much as 86 tons (78 metric tons) of soil eroded by wind per acre (4,000 $m^2$) each year (NRCS 2010). Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

None of the soils within the East Mormon Mountain SEZ are rated as hydric.[2] Flooding is not likely for soils at the site (occurring less than once in 500 years). None of the soils are classified as prime or unique farmland (NRCS 2010).

### 11.5.7.2 Impacts

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

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger

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

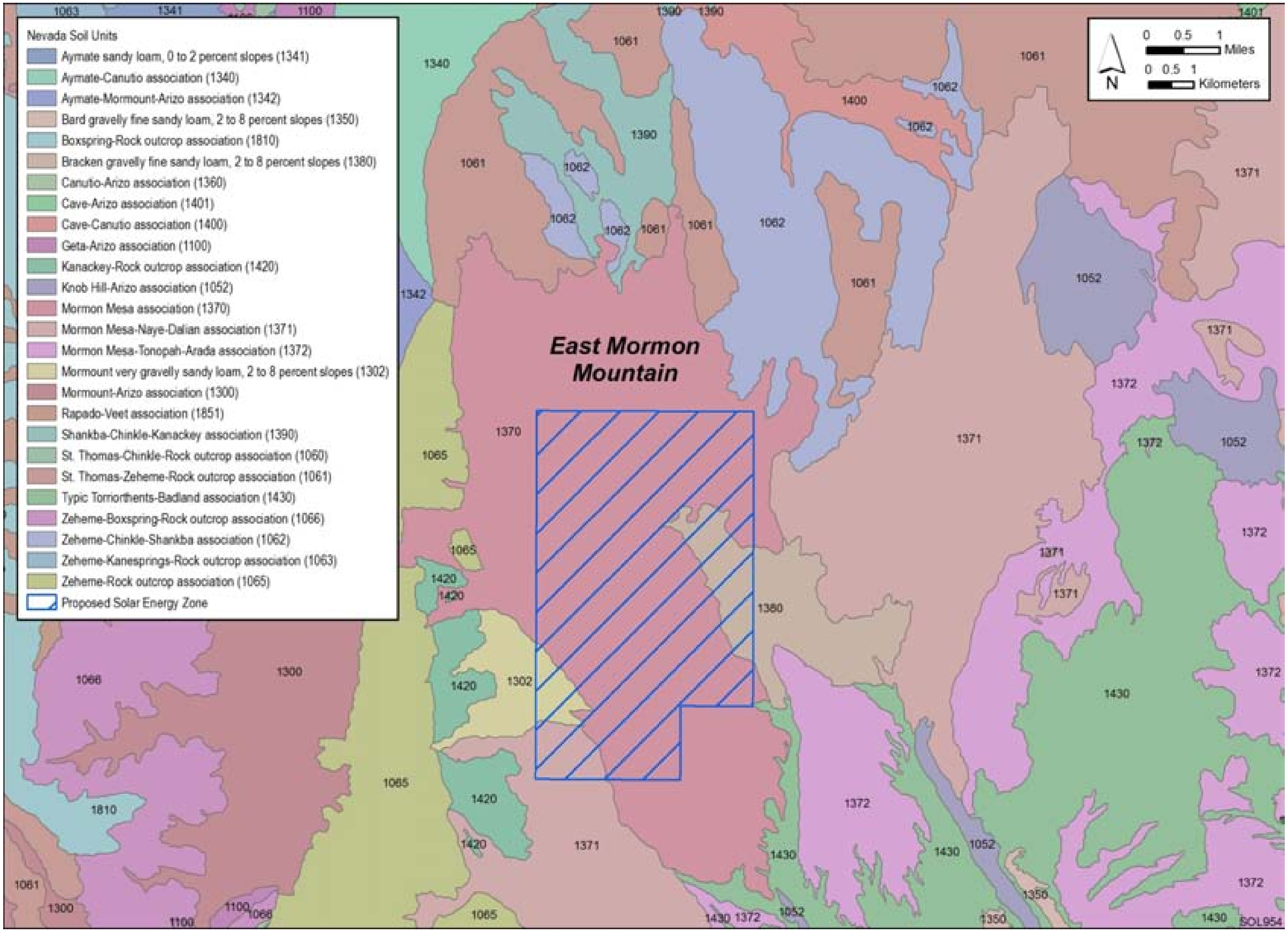


FIGURE 11.5.7.1-5 Soil Map for the Proposed East Mormon Mountain SEZ (NRCS 2008)

**TABLE 11.5.7.1-1 Summary of Soil Map Units within the Proposed East Mormon Mountain SEZ**

| Map Unit Symbol | Map Unit Name | Water Erosion Potential[a] | Wind Erosion Potential[b] | Description | Area[c] (% of SEZ) |
|---|---|---|---|---|---|
| 1370 | Mormon Mesa association (0 to 2% slopes) | Low (0.28) | Moderate (WEG 3)[d] | Level to nearly level fine sandy loams on fan remnants and mesas. Parent material consists of alluvium derived from limestone and dolomite. Shallow (to a petrocalcic or hardpan horizon) and well drained, with high surface runoff potential (very slow infiltration rate) and moderately rapid permeability. Available water capacity is very low. Moderate rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation. | 7,506 (84) |
| 1380 | Bracken gravelly fine sandy loam (2 to 8% slopes) | Low (0.20) | Moderate (WEG 4) | Gently sloping soils on hills and pediments. Parent material is residuum and colluvium (landslide debris) from gypsiferous sedimentary rocks. Deep and somewhat excessively drained, with moderate surface runoff potential and moderately rapid permeability. Available water capacity is very low. Moderate rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation. | 1,814 (8) |
| 1371 | Mormon Mesa-Nay-Dalian association (4 to 8% slopes) | Low (0.15) | Moderate (WEG 4) | Consists of about 45% Mormon Mesa gravelly fine sand, 25% Naye gravelly fine sandy loam, and 15% Dalian very gravelly fine sandy loam. Gently sloping soils on inset fans and fan remnants. Parent material is alluvium derived from limestone and dolomite. Moderately deep and well drained, with high surface runoff potential (very slow infiltration rate) and moderate permeability. Available water capacity is low to very low. Moderate rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation. | 412 (5) |

**TABLE 11.5.7.1-1 (Cont.)**

| Map Unit Symbol | Map Unit Name | Water Erosion Potential[a] | Wind Erosion Potential[b] | Description | Area (% of SEZ) |
|---|---|---|---|---|---|
| 1302 | Mormount very gravelly sandy loam (2 to 8% slopes) | Low (0.17) | Moderate (WEG 5) | Gently sloping soils on fan piedmont remnants. Parent material consists of alluvium from limestone with minor amounts of volcanic tuffs. Shallow (to a petrocalcic or hardpan horizon) and well drained, with high surface runoff potential (very slow infiltration rate) and moderate permeability. Available water capacity is very low. Slight rutting hazard. Used mainly as rangeland, forestland, or wildlife habitat; unsuitable for cultivation. | 308 (4) |

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

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

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

[d] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEGs 3 and 4, 86 tons (78 metric tons) per acre (4,000 $m^2$) per year; and WEG 5, 56 tons (51 metric tons) per acre (4,000 $m^2$) per year.

Source: NRCS (2010).

areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility, since some components would involve greater disturbance and would take place over a longer timeframe.

#### 11.5.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

## 11.5.8 Minerals (Fluids, Solids, and Geothermal Resources)

### 11.5.8.1 Affected Environment

As of September 20, 2010, there were no active mining claims located in the proposed East Mormon Mountains SEZ, and there is no history of closed mining claims within the area (BLM and USFS 2010a). The public land within the SEZ was closed to locatable mineral entry in June 2009, pending the outcome of this PEIS. There are no active oil and gas leases within the SEZ, but all of the area has been leased in the past (BLM and USFS 2010b). There are existing non-producing leases adjacent to the eastern border of the SEZ. The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals and for disposal of salable minerals. There is no active or historical geothermal leasing or development in or near the SEZ (BLM and USFS 2010b).

### 11.5.8.2 Impacts

If the area were identified as a solar energy zone, it would continue to be closed to all incompatible forms of mineral development. For the purpose of this analysis, it was assumed that future development of oil and gas resources, should any be found, would still be possible, since such development could occur with directional drilling from outside the SEZ.

Since the SEZ does not contain existing or closed mining claims, it was also assumed that there would be no future loss of locatable mineral production.

The SEZ has had no history of development of geothermal resources. For that reason, it is not anticipated that solar development would not adversely affect geothermal resources.

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

### 11.5.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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## 11.5.9 Water Resources

### 11.5.9.1 Affected Environment

The proposed East Mormon Mountain SEZ is located within the Lower Colorado–Lake Mead subbasin of the Lower Colorado hydrologic region (USGS 2010c) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed East Mormon Mountain SEZ is located on top of an alluvial fan at the base of the East Mormon Mountains and Tule Springs Mountains within the Lower Virgin River Valley. There are significant surface drainage patterns throughout the proposed SEZ, as evident from aerial photos and topographic maps. Surface elevations within the proposed SEZ range from 2,410 to 2,890 ft (734 to 881 m) and surface elevations in the surrounding East Mormon Mountains reach more than 4,700 ft (1,400 m) (Figure 11.5.9.1-1). The average annual precipitation is approximately 6 in. (15 cm) in the valley (WRCC 2010a). In the mountain regions, the average annual precipitation is higher, ranging up to 15 in. (38 cm) at the highest elevations (Glancy and Van Denburgh 1969). Pan evaporation rates are estimated to be 85 in./yr (216 cm/yr) (Cowherd et al. 1988; WRCC 2010b), and reference crop evapotranspiration has been estimated at 61 in./yr (155 cm/yr) (Huntington and Allen 2010).

#### *11.5.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)*

There are no perennial surface water features in the proposed East Mormon Mountain SEZ. The Toquop Wash and the South Fork Toquop Wash are significantly incised ephemeral washes that flow through the proposed SEZ (Figure 11.5.9.1-1). The Toquop Wash is a tributary to the Virgin River, approximately 12 mi (19 km) south of the SEZ. The Virgin River is a tributary to the Colorado River and flows into Lake Mead approximately 24 mi (39 km) downstream of the confluence of the river with Toquop Wash. Glancy and Van Denburgh (1969) estimated that the Toquop Wash contributes approximately 3,000 ac-ft/yr (3.7 million $m^3$/yr) to the Virgin River. The Toquop Wash flows into the Virgin River Valley basin from the Tule Basin, which is adjacent to and to the north of the basin. The Toquop Wash is referred to as the Garden Wash in the Tule basin before it flows through the Toquop Gap and into the Virgin River Valley basin, conveying approximately 1,000 ac-ft/yr (1.2 million $m^3$/yr) of runoff (Figure 11.5.9.1-1). Total runoff in the Nevada portion of the Virgin River Valley basin is estimated to be 6,300 ac-ft/yr (7.8 million $m^3$/yr) (Glancy and Van Denburgh 1969). Average surface water inflow in the Virgin River to the Nevada portion of the basin from Arizona is estimated to be 160,000 ac-ft/yr (197 million $m^3$/yr) (NDWR 1971). Virgin River mean annual flow between 1930 and 2004 at the stream gauge in Littlefield, Arizona, just upstream from the border with Nevada, is 173,000 ac-ft/yr (213 million $m^3$/yr) (USGS 2010d; gauge 09415000). Outflow of the Virgin River to Lake Mead has been estimated at between 80,000 and 140,000 ac-ft/yr (99 million and 170 million $m^3$/yr) (Glancy and Van Denburgh 1969; Virgin Valley Water District 2002).

The entire area of the proposed East Mormon Mountain SEZ is located on an alluvial fan at the base of the East Mormon Mountains and Tule Springs Mountains. Several ephemeral

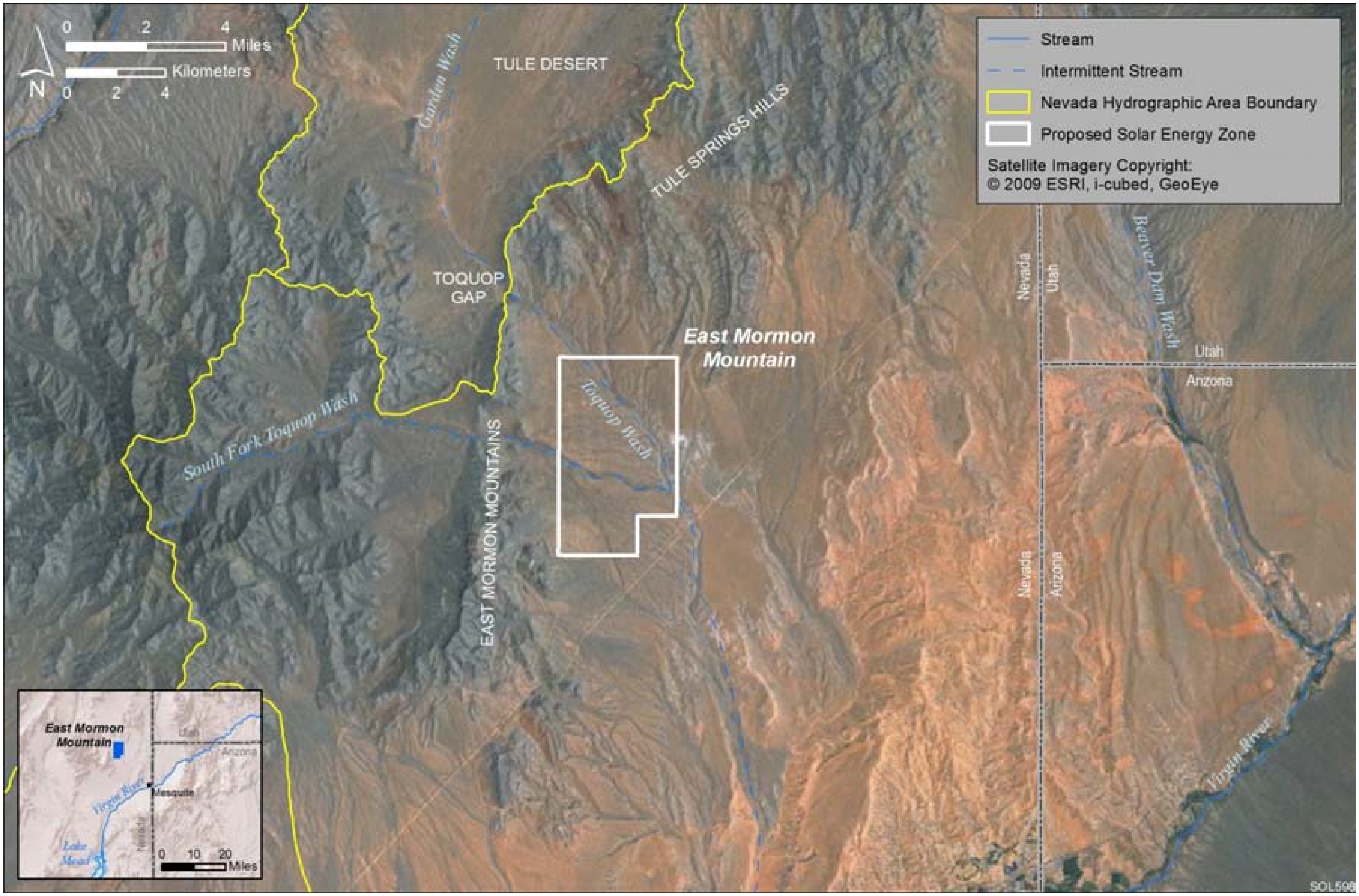


**FIGURE 11.5.9.1-1 Surface Water Features near the Proposed East Mormon Mountain SEZ**

drainages are present along the fan (Figure 11.5.9.1-1). Four springs are known to exist near the proposed SEZ. Gourd Spring and Peach Spring originate in the East Mormon Mountains approximately 1 mi (1.6 km) west of the SEZ, and Tule Spring and Abe Spring originate in the Tule Springs Mountains about 2.3 mi (3.7 km) north of the SEZ.

The NWI has not identified any wetlands on or in the vicinity of the proposed East Mormon Mountain SEZ (USFWS 2009).

Flood hazards have not been identified in Lincoln County, Nevada (FEMA 2009). During large rainfall events, erosion and sedimentation may occur along Toquop Wash, South Fork Toquop Wash, and the associated alluvial fan within the proposed SEZ. Flooding is very common in all channels in the watershed during large storm events. Flooding was particularly great in 2005 after widespread wildfires in the watershed in the years previous (USACE 2008).

#### *11.5.9.1.2 Groundwater*

The proposed East Mormon Mountain SEZ is located within the Virgin River Valley basin (NDWR 2010a). The Virgin River Valley basin, as defined in Nevada, is part of the Lower Virgin River Valley groundwater basin, which covers an area of approximately 1.2 million acres (4,800 $km^2$) over three states (Arizona, Nevada, and Utah); 770,000 acres (3,100 $km^2$) of the basin are within Nevada (Glancy and Van Denburgh 1969). The mountain ranges surrounding the SEZ are composed of both carbonate and non-carbonate consolidated rocks. Groundwater in the Lower Virgin River Valley basin is primarily found in the basin-fill aquifer, which is composed of unconsolidated gravel, sand, silt, and clay (Glancy and Van Denburgh 1969). The basin-fill Muddy Creek Formation is the primary source of the potable groundwater supply in the basin (Johnson et al. 2002).

The basin-fill aquifer is underlain by sequences of Paleozoic carbonate rocks (Harrill and Prudic 1998). The basin-fill deposits and carbonate-rock sequences may extend as far as 5 mi (8 km) below the surface near the center of the basin, making it one of the deepest known basins in the region (Glancy and Van Denburgh 1969; Johnson et al. 2002; Virgin Valley Water District, 2002). The Paleozoic carbonate rocks that underlie the basin-fill deposits are thought to be a part of the Virgin River Subregion of the Colorado River Flow System, an interbasin regional-scale carbonate-rock aquifer that flows generally toward the south and terminates at the Virgin River and two regional springs, Rogers and Blue Point Springs, that are in the Lake Mead watershed (Prudic et al. 1995). The Virgin River Subregion of the Colorado River Flow System is a part of a large carbonate-rock province that occurs within approximately one-third of Nevada, a large portion of Utah, and parts of Arizona and California (Harrill and Prudic 1998). In addition, the carbonate-rock aquifer system is thought to be structurally complex in the Virgin River Valley basin, and is discontinuous, highly faulted, and thinned in this area (Dettinger 1992; Virgin Valley Water District 2002). In the vicinity of the SEZ, the thickness of the Paleozoic carbonate-rock sequence is estimated to be approximately 4,000 ft (1,200 m). The Paleozoic carbonate rocks are divided into two parts that are separated by a low-angle thrust fault and a 2,000-ft (610-m) layer of Mesozoic rock that contains sequences of less permeable siltstone and shale (Virgin Valley Water District 2002).

Flow in the basin-fill aquifer is generally toward the Virgin River The basin-fill aquifer Muddy Creek Formation typically has a low transmissivity of about 1,300 $ft^2$/day (120 $m^2$/day). However, the aquifer is pumped mostly in zones that have been heavily faulted, which have higher transmissivity values of around 20,000 $ft^2$/day (1,800 $m^2$/day) (Johnson et al. 2002). Groundwater recharge from precipitation was estimated by Glancy and Van Denburgh (1969) to be about 9,500 ac-ft/yr (11.7 million $m^3$/yr) within the Lower Virgin River Valley, with approximately 3,600 ac-ft/yr (4.4 million $m^3$/yr) of recharge occurring within the Nevada portion of the basin. Glancy and Van Denburgh (1969) estimated subsurface inflow from the Tule basin to the north to be 2,100 ac-ft/yr (2.6 million $m^3$/yr) and groundwater flow from Arizona to be at least 1,000 ac-ft/yr (1.2 million $m^3$/yr), for a total inflow estimate of 12,600 ac-ft/yr (16 million $m^3$/yr) to the groundwater basin. Using a recharge model specifically designed to estimate recharge in the Great Basin Aquifer system, Flint and others (2004) estimated recharge in the basin to be 32,400 ac-ft/yr (40 million $m^3$/yr). The Virgin Valley Water District (2002) estimated groundwater recharge in basin to be 55,000 ac-ft/yr (440 million $m^3$/yr), using a revised precipitation map along with a new relationship of groundwater recharge from precipitation.

Evaporation from groundwater in the Nevada portion of basin was estimated by Glancy and Van Denburgh (1969) to be 30,000 ac-ft/yr (37 million $m^3$/yr) and groundwater outflow from the basin into Lake Mead was estimated to be 40,000 ac-ft/yr (49 million $m^3$/yr). DeMeo and others (2008) estimated evapotranspiration in the basin to be 52,000 ac-ft/yr (64 million $m^3$/yr). The Virgin Valley Water District (2002) estimated evapotranspiration in the basin to be 70,000 ac-ft/yr (86 million $m^3$/yr) and groundwater outflow to Lake Mead to be 29,000 ac-ft/yr (36 million $m^3$/yr), including 8,000 ac-ft/yr (9.9 million $m^3$/yr) of estimated discharge to Lake Mead from the regional carbonate aquifer system. Groundwater withdrawals are estimated to be 12,000 ac-ft/yr (15 million $m^3$/yr) within the basin (Virgin Valley Water District 2002).

Some studies have attempted to determine the sustainable yield of the groundwater basin in the Lower Virgin River Valley basin with estimates ranging between 12,600 and 40,000 ac-ft/yr (16 million and 49 million $m^3$/yr) (Virgin Valley Water District 2002). However, as discussed in Section 11.5.9.1.3, the NDWR has set the perennial yield at 3,600 ac-ft/yr (4.4 million $m^3$/yr) in the Nevada portion of the Virgin River basin according to the study by Glancy and Van Denburgh (1969) (NDWR 2010a).

The chemical quality of the water in the Virgin River Valley basin is varied. In the vicinity of the SEZ, the Virgin River Valley basin contains evaporite deposits that lead to poor-quality groundwater in the area (Dettinger 1992; Virgin Valley Water District 2002). TDS concentrations have been measured at between 240 and 10,800 mg/L in the groundwater samples taken within the basin (Virgin Valley Water District 2002). Arsenic concentrations are also high in groundwater, with concentrations ranging from 14 to 53 μg/L. Since the EPA lowered the arsenic drinking water standard to 10 μg/L, the Virgin Valley Water District has constructed five water treatment plants to lower arsenic concentrations to below the MCL (Virgin Valley Water District 2010).

#### *11.5.9.1.3 Water Use and Water Rights Management*

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million $m^3$/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million $m^3$/yr). Public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million $m^3$/yr), with livestock and mining water uses on the order of 230 ac-ft/yr (280,000 $m^3$/yr) and 450 ac-ft/yr (560,000 $m^3$/yr), respectively (Kenny et al. 2009).

In 2005, water withdrawals from surface waters and groundwater in Clark County were 680,000 ac-ft/yr (839 million $m^3$/yr), of which 83% came from surface waters and 17% came from groundwater. The largest water use category was public supply, at 526,000 ac-ft/yr (649 million $m^3$/yr). Thermoelectric water use accounted for 28,000 ac-ft/yr (34 million $m^3$/yr), with irrigation water use on the order of 17,000 ac-ft/yr (21 million $m^3$/yr) (Kenny et al. 2009).

The Virgin Valley Water District (2008) reports that groundwater withdrawals for residential use were 2,730 ac-ft (3.4 million $m^3$/yr) and a total groundwater pumpage of 7,460 ac-ft (9.2 million $m^3$/yr) in 2007 within the basin. In the Arizona portion of the basin, groundwater withdrawals were reportedly an average of 2,950 ac-ft/yr (3.6 million $m^3$/yr) between 2001 and 2005 (ADWR 2010). It is estimated that a total of 12,000 ac-ft/yr (15 million $m^3$/yr) are withdrawn from the basin as a whole (Virgin Valley Water District 2002).

All waters in Nevada are the property of the public in the State of Nevada and subject to the laws described in Nevada Revised Statutes, Chapters 532 through 538 (available at http://leg.state.nv.us/nrs). The NDWR, led by the State Engineer, is the agency responsible for managing both surface water and groundwater resources, which includes overseeing water right applications, appropriations, and interbasin transfers (NDWR 2010b). The two principle ideas behind water rights in Nevada are the prior appropriations doctrine and the concept of beneficial use. A water right establishes an appropriation amount and date such that more senior water rights have priority over newer water rights. In addition, water rights are treated as both real and personal property, such that water rights can be transferred without affecting the land ownership (NDWR 2010b). Water rights applications (new or transfer of existing) are approved if the water is available to be appropriated, if existing water rights will not be affected, and if the proposed use is not deemed to be harmful to the public interest. If these conditions are satisfied according to the State Engineer, proof of beneficial use of the approved water must be provided within a certain time period, and following that a certificate of appropriation is issued (BLM 2001).

The NDWR has the authority to designate preferred uses of groundwater in a basin, overriding the prior appropriation doctrine (BLM 2001). The NDWR generally does not grant water rights in a basin that is over-appropriated. However, in basins that may have alternative sources of water, groundwater rights can be temporarily granted in excess of the estimated recharge of the basin. For example, basins that may have access to Colorado River water in the future may be temporarily granted use of groundwater. Those permits may then be revoked at a later date when water becomes available from the Colorado River (BLM 2001). Interbasin transfers of water are possible within Nevada and are regulated by the NDWR (NDWR 2010b).

In 1980, Virgin River Valley was designated as a groundwater basin by the State Engineer, and no preferred uses were specified (NDWR 1980). In 2007, the State Engineer issued Order 1193 declaring the Virgin River closed to new appropriations of surface water (NDWR 2007). Currently, there are a total of 12,348 ac-ft/yr (15 million $m^3$/yr) of groundwater rights granted by the NDWR within the Virgin River Valley Hydrographic Area, the vast majority of which are for municipal use (NDWR 2010a). An additional 185,340 ac-ft/yr (228 million $m^3$/yr) of groundwater rights have been applied for within the basin and are under consideration by the NDWR, most of which have been requested by the Virgin Valley Water district (NDWR 2010c; Virgin Valley Water District 2010). The NDWR estimates the perennial yield for each groundwater basin as the amount of water that can be economically withdrawn for an indefinite period without depleting the source (NDWR 1999). The NDWR has set the perennial yield of the basin at 3,600 ac-ft/yr (4.4 million $m^3$/yr), based the estimated recharge in the Nevada portion of the basin in the study done by Glancy and VanDenburgh (1969) (NDWR 2010a).

### 11.5.9.2 Impacts

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

#### *11.5.9.2.1 Land Disturbance Impacts on Water Resources*

Impacts related to land disturbance activities are common to all utility-scale solar energy developments, which are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. Land disturbance activities should be minimized in the vicinity of the incised ephemeral stream channels of the Toquop Wash, the South Fork Toquop Wash, and the incised tributaries to these washes. During large storm events, these channels have the potential to flood and cause sedimentation and erosion issues (note that these streams are suspected to be within the 100-year floodplain, which will have to be determined during the site characterization phase). The entire proposed SEZ is located on top of an alluvial fan containing numerous ephemeral drainages. Disturbances to these ephemeral drainages could cause erosion impacts and disrupt groundwater recharge. In addition, site design and land disturbance activities could potentially alter surface water drainage and sedimentation downstream of the proposed SEZ within the Toquop Wash, which is a tributary to the Virgin River. As such, studies would need to be completed to determine the occurrence of jurisdictional water bodies subject to Clean Water Act Section 404 permitting in areas of proposed development.

#### *11.5.9.2.2 Water Use Requirements for Solar Energy Technologies*

**Analysis Assumptions**

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

- On the basis of a total area of 8,968 acres (36.2 $km^2$), it is assumed that one solar project would be constructed during the peak construction year;

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

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

- Assumptions on individual facility size and land requirements (Appendix M) along with the assumed number of projects and maximum allowable land disturbance, results in the potential to disturb up to 33% of the SEZ total area during the peak construction year; and

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

**Site Characterization**

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

**Construction**

During construction, water would be used mainly for controlling fugitive dust and the workforce potable water supply. Because there are no significant surface water bodies on the proposed East Mormon Mountain SEZ, the water requirements for construction activities are assumed to be met by either trucking water to the sites or by using on-site groundwater resources.

Water requirements for dust suppression and potable water supply during construction are shown in Table 11.5.9.2-1 and could be as high as 1,492 ac-ft/yr (1.8 million $m^3$/yr) in the peak construction year. The assumptions underlying these estimates for each solar energy technology are described in Appendix M. Groundwater wells would have to yield an estimated 600 to 920 gpm (2,300 to 3,500 L/min) to meet the estimated construction water requirements. These yields are on the same order of magnitude as large municipal and agricultural production wells (Harter 2003), so multiple wells may be needed in order to obtain the water requirements. In addition, up to 74 ac-ft (91,000 $m^3$) of sanitary wastewater generated on-site would need to be either treated on-site or sent to an off-site facility. The availability of groundwater and groundwater rights and the impacts of groundwater withdrawal would need to be assessed during the site characterization phase of a solar development project. Obtaining water from an offsite source could be necessary for solar development projects.

Groundwater quality in the vicinity of the SEZ is known to have elevated concentrations of TDS and other constituents. If groundwater were to be used for potable supply during construction, it would need to be tested to verify the quality would comply with drinking water standards.

### Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 11.5.9.2-2).

**TABLE 11.5.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed East Mormon Mountain SEZ**

| Activity | Parabolic Trough | Power Tower | Dish Engine | PV |
|---|---|---|---|---|
| Water use requirements[a] | | | | |
| Fugitive dust control (ac-ft)[b,c] | 965 | 1,447 | 1,447 | 1,447 |
| Potable supply for workforce (ac-ft) | 74 | 45 | 19 | 9 |
| Total water use requirements (ac-ft) | 1,039 | 1,492 | 1,466 | 1,457 |
| Wastewater generated | | | | |
| Sanitary wastewater (ac-ft) | 74 | 45 | 19 | 9 |

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

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 85 in./yr (216 cm/yr) (Cowherd et al. 1988; WRCC 2010b).

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

Water needs for cooling are a function of the type of cooling used (dry, hybrid, wet). Further refinements to water requirements for cooling would result from the percentage of time the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 11.5.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 40 to 717 ac-ft/yr (49,000 to 880,000 $m^3$/yr), and the workforce potable water supply is estimated to range from 0.9 to 20 ac-ft/yr (1,100 to 25,000 $m^3$/yr). The maximum total water usage during normal operation at full build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 21,543 ac-ft/yr (26 million $m^3$/yr). Water usage for dry-cooling systems would be as high as 2,172 ac-ft/yr (2.7 million $m^3$/yr), approximately a factor of 10 times less than the wet-cooling option. Non-cooled technologies, dish engine and PV systems, require substantially less water at full build-out capacity, at 408 ac-ft/yr (500,000 $m^3$/yr) for dish engine and 41 ac-ft/yr (95,000 $m^3$/yr) for PV (Table 11.5.9.2-2). Operations would produce up to 20 ac-ft/yr (50,000 $m^3$/yr) of sanitary wastewater; in addition, for wet-cooled technologies, 226 to 408 ac-ft/yr (280,000 to 500,000 $m^3$/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed East Mormon Mountain SEZ. However, obtaining water from an offsite source could be necessary for solar development projects. At full build-out of the SEZ, parabolic trough technologies that use wet cooling would use 2 to 6 times the amount of water of the perennial yield set by the NDWR (2010a). In addition, there are over 185,000 ac-ft/yr (228 million $m^3$/yr) of water rights that have been applied for within the basin and would be considered by the NDWR first before any applications for new water rights or transfer of existing water rights would be considered. Based on the information presented here, wet cooling would not be feasible for full build-out of the East Mormon Mountain SEZ. To the extent possible, facilities using dry cooling should implement water conservation practices to limit water needs.

**Decommissioning/Reclamation**

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

**TABLE 11.5.9.2-2 Estimated Water Requirements during Operations at the Proposed East Mormon Mountain SEZ**

| Activity | Parabolic Trough | Power Tower | Dish Engine | PV |
|---|---|---|---|---|
| Full build-out capacity (MW)[a,b] | 1,435 | 797 | 797 | 797 |
| Water use requirements | | | | |
| Mirror/panel washing (ac-ft/yr)[c,d] | 717 | 399 | 399 | 40 |
| Potable supply for workforce (ac-ft/yr) | 20 | 9 | 9 | 0.9 |
| Dry cooling (ac-ft/yr)[e] | 287–1,435 | 159–797 | NA[f] | NA |
| Wet cooling (ac-ft/yr)[e] | 6,457–20,806 | 3,587–11,559 | NA | NA |
| Total water use requirements | | | | |
| Non-cooled technologies (ac-ft/yr) | NA | NA | 408 | 41 |
| Dry-cooled technologies (ac-ft/yr) | 1,025–2,172 | 567–1,205 | NA | NA |
| Wet-cooled technologies (ac-ft/yr) | 7,195–21,543 | 3,995–11,966 | NA | NA |
| Wastewater generated | | | | |
| Blowdown (ac-ft/yr)[g] | 408 | 226 | NA | NA |
| Sanitary wastewater (ac-ft/yr) | 20 | 9 | 9 | 0.9 |

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

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

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

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

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

[f] NA = not applicable.

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

### *11.5.9.2.3 Off-Site Impacts: Roads and Transmission Lines*

The proposed East Mormon Mountain SEZ is located approximately 11 mi (18 km) from I-15, and is adjacent to existing transmission lines as described in Section 11.5.1.2. Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. The extent of the impacts on water resources is proportional to the amount and location of land disturbance needed to connect the proposed SEZ to major roads and existing transmission lines. Water needed for road modification activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. As a result, water use impacts would be negligible. Impacts on surface water and groundwater quality resulting from spills would be minimized by implementing the mitigation measures described in Section 5.9.3 (e.g., cleaning up spills as soon as they occur). Ground-disturbing activities that have the potential to increase sediment and dissolved solid loads in downstream waters would be conducted following the mitigation measures outlined in Section 5.9.3 to minimize impacts associated with alterations to natural drainage pathways and hydrologic processes.

#### *11.5.9.2.4 Summary of Impacts on Water Resources*

The impacts on water resources associated with developing solar energy at the proposed East Mormon Mountain SEZ are related to land disturbance effects on the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation issues, as well as altering groundwater recharge and discharge processes. The ephemeral stream channels of Toquop Wash, South Fork Toquop Wash, and other ephemeral washes found within the SEZ are likely within the 100-year floodplain. Identifying the 100-year floodplain would be done during the site characterization phase, and areas of the proposed SEZ within the 100-year floodplain should be avoided during solar energy development. In addition, alteration of the surface water drainage pattern off the proposed SEZ could impair the Toquop Wash downstream of the SEZ through sedimentation and erosion, as well as changing the quality or quantity of inflows to the Virgin River from Toquop Wash.

Impacts related to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater is the primary water resource available to solar energy facilities in the proposed East Mormon Mountain SEZ. However, obtaining water from an offsite source could be necessary for solar development projects. The estimates of groundwater recharge, discharge, and underflow from adjacent basins suggest that there may not be available groundwater available to support water-intensive technologies, such as those using wet cooling. In addition, there are over 185,000 ac-ft/yr (228 million $m^3$/yr) of water rights that have been applied for within the basin and would be considered by the NDWR first before any applications for new water rights or transfer of existing water rights would be considered. Obtaining new water rights or transfer of existing water rights within the Virgin River Valley basin could present challenges for solar development. Based on the information presented here, wet cooling would not be feasible for full build-out of the East Mormon Mountain SEZ. To the extent possible, facilities using dry cooling should implement water conservation practices to limit water needs.

Groundwater quality in the vicinity of the SEZ is known to have elevated concentrations of TDS and other constituents. If groundwater were to be used for potable supply during construction, it would need to be tested to verify that the quality would comply with drinking water standards.

#### 11.5.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, will mitigate some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Proposed design features specific to the East Mormon Mountain SEZ include the following:

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

- Land-disturbance activities should minimize impacts on the ephemeral stream channels found within the SEZ, including but not limited to Toquop Wash and South Fork Toquop Wash, as well as alluvial fan features throughout the SEZ;

- Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters;

- Groundwater rights must be purchased and transferred through coordination with the NDWR and current water rights holders;

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

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

- Water for potable uses would have to meet or be treated to meet water quality standards in accordance with the *Nevada Administrative Code* (445A.453-445A.455).

## 11.5.10 Vegetation

This section addresses vegetation that could occur or is known to occur within t*he potentially affected ar*ea of the proposed East Mormon Mountain SEZ. The affected area considered in this assessment includes the areas of direct and indirect effects. The area of direct effects is defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and includes the SEZ and a 60-ft (18-m) wide portion of an assumed access road corridor. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed access road corridor, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects.

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

### 11.5.10.1 Affected Environment

The proposed East Mormon Mountain SEZ is located within the Creosotebush–Dominated Basins Level IV ecoregion (EPA 2007), which includes stream terraces, floodplains, alluvial fans, and eroded washes, as well as isolated hills, mesas, and buttes (Bryce et al. 2003). Plant communities are characterized by sparse creosotebush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), and big galleta grass (*Pleuraphis rigida*); cacti, yucca (*Yucca* sp.), ephedra (*Ephedra* sp.), and Indian ricegrass (*Achnatherum hymenoides*) are also common, although barren areas occur. Mesquite (*Prosopis* sp.) and acacia (*Acacia* sp.) are present, and blackbrush (*Coleogyne ramosissima*) is common in areas near the Arid Footslopes ecoregion. Riparian habitats include desert willow (*Chilopsis linearis*), coyote willow (*Salix exigua*), and mesquite (*Prosopis* sp.), with salt cedar (*Tamarix* sp.), a non-native shrub/tree invading riparian areas.

Areas surrounding the SEZ include the Creosotebush–Dominated Basins and Arid Footslopes ecoregions. This Level IV ecoregion supports a diverse but sparse mixture of Mojave desert forbs, succulents and shrubs, such as creosotebush, white bursage, *Yucca* species, including Joshua tree (*Yucca brevifolia*), winterfat (*Krascheninnikovia lanata*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedra nevadensis*), big galleta, Indian ricegrass, and annual fescue (*Vulpia myuros*) on alluvial fans, basalt flows, hills, and low mountains (Bryce et al. 2003). Cacti, such as silver cholla (*Cylindropuntia echinocarpa*) and beavertail (*Opuntia basilaris*), occur in rocky areas.

These ecoregions are located within the Mojave Basin and Range Level III ecoregion (see Appendix I). This ecoregion is characterized by broad basins and scattered mountains. Communities of sparse, scattered shrubs and grasses including creosotebush, white bursage, and big galleta grass occur in basins; Joshua tree, other *Yucca* species, and cacti occur on arid footslopes; and woodland and shrubland communities occur on mountain slopes, ridges, and hills (Bryce et al. 2003). Creosotebush, all-scale (*Atriplex polycarpa*), brittlebush (*Encelia farinosa*), desert holly (*Atriplex hymenelytra*), white burrobrush (*Hymenoclea salsola*), shadscale (*Atriplex confertifolia*), blackbrush, and Joshua tree are dominant species within the Mojave desertscrub biome (Turner 1994). Precipitation in the Mojave Desert occurs primarily in winter. Many ephemeral species (winter annuals) germinate in response to winter rains (Turner 1994). Annual plants are abundant with sufficient winter precipitation. Annual precipitation in the vicinity of the SEZ is low, averaging about 6.0 in. (16.3 cm) at Bunkerville, Nevada and 10.4 in. (26.4 cm) at Lytle Ranch, Utah (see Section 11.5.13).

Land cover types described and mapped under the SWReGAP (USGS 2005a) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed East Mormon Mountain SEZ are shown in Figure 11.5.10.1-1. The surface area of each cover type within the potentially affected area is listed in Table 11.5.10.1-1.

Sonora-Mojave Creosote-White Bursage Desert Scrub is the predominant cover type within the proposed East Mormon Mountain SEZ. Additional cover types within the SEZ are given in Table 11.5.10.1-1. During an August 2009 visit to the site, creosotebush and white bursage were the dominant species observed in the desert scrub communities present throughout much of the SEZ, with scattered Joshua tree (*Yucca brevifolia*). Cacti observed on the SEZ included cholla (*Cylindropuntia* sp.). Sensitive habitats on the SEZ include desert dry wash and playa habitats. The area has a history of livestock grazing, and the plant communities on the SEZ have likely been affected by grazing. Much of the SEZ was burned by wildfire in 2005, with very little subsequent shrub regeneration.

The area of indirect effects, including the area within 5 mi (8 km) around the SEZ, includes 11 cover types, which are listed in Table 11.5.10.1-1. The predominant cover type in the area of indirect effects is Sonora-Mojave Creosote-White Bursage Desert Scrub.

There are no wetlands mapped by the NWI within the SEZ or the area of indirect effects (USFWS 2009). NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009). Small areas identified as North American Warm Desert Playa occur in the eastern portion of the SEZ. Toquop Wash and a tributary, South Fork Toquop Wash, are ephemeral streams and major drainages on the SEZ. These drainages include small riparian areas of dense shrubs, primarily desert willow (BLM 2009f). Numerous desert dry washes occur within the SEZ and are tributaries to Toquop Wash and South Fork. The dry washes typically do not support wetland or riparian habitats, but many support shrub communities. The dry washes and playa typically contain water for short periods during or following precipitation events. Springs occur in the vicinity of the SEZ, including Tule Spring and Abe Spring, about 2.3 mi (3.7 km) north of the SEZ, which support wetland communities. Gourd Spring and Peach Spring are about 1 mi (1.6 km) west of the SEZ. The Virgin River, approximately 12 mi (19 km) south of the SEZ, supports extensive wetland and riparian communities.

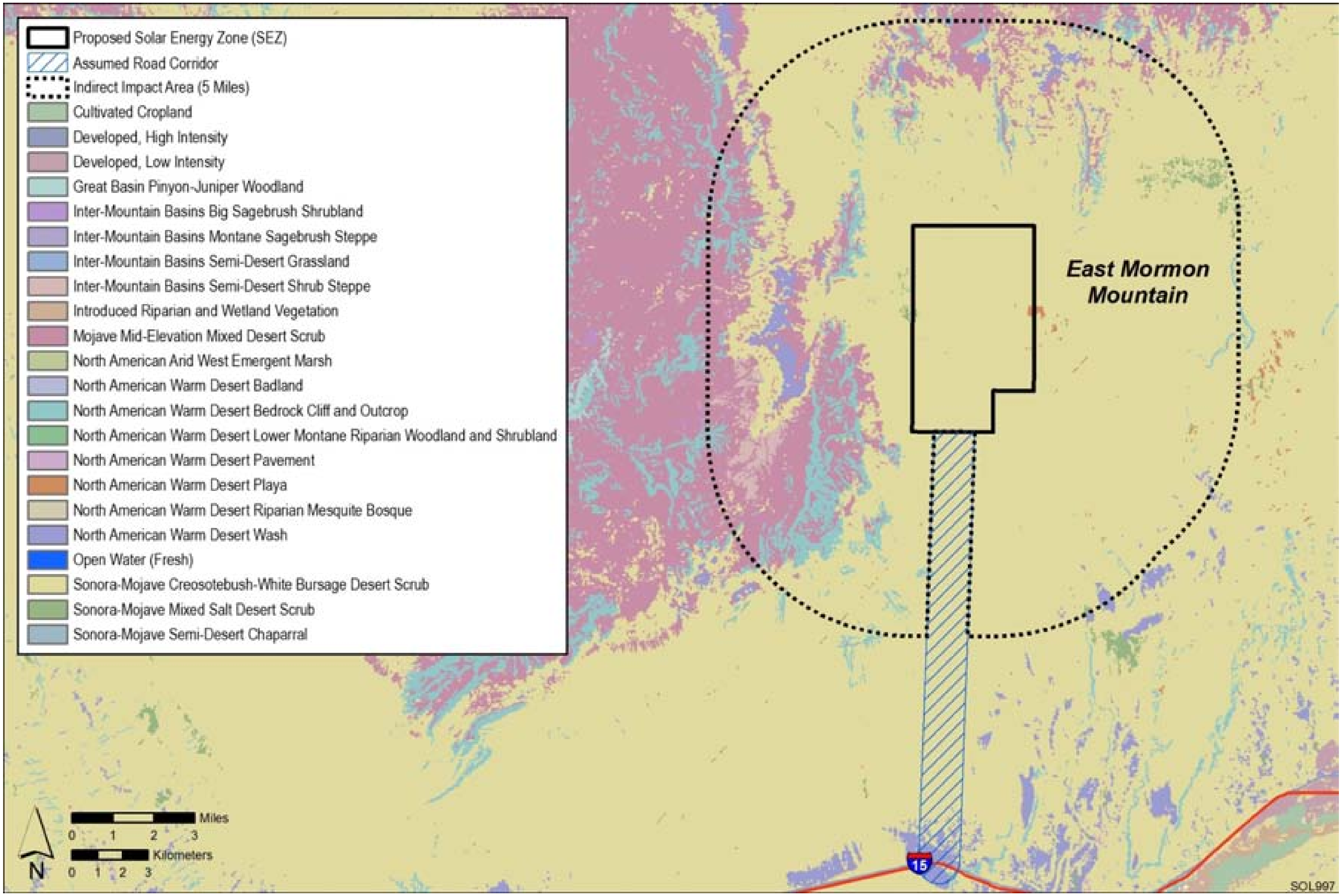


**FIGURE 11.5.10.1-1 Land Cover Types within the Proposed East Mormon Mountain SEZ (Source: USGS 2004)**

**TABLE 11.5.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed East Mormon Mountain SEZ and Potential Impacts**

| | Area of Cover Type Affected (acres)[b] | | | |
|---|---|---|---|---|
| Land Cover Type[a] | Within SEZ (Direct Effects)[c] | Access Road (Direct Effects)[d] | Corridor and Outside SEZ (Indirect Effects)[e] | Overall Impact Magnitude[f] |
| **Sonora-Mojave Creosotebush-White Bursage Desert Scrub:** Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran Deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant. | 8,913 acres[g] (0.5%, 0.6%) | 71 acres (<0.1%) | 80,168 acres (4.1%) | Small |
| **North American Warm Desert Playa:** Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant. | 24 acres (0.6%, 1.1%) | 0 acres | 110 acres (2.7%) | Small |
| **Sonora-Mojave Mixed Salt Desert Scrub:** Extensive open-canopied shrublands in the Mojave and Sonoran Deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even co-dominant. Grasses occur at varying densities. | 10 acres (0.1%, 0.1%) | 0 acres | 522 acres (2.7%) | Small |
| **North American Warm Desert Bedrock Cliff and Outcrop:** Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, and unstable scree and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas. | 4 acres (<0.1%, <0.1%) | <1 acre (<0.1%) | 5,304 acres (2.5%) | Small |

**TABLE 11.5.10.1-1 (Cont.)**

| Land Cover Type[a] | Area of Cover Type Affected (acres)[b] Within SEZ (Direct Effects)[c] | Access Road (Direct Effects)[d] | Corridor and Outside SEZ (Indirect Effects )[e] | Overall Impact Magnitude[f] |
|---|---|---|---|---|
| **North American Warm Desert Wash:** Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges. | 0 acres | 5 acres (<0.1%) | 2,121 acres (3.1%) | Small |
| **Developed, Medium-High Intensity:** Includes housing and commercial/industrial development. Impervious surfaces compose 50 to 100% of the total land cover. | 0 acres | 1 acre (<0.1%) | 75 acres (1.3%) | Small |
| **Invasive Southwest Riparian Woodland and Shrubland:** Dominated by non-native riparian woody plant species. | 0 acres | <1 acre (<0.1%) | 4 acres (<0.1%) | Small |
| **Mojave Mid-Elevation Mixed Desert Scrub:** The vegetation composition is quite variable. Dominant species include shrubs forbs and grasses and may include *Yucca* spp. | 0 acres | 0 acres | 13,545 acres (1.4%) | Small |
| **Inter-Mountain Basins Semi-Desert Shrub Steppe:** Generally consists of perennial grasses with an open shrub and dwarf shrub layer. | 0 acres | 0 acres | 1,672 acres (1.5%) | Small |
| **Inter-Mountain Basins Big Sagebrush Shrubland:** Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant. | 0 acres | 0 acres | 15 acres (<0.1%) | Small |

**TABLE 11.5.10.1-1 (Cont.)**

| | Area of Cover Type Affected (acres)[b] | | | |
|---|---|---|---|---|
| Land Cover Type[a] | Within SEZ (Direct Effects)[c] | Access Road (Direct Effects)[d] | Corridor and Outside SEZ (Indirect Effects )[e] | Overall Impact Magnitude[f] |
| **North American Warm Desert Lower Montane Riparian Woodland and Shrubland:** Occurs along perennial and seasonally intermittent streams in mountain canyons and valleys. Consists of a mix of woodlands and shrublands. | 0 acres | 0 acres | 10 acres (0.2%) | Small |

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

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

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

d For access road development, direct effects were estimated within an 11-mi (18-km) long, 60-ft (18-m) wide road ROW from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of the cover type within the 1-mi (1.6-km) wide road corridor. Impacts are for the area of the cover type within the assumed ROW, and the percentage that area represents of all occurrences of that cover type within the SEZ region.

e Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed access road corridor, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects include effects from surface runoff, dust, and other factors from project developments. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the area of indirect effects and the percentage that area represents of all occurrences of that cover type within the SEZ region.

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

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

The State of Nevada maintains an official list of weed species designated as noxious. Table 11.5.10.1-2 provides a summary of the noxious weed species regulated in Nevada known to occur in Lincoln County (USDA 2010; Creech et al. 2010) which includes the proposed East Mormon Mountain SEZ. Mediterranean grass (*Schismus barbatus*), an invasive species observed to occur within much of the SEZ in August 2009, is not included in this table. The BLM Ely District 2008 weed inventory documented Sahara mustard and salt cedar within the SEZ.

The Nevada Department of Agriculture classifies noxious weeds into one of three categories (NDA 2005):

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

- "Category B: Weeds established in scattered populations in some counties of the state; actively excluded where possible, actively eradicated from nursery

**TABLE 11.5.10.1-2 Designated Noxious Weeds of Nevada Occurring in Lincoln County**

| Common Name | Scientific Name | Category |
|---|---|---|
| Black henbane[a] | *Hyoscyamus niger* | A |
| Canada thistle[a] | *Cirsium arvense* | C |
| Dalmatian toadflax[a,b] | *Linaria dalmatica* | A |
| Diffuse knapweed[a] | *Centaurea diffusa* | B |
| Hoary cress[b] | *Cardaria draba* | C |
| Johnsongrass[a] | *Sorghum halepense* | C |
| Mayweed chamomile[b] | *Anthemis cotula* | A |
| Malta star thistle | *Centaurea melitensis* | A |
| Musk thistle[a] | *Carduus nutans* | B |
| Perennial pepperweed[a] | *Lepidium latifolium* | C |
| Perennial sowthistle[a] | *Sonchus arvensis* | A |
| Poison-hemlock[a] | *Conium maculatum* | C |
| Puncture vine[b] | *Tribulus terrestris* | C |
| Russian knapweed[a] | *Acroptilon repens* | B |
| Sahara/African mustard[a] | *Brassica tournefortii* | B |
| Saltcedar[b] | *Tamarix* spp. | C |
| Scotch thistle[a] | *Onopordium acanthium* | B |
| Spotted knapweed[a,b] | *Centaurea biebersteinii/maculosa* | A |
| Water hemlock[a] | *Cicuta maculata* | C |

[a] Creech et al. (2010).

[b] USDA (2010).

Source: NDA (2005).

stock dealer premises; control required by the state in areas where populations are not well established or previously unknown to occur."

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

### 11.5.10.2 Impacts

The construction of solar energy facilities within the proposed East Mormon Mountain SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and -grading operations. Approximately 80% of the SEZ (7,174 acres [29 $km^2$]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

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

Possible impacts from solar energy facilities on vegetation within the SEZ are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and from any additional mitigation applied. Section 11.5.10.2.3, below, identifies design features of particular relevance to the proposed East Mormon Mountain SEZ.

#### *11.5.10.2.1 Impacts on Native Species*

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

Solar facility construction and operation in the proposed East Mormon Mountain SEZ would primarily affect communities of the Sonora-Mojave Creosote-White Bursage Desert Scrub cover type. Additional cover types that would be affected within the SEZ include North American Warm Desert Playa, Sonora-Mojave Mixed Salt Desert Scrub, and North American

Warm Desert Bedrock Cliff and Outcrop. Additional cover types that would be affected only by the assumed access road include North American Warm Desert Wash, Developed, Medium-High Intensity, and Invasive Southwest Riparian Woodland and Shrubland. The Developed, Medium-High Intensity, and Invasive Southwest Riparian Woodland and Shrubland cover types would likely have relatively minor populations of native species. Table 11.5.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed East Mormon Mountain SEZ. While the Sonora-Mojave Creosote-White Bursage Desert Scrub and North American Warm Desert Bedrock Cliff and Outcrop cover types are relatively common in the SEZ region, Sonora-Mojave Mixed Salt Desert Scrub and North American Warm Desert Playa are relatively uncommon, representing 0.4% and 0.08% of the land area within the SEZ region, respectively. Desert dry washes, playas, and riparian habitats are important sensitive habitats. The construction, operation, and decommissioning of solar projects within the proposed East Mormon Mountain SEZ would result in small impacts on all cover types in the affected area. Because much of the SEZ and areas within the SEZ region have been impacted by wildfire, proportional impacts on some cover types may differ somewhat from that shown in Table 11.5.10.1-1, and in some cases may be greater.

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

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect impact area identified in Table 11.5.10.1-1.

Communities associated with playa habitats, riparian habitats, or other intermittently flooded areas within or downgradient from solar projects or access roads could be affected by ground-disturbing activities. Surface drainage throughout the SEZ is directed toward Toquop Wash. Site-clearing and -grading could disrupt surface water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter riparian shrub communities along Toquop Wash, including occurrences outside of the SEZ, and affect community function. Playa habitats in the eastern portion of the SEZ could also be affected by ground disturbance. Small areas of riparian habitat occur within the access road corridor. Increases in surface runoff from a solar energy project site or access road could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect desert dry wash habitats within the SEZ or access road area of direct effects. Alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation. Wetland and riparian communities along the Virgin River, located downgradient of the SEZ, could be affected by sediment deposition or altered hydrology.

Although the use of groundwater within the East Mormon Mountain SEZ for technologies with high water requirements, such as wet-cooling systems, may be unlikely, groundwater withdrawals for such systems could reduce groundwater elevations. Communities that depend on accessible groundwater, such as wetland communities associated with springs, could become degraded or lost as a result of lowered groundwater levels. The potential for impacts on springs in the vicinity of the SEZ, such as Tule Spring, Abe Spring, Gourd Spring, or Peach Spring, would need to be evaluated by project-specific hydrological studies. Lowered groundwater levels in the basin could potentially affect wetland and riparian communities along the Virgin River.

#### *11.5.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species*

On February 8, 1999, the President signed E.O. 13112, "Invasive Species," which directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Despite required design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed East Mormon Mountain SEZ, such that weeds could be transported into areas that were previously relatively weed-free, which could result in reduced restoration success and possible widespread habitat degradation. Invasive species, including Mediterranean grass, occur within the SEZ. Additional species designated as noxious weeds in Nevada and known to occur in Lincoln County are given in Table 11.5.10.1-2. Less than 1 acre (<0.004 $km^2$) of Invasive Southwest Riparian Woodland and Shrubland occurs within the area of direct effects of the assumed access road and approximately 4 acres (0.02 $km^2$) occurs in the area of indirect effects of the SEZ.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Existing roads, transmission lines, and recreational OHV use within the SEZ area of potential impact would also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species. Disturbed areas may contribute to the establishment of noxious weeds and invasive species. Approximately 1 acre (0.004 $km^2$) of Developed, Medium-High Intensity occurs within the area of direct effects of the assumed access road and 75 acres (0.3 $km^2$) occurs in the area of indirect effects.

### 11.5.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of desert scrub and other affected habitats, and minimize the potential for the spread of invasive species such as Mediterranean grass. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- All desert dry wash, playa, riparian, and Joshua tree communities within the SEZ and access road corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. Any Joshua trees, other yucca species, cacti, or succulent plant species in areas of direct impacts that cannot be avoided should be salvaged. A buffer area should be maintained around dry wash, playa, and riparian habitats to reduce the potential for impacts.

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

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetlands associated with springs, such as Tule Spring and Abe Spring. Potential impacts on springs should be determined through hydrological studies.

If these mitigations measures are implemented in addition to other programmatic design features, it is anticipated that a high potential for impacts from invasive species and potential impacts on Joshua tree communities, dry washes, playas, riparian habitats, wetlands, and springs would be reduced to a minimal potential for impact.

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## 11.5.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed East Mormon Mountain SEZ. Wildlife species known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from SWReGAP (USGS 2007) and the Nevada Natural Heritage Program (NDCNR 2002). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 60-ft (18-m) wide portion of an assumed 11-mi (18-km) long access road corridor. The maximum developed area within the SEZ would be 7,174 acres (29 $km^2$).

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within a 1.0-mi (1.6-km) access road corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills in the SEZ or road construction area). Potentially suitable habitat within the SEZ greater than the maximum of 7,174 acres (29.0 $km^2$) of direct effect was also included as part of the area of indirect effects. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. The area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The areas of direct and indirect effects are more thoroughly defined and the impact assessment approach is described in Appendix M.

The primary habitat type within the affected area is desert scrub, particularly Sonora-Mojave Creosotebush-White Bursage Desert Scrub (over 99.5% of the SEZ) (see Section 11.5.10). Potentially unique habitats in the affected area include cliff and rock outcrop, playa, wash, and riparian woodland and shrubland habitats. Toquop Wash and the South Fork Toquop Wash, temporary aquatic habitats, occur in the SEZ and in the area of indirect effects (see Figure 11.5.9.1-1).

### 11.5.11.1 Amphibians and Reptiles

#### *11.5.11.1.1 Affected Environment*

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed East Mormon Mountain SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008), SWReGAP (USGS 2007), and NatureServe (2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). Appendix M provides additional information on the approach used.

Based on the distribution and habitat preferences of the amphibian species, the Great Plains toad (*Bufo cognatus*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). Both toad species would most likely occur in or near the wash habitats within the SEZ.

More than 25 reptile species occur within the area that encompasses the proposed East Mormon Mountain SEZ (USGS 2007; Stebbins 2003). The desert tortoise (*Gopherus agassizii*) is a federal- and state-listed threatened species. This species is discussed in Section 11.5.12. Lizard species expected to occur within the SEZ include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), side-blotched lizard (*Uta stansburiana*), western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*). Snake species expected to occur within the proposed SEZ are the coachwhip (*Masticophis flagellum*), common kingsnake (*Lampropeltis getula*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and nightsnake (*Hypsiglena torquata*). The Mojave rattlesnake (*Crotalus scutulatus*) and sidewinder (*Crotalus cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 11.5.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed East Mormon Mountain SEZ. Special status amphibian and reptile species are addressed in Section 11.5.12.

#### *11.5.11.1.2 Impacts*

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.5.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed East Mormon Mountain SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area as presented in Section 11.5.11.1.1 and following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific

**TABLE 11.5.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur in the Affected Area of the Proposed East Mormon Mountain SEZ**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d] | Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Amphibians*** | | | | | |
| Great Plains toad (*Bufo cognatus*) | Prairies and deserts. Often breeds in shallow temporary pools or quiet waters of streams, marshes, irrigation ditches, and flooded fields. About 3,064,000 acres[h] of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,656 acres of potentially suitable habitat (3.2% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. Other than avoidance of playa and wash habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Red-spotted toad (*Bufo punctatus*) | Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos, desert streams and oases, open grassland, scrubland oaks, and dry woodlands. About 3,968,800 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,666 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. Other than avoidance of playa and wash habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

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**TABLE 11.5.11.1-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Lizards*** | | | | | |
| Desert horned lizard (*Phrynosoma platyrhinos*) | Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. About 3,713,700 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations | 105,243 acres of potentially suitable habitat (2.8% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Great Basin collared lizard (*Crotaphytus bicinctores*) | Usually inhabits alluvia, lava flows, mountain slopes, canyons, buttes, rock outcrops, washes, and rocky plains. Limiting factors are the presence of large boulders and open/sparse vegetation. About 3,490,100 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 105,084 acres of potentially suitable habitat (3.0% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of rocky outcrop and wash habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.1-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d] | Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Lizards (Cont.)*** | | | | | |
| Long-nosed leopard lizard (*Gambelia wislizenii*) | Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 3,256,100 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 95,999 acres of potentially suitable habitat (2.9% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Side-blotched lizard (*Uta stansburiana*) | Low to moderate elevations in washes, arroyos, boulder-strewn ravines, rocky cliff bases, and flat shrubby areas in canyon bottoms. Often along sandy washes. Usually in areas with a lot of bare ground. About 4,067,400 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 102,880 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | 45 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of cliff and rock outcrop and wash habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.1-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Lizards (Cont.)*** | | | | | |
| Western fence lizard (*Sceloporus occidentalis*) | Disturbed areas, roadsides, gravel beds, rock quarries, lava flows, outcrops, talus slopes, shrublands, riparian areas, and coniferous woodlands. About 3,835,700 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 89,448 acres of potentially suitable habitat (2.3% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrop habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Western whiptail (*Cnemidophorus tigris*) | Arid and semiarid habitats with sparse plant cover. About 4,271,400 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 99,255 acres of potentially suitable habitat (2.3% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6.612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.1-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Lizards (Cont.)*** | | | | | |
| Zebra-tailed lizard (*Callisaurus draconoides*) | Open, warm-desert habitats, especially dry washes and canyons with fine gravel and sand. About 3,181,900 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 98,239 acres of potentially suitable habitat (3.1% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| ***Snakes*** | | | | | |
| Coachwhip (*Masticophis flagellum*) | Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 3,521,300 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 88,902 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.1-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Snakes (Cont.)*** | | | | | |
| Common kingsnake (*Lampropeltis getula*) | Coniferous forests, woodlands, swampland, coastal marshes, river bottoms, farmlands, prairies, chaparral, and deserts. Uses rock outcrops and rodent burrows for cover. About 4,623,400 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 105,228 acres of potentially suitable habitat (2.3% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrops, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Glossy snake (*Arizona elegans*) | Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 2,475,300 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations | 85,715 acres of potentially suitable habitat (3.5% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.1-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Snakes (Cont.)*** | | | | | |
| Gophersnake (*Pituophis catenifer*) | Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 4,446,600 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 98,339 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Groundsnake (*Sonora semiannulata*) | River bottoms, desert flats, sand hummocks, rocky hillsides with pockets of loose soil; from prairie and desert lowlands to pinyon-juniper and oak-pine zone; soil may be rocky to sandy, vegetation dense to sparse. About 4,162,900 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,149 acres of potentially suitable habitat (2.3% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.1-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d] | Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Snakes (Cont.)*** | | | | | |
| Mojave rattlesnake (*Crotalus scutulatus*) | Mostly upland desert and lower mountain slopes. Barren desert, grassland, open juniper woodland, and scrubland; especially common in areas of scattered scrubby growth such as creosote and mesquite. About 5,017,600 acres of potentially suitable habitat occurs within the SEZ region | 7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations | 105,323 acres of potentially suitable habitat (2.1% of available potentially suitable habitat) | 77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Nightsnake (*Hypsiglena torquata*) | Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, it seeks refuge underground, in crevices, or under rocks. About 3,390,400 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 88,887 acres of potentially suitable habitat (2.6% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrops, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.1-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Snakes (Cont.)*** | | | | | |
| Sidewinder (*Crotalus cerastes*) | Windblown sand habitats near rodent burrows. Most common in areas of sand hummocks topped with creosote, mesquite, or other desert plants. About 2,884.400 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 95,462 acres of potentially suitable habitat (3.3% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

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

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 7,174 acres (29 $km^2$) of direct effect within the SEZ was assumed.

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

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 7,174 acres (29 $km^2$) of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] For access road development, direct effects were estimated within a 11-mi (18-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

**Footnotes continued on next page.**

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**TABLE 11.5.11.1-1 (Cont.)**

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

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

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

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

impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 11.5.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on amphibians and reptiles summarized in Table 11.5.11.1-1, direct impacts on representative amphibian and reptile species would be expected to be small, ranging from 0.1 to 0.3%. For all amphibian and reptile species, up to 7,174 acres (29.0 $km^2$) of potentially suitable habitat would be lost within the SEZ; while, depending on the species, an additional 45 to 77 acres (0.2 to 0.3 $km^2$) of potentially suitable habitat could be lost by access road construction. Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 3.5% of available habitat for the glossy snake) (Table 11.5.11.1-1). Indirect impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

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

#### *11.5.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness*

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

- Development in wash, playa, and rock outcrop habitats should be avoided.

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

### 11.5.11.2 Birds

#### *11.5.11.2.1 Affected Environment*

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on the potentially affected area of the proposed East Mormon Mountain SEZ. The list of bird species potentially present in the SEZ area was determined from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008), SWReGAP (USGS 2007), and NatureServe (2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). Appendix M provides additional information on the approach used.

Fourteen bird species that could occur in the affected area of the SEZ are considered focal species in the *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), crissal thrasher (*Toxostoma crissale*), Gila woodpecker (*Melanerpes uropygialis*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), Lucy's warbler (*Vermivora luciae*), phainopepla (*Phainopepla nitens*), Scott's oriole (*Icterus parisorum*), and verdin (*Auriparus flaviceps*). Because of their special species status, the burrowing owl and phainopepla are discussed in Section 11.5.12.

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

**Waterfowl, Wading Birds, and Shorebirds**

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state solar study area. However, within the proposed East Mormon Mountain SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Playa and wash habitats within the SEZ may attract shorebird species, but Lake Mead, Muddy River, Virgin River, and larger named washes within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) is the shorebird species most likely to occur within the SEZ.

**Neotropical Migrants**

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state solar energy study area. Species expected to occur within the proposed East Mormon Mountain SEZ include the ash-throated flycatcher, Bewick's wren (*Thryomanes bewickii*), black-tailed gnatcatcher, black-throated sparrow, Brewer's sparrow (*Spizella breweri*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker, Le Conte's thrasher, lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), northern mockingbird (*Mimus polyglottos*), rock wren (*Salpinctes obsoletus*), Say's phoebe (*Sayornis saya*), verdin, and western kingbird (*Tyrannus verticalis*) (CDFG 2008; NDCNR 2002; USGS 2007). Potentially suitable habitat for several of the desert focal bird species (crissal thrasher, Gila woodpecker, Lucy's warbler, phainopepla, and Scott's oriole) do not occur in the SEZ; but potentially suitable habitat for all of these species, except Scott's oriole, occurs within the assumed access road corridor.

**Birds of Prey**

Section 4.10.2.2.4 provided an overview of the birds of prey (raptors, owls, and vultures) within the six-state solar study area. Species that could occur within the proposed East Mormon Mountain SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), and turkey vulture (*Cathartes aura*) (CDFG 2008; NDCNR 2002; USGS 2007). Several special status birds of prey species are discussed in Section 11.5.12.

**Upland Game Birds**

Section 4.10.2.2.5 provided an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed East Mormon Mountain SEZ include the chukar (*Alectoris chukar*), Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), and white-winged dove (*Zenaida asiatica*). Potentially suitable habitat for the wild turkey (*Meleagris gallopavo*) occurs within the assumed access road corridor (CDFG 2008; NDCNR 2002; USGS 2007).

Table 11.5.11.2-1 provides habitat information for representative bird species that could occur within the proposed East Mormon Mountain SEZ. Special status bird species are discussed in Section 11.5.12.

### *11.5.11.2.2 Impacts*

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.5.11.2.3, below, identifies design features of particular relevance to the proposed East Mormon Mountain SEZ.

**TABLE 11.5.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur in the Affected Area of the Proposed East Mormon Mountain SEZ**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b] | | | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| | | Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | |
| ***Shorebirds*** | | | | | |
| Killdeer (*Charadrius vociferus*) | Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 73,000 acres[h] of potentially suitable habitat occurs within the SEZ region. | 24 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations | 105 acres of potentially suitable habitat (0.1% of available potentially suitable habitat) | 1 acre of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 87 acres in area of indirect effect | Small overall impact. Avoid playa and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| ***Neotropical Migrants*** | | | | | |
| Ash-throated flycatcher (*Myiarchus cinerascens*) | Common in scrub and woodland habitats, including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 4,437,400 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 98,130 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |

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**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Neotropical Migrants (Cont.)*** | | | | | |
| Bewick's wren (*Thryomanes bewickii*) | Generally associated with dense, brushy habitats. It is a permanent resident of lowland deserts and pinyon-juniper forests. Breeding occurs in brushy areas of open woodlands and other open habitats. It is a cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 3,856,100 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 91,036 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| Black-tailed gnatcatcher (*Polioptila melanura*) | Nests in bushes mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 2,029,200 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations | 84,032 acres of potentially suitable habitat (4.1% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.004% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Neotropical Migrants (Cont.)*** | | | | | |
| Black-throated sparrow (*Amphispiza bilineata*) | Chaparral and desertscrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 3,936,500 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 95,452 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| Brewer's sparrow (*Spizella breweri*) | Prefers to nest in sagebrush, but also nests in other shrubs and cactus. During migration and winter, it occurs in low, arid vegetation, desert scrub, sagebrush, and creosotebush. About 3,390,800 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 95,467 acres of potentially suitable habitat (2.8% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Common poorwill (*Phalaenoptilus nuttallii*) | Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 3,741,100 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 89,882 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Neotropical Migrants (Cont.)*** | | | | | |
| Common raven (*Corvus corax*) | Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or man-made structures. Forages in sparse, open terrain. About 4,615,600 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,756 acres of potentially suitable habitat (2.1% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| Costa's hummingbird (*Calypte costae*) | Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 2,982,700 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 98,115 acres of potentially suitable habitat (3.3% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Neotropical Migrants (Cont.)*** | | | | | |
| Greater roadrunner (*Geococcyx californianus*) | Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,661,400 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 103,561 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| Horned lark (*Eremophila alpestris*) | Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 3,442,600 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,671 acres of potentially suitable habitat (2.8% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Neotropical Migrants (Cont.)*** | | | | | |
| Ladder-backed woodpecker (*Picoides scalaris*) | Variety of habitats, including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 4,148,600 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 98,115 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of riparian habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| Le Conte's thrasher (*Toxostoma lecontei*) | Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 3,003,300 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,573 acres of potentially suitable habitat (3.2% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |

TABLE 11.5.11.2-1 (Cont.)

| | | Maximum Area of Potential Habitat Affected[b] | | | |
|---|---|---|---|---|---|
| Common Name (Scientific Name) | Habitat[a] | Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
| ***Neotropical Migrants (Cont.)*** | | | | | |
| Lesser nighthawk (*Chordeiles acutipennis*) | Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water, including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 3,749,600 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 103,427 acres of potentially suitable habitat (2.8% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| Loggerhead shrike (*Lanius ludovicianus*) | Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 4,679,600 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 99,806 acres of potentially suitable habitat (2.1% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Neotropical Migrants (Cont.)*** | | | | | |
| Northern mockingbird (*Mimus polyglottos*) | Parkland, cultivated lands, second-growth habitats, desert scrub, and riparian areas at low elevations. Forages on ground in short, grassy to nearly barren substrates. About 4,887,300 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations | 105,185 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| Rock wren (*Salpinctes obsoletus*) | Arid and semiarid habitats. Breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices, and the nest entrance is paved with small rocks and stones. About 4,903,200 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations | 104,577 acres of potentially suitable habitat (2.1% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Neotropical Migrants (Cont.)*** | | | | | |
| Say's phoebe (*Sayornis saya*) | Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 3,489,400 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 101,307 acres of potentially suitable habitat (2.9% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| Verdin (*Auriparus flaviceps*) | Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 2,965,800 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,583 acres of potentially suitable habitat (3.3% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Neotropical Migrants (Cont.)*** | | | | | |
| Western kingbird (*Tyrannus verticalis*) | Occurs in a variety of habitats, including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. It migrates to Central America or the southeastern United States for the winter. About 3,700,000 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,224 acres of potentially suitable habitat (2.6% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act. |
| ***Birds of Prey*** | | | | | |
| American kestrel (*Falco sparverius*) | Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 2,729,100 acres of potentially suitable habitat occurs in the SEZ region. | 14 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) during construction and operations | 21,143 acres of potentially suitable habitat (0.8% of available potentially suitable habitat) | 1 acre of potentially suitable habitat lost (<0.0001% of available potentially suitable habitat) and 87 acres in area of indirect effect | Small overall impact. Avoid bedrock cliff and outcrop habitat. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Birds of Prey (Cont.)*** | | | | | |
| Golden eagle (*Aquila chrysaetos*) | Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 2,783,000 acres of potentially suitable habitat occurs in the SEZ region. | 38 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) during construction and operations | 23,298 acres of potentially suitable habitat (0.8% of available potentially suitable habitat) | 6 acres of potentially suitable habitat lost (0.0002% of available potentially suitable habitat) and 522 acres in area of indirect effect | Small overall impact. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act. |
| Great horned owl (*Bubo virginianus*) | Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 4,808,500 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations | 100,015 acres of potentially suitable habitat (2.1% of available potentially suitable habitat) | 77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Long-eared owl (*Asio otus*) | Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush-bursage flats, desert scrub, grasslands, and agricultural fields). About 4,478,400 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,153 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Birds of Prey (Cont.)*** | | | | | |
| Turkey vulture (*Cathartes aura*) | Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 4,105,300 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 101,306 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| ***Upland Game Birds*** | | | | | |
| Chukar (*Alectoris chukar*) | Steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds found within 0.25 mi (0.4 km) of water during the brooding period. About 4,549.100 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,681 acres of potentially suitable habitat (2.1% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Gambel's quail (*Callipepla gambelii*) | Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 3,895,300 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 105,113 acres of potentially suitable habitat (2.7% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.2-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Upland Game Birds (Cont.)*** | | | | | |
| Mourning dove (*Zenaida macroura*) | Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,603,900 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 100,015 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| White-winged dove (*Zenaida asiatica*) | Nests in low to medium height trees with dense foliage and fairly open ground cover. Feeds on wild seeds, grains, and fruit. About 2,985,500 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 98,109 acres of potentially suitable habitat (3.3% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

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

b Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 7,174 acres of direct effect within the SEZ was assumed.

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

**Footnotes on next page.**

**TABLE 11.5.11.2-1 (Cont.)**

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[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 7,174 acres (29 $km^2$) of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

[e] For access road development, direct effects were estimated within a 11-mi (18-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

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

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

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

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

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 11.5.11.2.1 and following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 11.5.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), and from disturbance, injury, or mortality to individual birds. Table 11.5.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed East Mormon Mountain SEZ. Direct impacts on representative bird species would be small, ranging from <0.001 to 0.4%. For most of the representative bird species, up to 7,174 acres (29.0 $km^2$) of potentially suitable habitat would be lost within the SEZ, while, depending on the species, an additional 0.0 to 77 acres (0.0 to 0.3 $km^2$) of potentially suitable habitat could be lost by access road construction (Table 11.5.11.2-1). No direct impacts would occur to the crissal thrasher, Gila woodpecker, Lucy's warbler, or wild turkey from solar energy development in the SEZ. However, access road construction could result in the loss of up to 1 acre (0.004 $km^2$) of potential habitat for the Gila woodpecker and up to 5 acres (0.02 $km^2$) of potential habitat for the other three species.

Larger areas of potentially suitable habitats for the bird species occur within the area of potential indirect effects (e.g., up to 4.1% of available habitat for the black-tailed gnatcatcher) (Table 11.5.11.2-1). Indirect impacts on birds could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

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

#### *11.5.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness*

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

- The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed.

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

- Playa, wash, and rock outcrop habitats should be avoided.

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

### 11.5.11.3 Mammals

#### *11.5.11.3.1 Affected Environment*

This section addresses representative mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed East Mormon Mountain SEZ. The list of mammal species potentially present in the SEZ area was determined from the Nevada Natural Heritage Program (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008), SWReGAP (USGS 2007), and NatureServe (2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). Appendix M provides additional information on the approach used.

Over 55 species of mammals have ranges that encompass the area of the proposed SEZ (NDCNR 2002; USGS 2007); however, suitable habitats for a number of these species are limited or nonexistent within the SEZ (USGS 2007). Similar to the overview of mammals provided for the six-state solar energy study area (Section 4.10.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share similar habitats.

**Big Game**

The big game species that occur within Lincoln County include cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), Nelson's bighorn sheep (*Ovis* *canadensis nelsoni*), and pronghorn (*Antilocapra americana*) (CDFG 2008; NDCNR 2002; USGS 2007). Because of its special species status, the Nelson's bighorn sheep is addressed in Section 11.5.12. Based on land cover, potentially suitable habitat for the cougar and mule deer occurs within the proposed East Mormon Mountain SEZ, whereas no potentially suitable habitat for elk or pronghorn occurs within the SEZ. Only 15 acres (0.6 $km^2$) of potentially suitable habitat for elk and 1,687 acres (6.8 $km^2$) of potentially suitable habitat for pronghorn occurs within the area of indirect effect. Figure 11.5.11.3-1 shows the location of the SEZ relative to the mapped range of mule deer habitat.

**Other Mammals**

A number of furbearers and small game mammal species occur within the area of the proposed East Mormon Mountain SEZ. Species that could occur within the area of the SEZ include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and red fox (*Vulpes vulpes*) (CDFG 2008; NDCNR 2002; USGS 2007).

The nongame (small) mammals include bats, rodents, and shrews. Representative species for which potentially suitable habitat occurs within the proposed East Mormon Mountain SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), canyon mouse (*P. crinitis*), deer mouse (*P. maniculatus*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), Merriam's pocket mouse (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), southern grasshopper mouse (*O. torridus*), western harvest mouse (*Reithrodontomys megalotis*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (CDFG 2008; NDCNR 2002; USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), long-legged myotis (*M. volans*), silver-haired bat (*Lasionycteris noctivagans*), and western pipistrelle (*Parastrellus hesperus*) (CDFG 2008; NDCNR 2002; USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ. Several other special status bat species that could occur within the SEZ area are addressed in Section 11.5.12.

Table 11.5.11.3-1 provides habitat information for representative mammal species that could occur within the proposed SEZ. Special status mammal species are discussed in Section 11.5.12.

***11.5.11.3.2 Impacts***

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied.

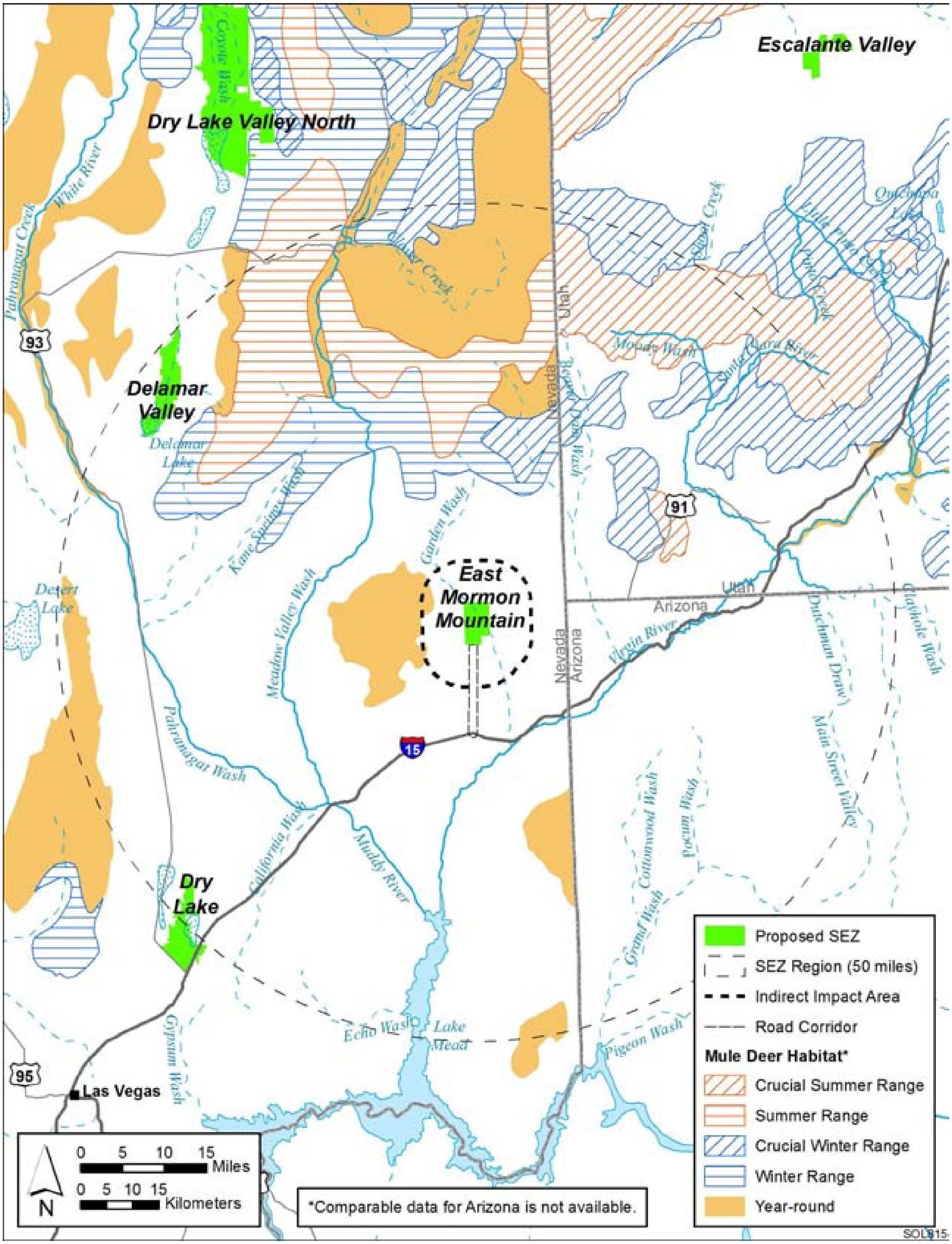


**FIGURE 11.5.11.3-1 Location of the Proposed East Mormon Mountain SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)**

**TABLE 11.5.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur in the Affected Area of the Proposed East Mormon Mountain SEZ**

| | | Maximum Area of Potential Habitat Affected[b] | | | |
|---|---|---|---|---|---|
| Common Name (Scientific Name) | Habitat[a] | Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
| ***Big Game*** | | | | | |
| Cougar (*Puma concolor*) | Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,801,300 acres[h] of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations | 102,989 acres of potentially suitable habitat (2.1% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Mule deer (*Odocoileus hemionus*) | Most habitats, including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provides abundant browse and cover. About 3,823,300 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 99,408 acres of potentially suitable habitat (2.6% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| | | Maximum Area of Potential Habitat Affected[b] | | | |
|---|---|---|---|---|---|
| Common Name (Scientific Name) | Habitat[a] | Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
| ***Small Game and Furbearers*** | | | | | |
| American badger (*Taxidea taxus*) | Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 4,394,900 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,149 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Black-tailed jackrabbit (*Lepus californicus*) | Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,861,000 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations | 104,567 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Small Game and Furbearers (Cont.)*** | | | | | |
| Bobcat (*Lynx rufus*) | Most habitats except subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 4,563,500 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 99,270 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Coyote (*Canis latrans*) | All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 4,985,600 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations | 105,323 acres of potentially suitable habitat (2.1% of available potentially suitable habitat) | 77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b] | | | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| | | Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | |
| ***Small Game and Furbearers (Cont.)*** | | | | | |
| Desert cottontail (*Sylvilagus audubonii*) | Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 3,687,700 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 85,715 acres of potentially suitable habitat (2.3% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Gray fox (*Urocyon cinereoargenteus*) | Deserts, open forests, and brush. Prefers wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 3,547,800 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 91,141 acres of potentially suitable habitat (2.6% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Small Game and Furbearers (Cont.)*** | | | | | |
| Kit fox (*Vulpes macrotis*) | Desert and semidesert areas with relatively open vegetative cover and soft soils. Seeks shelter in underground burrows. About 3,701,200 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 99,926 acres of potentially suitable habitat (2.7% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Red fox (*Vulpes vulpes*) | Most common in open woodlands, pasturelands, riparian areas, and agricultural lands. About 3,414,600 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 83,604 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d] | Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Nongame (small) Mammals*** | | | | | |
| Big brown bat (*Eptesicus fuscus*) | Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 3,523,900 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 88,962 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | 72 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,264 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrops, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Botta's pocket gopher (*Thomomys bottae*) | Variety of habitats, including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 2,628,600 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations | 85,715 acres of potentially suitable habitat (3.3% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6.612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| | | Maximum Area of Potential Habitat Affected[b] | | | |
|---|---|---|---|---|---|
| Common Name (Scientific Name) | Habitat[a] | Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
| ***Nongame (small) Mammals (Cont.)*** | | | | | |
| Brazilian free-tailed bat (*Tadarida brasiliensis*) | Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 3,787,200 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 91,108 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | 77 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,699 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrops, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Cactus mouse (*Peromyscus eremicus*) | Variety of areas, including desert scrub, semidesert chaparral, desert wash, semidesert grassland, and cliff and canyon habitats. About 4,001,600 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 99,791 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of wash and rock outcrop habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d] | Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Nongame (small) Mammals (Cont.)*** | | | | | |
| California myotis (*Myotis californicus*) | Desertscrub, semidesert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 2,934,600 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 91,032 acres of potentially suitable habitat (3.1% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrop habitats, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Canyon mouse (*Peromyscus crinitus*) | Associated with rocky substrates in a variety of habitats, including desert scrub, sagebrush shrublands, woodlands, cliffs and canyons, and volcanic rock and cinder lands. Source of free water not required. About 3,417,200 acres of potentially suitable habitat occurs in the SEZ region. | 977 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 96,009 acres of potentially suitable habitat (2.8% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. Avoid rock outcrop habitat. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Nongame (small) Mammals (Cont.)*** | | | | | |
| Deer mouse (*Peromyscus maniculatus*) | Tundra; alpine and subalpine grasslands; plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran desert scrub habitats. About 4,713,100 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 102,457 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Desert shrew (*Notiosorex crawfordi*) | Usually in arid areas with adequate cover such as semiarid grasslands, shortgrass plains, desert scrub, chaparral slopes, shortgrass plains, oak savannas and woodlands, and alluvial fans. About 3,527,700 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 105,098 acres of potentially suitable habitat (3.0% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Nongame (small) Mammals (Cont.)*** | | | | | |
| Desert woodrat (*Neotoma lepida*) | Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,851,400 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations | 105,109 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Hoary bat (*Lasiurus cinereus*) | Chaparral, shortgrass plains, scrub-grassland, desertscrub, forests and woodlands. Usually roosts in trees, also in caves, rock crevices, and houses. About 3,401,900 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 88,976 acres of potentially suitable habitat (2.6% of available potentially suitable habitat) | 72 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,264 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

TABLE 11.5.11.3-1 (Cont.)

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d] | Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Nongame (small) Mammals (Cont.)*** | | | | | |
| Little pocket mouse (*Perognathus longimembris*) | Mostly sandy and gravelly soils, but also stony soils and rarely rocky sites. About 3,376,900 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 99,792 acres of potentially suitable habitat (3.0% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Long-legged myotis (*Myotis volans*) | Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees are used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 3,564,900 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 88,897 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Nongame (small) Mammals (Cont.)*** | | | | | |
| Merriam's kangaroo rat (*Dipodomys merriami*) | Plains grasslands, scrub-grasslands, desertscrub, shortgrass plains, oak and juniper savannahs, mesquite dunes, and creosote flats. About 3,637,500 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 99,792 acres of potentially suitable habitat (2.7% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Northern grasshopper mouse (*Onychomys leucogaster*) | Grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 4,472,300 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 97,149 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

TABLE 11.5.11.3-1 (Cont.)

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Nongame (small) Mammals (Cont.)*** | | | | | |
| Silver-haired bat (*Lasionycteris noctivagans*) | Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savannah, and desertscrub habitats. Roosts under bark, and in hollow trees, caves and mines. Forages over clearings and open water. About 3,756,200 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 88,987 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | 72 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,264 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Southern grasshopper mouse (*Onychomys torridus*) | Low, arid, shrub and semiscrub vegetation of deserts. About 3,170,400 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 99,791 acres of potentially suitable habitat (3.1% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Nongame (small) Mammals (Cont.)*** | | | | | |
| Western harvest mouse (*Reithrodontomys megalotis*) | Various habitats, including scrub-grasslands, temperate swamps and riparian forests, salt marshes, shortgrass plains, oak savannah, dry fields, agricultural areas, deserts, and desertscrub. Grasses are the preferred cover. About 2,525,700 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations | 76,480 acres of potentially suitable habitat (3.0% of available potentially suitable habitat) | 27 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,364 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Western pipistrelle (*Parastrellus hesperus*) | Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes in mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 2,789,500 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations | 88.977 acres of potentially suitable habitat (3.2% of available potentially suitable habitat) | 72 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,264 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

**TABLE 11.5.11.3-1 (Cont.)**

| Common Name (Scientific Name) | Habitat[a] | Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c] | Outside SEZ (Indirect Effects)[d] | Within Road Corridor (Direct and Indirect Effects)[e] | Overall Impact Magnitude[f] and Species-Specific Mitigation[g] |
|---|---|---|---|---|---|
| ***Nongame (small) Mammals (Cont.)*** | | | | | |
| White-tailed antelope squirrel (*Ammospermophilus leucurus*) | Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends its nights and other periods of inactivity in underground burrows. About 3,618,600 acres of potentially suitable habitat occurs within the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations | 104,552 acres of potentially suitable habitat (2.9% of available potentially suitable habitat) | 76 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 6,612 acres in area of indirect effect | Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |
| Yuma myotis (*Myotis yumanensis*) | Riparian areas, grasslands, semidesert shrubland, mountain brush, woodlands, and deserts. It occurs where there is open water, regardless of the habitat. Roosts in caves, mines, cliffs, crevices, buildings, and swallow nests. About 2,772,300 acres of potentially suitable habitat occurs in the SEZ region. | 7,174 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations | 89,050 acres of potentially suitable habitat (3.2% of available potentially suitable habitat) | 71 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 6,177 acres in area of indirect effect | Small overall impact. Other than avoidance of rock outcrop habitat, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. |

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

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 7,174 acres (29 $km^2$) of direct effect within the SEZ was assumed.

**Footnotes continued on next page.**

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**TABLE 11.5.11.3-1 (Cont.)**

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

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 7,174 acres (29 $km^2$) of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] For access road development, direct effects were estimated within a 11-mi (18-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

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

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

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

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

Section 11.5.11.3.3, below, identifies design features of particular relevance to mammals for the proposed East Mormon Mountain SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 11.5.11.3.1 and following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 11.5.11.3.3). Table 11.5.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed East Mormon Mountain SEZ.

**Cougar**

Up to 7,245 acres (29.3 $km^2$) of potentially suitable cougar habitat could be lost through solar energy and access road development at the proposed East Mormon Mountain SEZ. This represents about 0.1% of potentially suitable cougar habitat within the SEZ region. Nearly 103,000 acres (417 $km^2$) of potentially suitable cougar habitat occurs within the area of indirect effect for the SEZ and access road. This is about 2.1% of potentially suitable cougar habitat within the SEZ region. Overall, impacts on cougar from solar energy development in the SEZ would be small.

**Mule Deer**

Based on land cover analyses, up to 7,250 acres (29.3 $km^2$) of potentially suitable mule deer habitat could be lost through solar energy and access road development at the proposed East Mormon Mountain SEZ. This acreage represents about 0.2% of potentially suitable mule deer habitat within the SEZ region. About 99,400 acres (402 $km^2$) of potentially suitable mule deer habitat occurs within the area of indirect effect for the SEZ and access road. This acreage is about 2.6% of potentially suitable mule deer habitat within the SEZ region. Based on mapped range, the closest year-round mule deer habitat is about 3.5 mi (5.6 km) from the SEZ (Figure 11.5.11.3-1). About 3,170 acres (12.8 $km^2$) of year-round mule deer habitat occurs within the area of indirect effect. This is about 0.6% of the year-round mule deer habitat within the SEZ region. The closest summer range, winter range, and crucial winter range are about 17 mi (27 km), 13 mi (21 km), and 15 mi (24 km), respectively from the SEZ (Figure 11.5.11.3-1). Thus, no direct or indirect effect to these mule deer ranges would be expected. Overall, impacts on mule deer from solar energy development in the SEZ would be small.

**Other Mammals**

Direct impacts on other representative mammal species would be small, ranging from 0.1 to 0.3%. For most of the species, up to 7,174 acres (29 $km^2$) of potentially suitable habitat would be lost within the SEZ; while, depending on the species, an additional 27 to 77 acres (0.1 to 0.3 $km^2$) of potentially suitable habitat could be lost by access road construction (Table 11.5.11.3-1). Larger areas of potentially suitable habitats for the furbearers, small game, and nongame mammal species occur within the area of potential indirect effects (e.g., up to 3.2% of available habitat for the western pipistrelle and Yuma myotis) (Table 11.5.11.3-1). Indirect impacts on mammals could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

**Summary**

Overall, impacts on mammal species would be small (Table 11.5.11.3-1). In addition to habitat loss, other direct impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences). Indirect impacts on mammals could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

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

#### *11.5.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness*

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

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

- Playa, wash, and rock outcrop habitats should be avoided.

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

### 11.5.11.4 Aquatic Biota

#### *11.5.11.4.1 Affected Environment*

This section addresses aquatic habitats and biota on the proposed East Mormon Mountain SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ and the presumed new access road. There are no permanent streams or water bodies within the proposed East Mormon Mountain SEZ. About 5 mi (8 km) of Toquop Wash, an intermittent stream, is located within the SEZ. Several large, unnamed ephemeral washes also are present in the SEZ. Streams and washes in the SEZ typically contain water only after substantial rainfall, at which time they carry water across the SEZ to the southeast and eventually drain into the Virgin River (Beck and Wilson 2006). Although intermittent or ephemeral, channel incision indicates that the washes within the SEZ can carry substantial flow during large runoff events. Ephemeral or intermittent streams may contain a diverse seasonal community of invertebrates that are potentially present in a dormant state, even in dry periods (Levick et al. 2008). However, more site-specific data are needed to fully evaluate aquatic biota present in the proposed East Mormon Mountain SEZ. NWI mapping (USFWS 2009) does not indicate any wetlands are present within the SEZ. The assumed access road corridor does not intersect any intermittent or permanent surface water features within the SEZ.

Ten miles (16 km) of intermittent washes are located within the area of indirect effects. Several unnamed ephemeral washes are present as well. The washes are typically dry and are not expected to contain permanent aquatic habitat or communities. The assumed access road corridor intersects ephemeral, but not permanent, surface water features within the area of indirect effects. NWI mapping (USFWS 2009) does not indicate any wetlands are present within the area of indirect effects. However, springs occur in the vicinity of the SEZ, including Tule Spring and Abe Spring, about 2.3 mi (3.7 km) north of the SEZ, and Gourd Spring and Peach Spring, which are about 1 mi (1.6 km) west of the SEZ. These springs may support aquatic habitat and communities, but site specific survey data is needed to characterize the extent to which aquatic habitat and biota are present.

Outside of the area of indirect effects, but within 50 mi (80 km) of the proposed East Mormon Mountain SEZ, are 7,372 acres (30 km$^2$) of dry lakes and 19,963 acres (81 km$^2$) of perennial lakes. In addition, there are 319 mi (513 km) of perennial streams and 402 mi (647 km) of intermittent streams. The nearest perennial surface water feature is the Virgin River, about 10 mi (16 km) from the southern border of the SEZ. Intermittent streams are the primary surface water feature present in the area of direct and indirect effects and account for about 4% of the total amount of intermittent stream present in the SEZ region.

#### *11.5.11.4.2 Impacts*

Because surface water habitats are a unique feature in the arid landscape in the vicinity of the proposed East Mormon Mountain SEZ, the maintenance and protection of such habitats is important to the survival of aquatic and terrestrial organisms. The types of impacts that aquatic habitats and biota could incur from the development of utility-scale solar energy facilities are described in detail in Section 5.10.3. Aquatic habitats present on or near the locations selected for construction of solar energy facilities could be affected in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality.

The intermittent Toquop Wash and several unnamed ephemeral washes are present in the proposed East Mormon Mountain SEZ and the area of indirect effects, and these features may be directly affected by ground disturbance (SEZ only) and sedimentation from runoff and fugitive dust. However, washes in the SEZ are typically dry, and impacts on aquatic habitat and communities are not likely to occur. The streams present in the SEZ and area of indirect effects flow into the Virgin River. Therefore, the potential exists for sediments deposited in the washes to affect aquatic habitat and communities downstream. However, the distance from the SEZ to the Virgin River (more than 12 mi [19 km]) reduces the chance for sediment to reach the aquatic habitat. Aquatic habitat and biota potentially found in springs present within the area of indirect effects could be affected by fugitive dust associated with solar energy development within the SEZ. However, more site-specific data on these springs is needed to assess the potential for impacts. The implementation of commonly used engineering practices to control the entry of soils and fugitive dust into surface waters such as site watering, building settling basins and silt fences, or directing water draining from the developed areas away from streams, would help minimize the potential for impacts on aquatic organisms.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower facilities, were developed at the site. The associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). No permanent surface waters occur in the proposed East Mormon Mountain SEZ. However, springs are present in the area of indirect effects. Obtaining cooling water from perennial surface water features or from groundwater could potentially reduce habitat size and create more adverse environmental conditions for aquatic organisms in the springs located in the area of indirect effects as well as surface water outside of the area of indirect effects. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

As identified in Section 5.9, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning of a solar energy facility. The potential exists for contaminants to enter intermittent washes within the SEZ, especially if heavy machinery is used in or near these surface water features. The intermittent streams within the SEZ region are typically dry, and are not likely to support aquatic habitat or communities. However, they do drain into the perennial Virgin River; therefore, there is the potential for contaminants entering washes within the SEZ to impact aquatic habitat and biota in the river. However, the distance from the SEZ to the Virgin River (more than 12 mi [19 km]) and the infrequency of flooding reduces the chance for contaminants to reach the aquatic habitat. The introduction of contaminants can be minimized by avoiding construction near washes within the SEZ.

#### *11.5.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness*

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

- Ground disturbance and contaminant spills near Toquop Wash and the other unnamed washes within the SEZ should be minimized;

- Appropriate engineering controls should be implemented to minimize the amount of surface water runoff and fugitive dust reaching springs, Toquop Wash and unnamed washes in the SEZ and in the area of indirect effects; and

- The impact of groundwater withdrawals on surface water features near the SEZ (such as Tule Spring, Abe Spring, Gourd Spring and Peach Spring) should be eliminated or minimized.

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

## 11.5.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, within the potentially affected area of the proposed East Mormon Mountain SEZ. Special status species include the following types of species[3]:

- Species listed as threatened or endangered under the ESA;
- Species that are proposed for listing, under review, or are candidates for listing under the ESA;
- Species that are listed by the BLM as sensitive;
- Species that are listed by the State of Nevada[4]; and
- Species that have been ranked by the State of Nevada as S1 or S2, or species of concern by the State of Nevada or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the center of the proposed East Mormon Mountain SEZ (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the NDOW NNHP (Miskow 2009; NDCNR 2004, 2009a,b, 2010), SWReGAP (USGS 2004, 2005a, 2007), and the USFWS ECOS (USFWS 2010a). Information reviewed consisted of county-level occurrences as determined from Nature Serve, element occurrences provided by the NNHP, as well as modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from SWReGAP. The 50-mi (80-km) SEZ region intersects Clark and Lincoln Counties, Nevada; Mohave County, Arizona; and Iron and Washington Counties, Utah. However, the entire SEZ is located in Lincoln County, Nevada. Appendix M contains additional information on the approach used to identify species that could be affected by development within the SEZ.

### 11.5.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the proposed East Mormon Mountain SEZ, the area of direct effect included the SEZ and the portion of the road corridor where ground-disturbing activities are assumed to occur. Due to the

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

[4] State-listed species for the state of Nevada are those protected under NRS 501.110 (animals) or NRS 527 (plants).

proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades (see Section 11.5.1.2 for development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and the portion of the access road corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ and road construction area, but did not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary land cover habitat type within the affected area is Sonora-Mojave creosote desert scrub (see Section 11.5.10). Potentially unique habitats in the affected area in which special status species may reside include rocky cliffs and outcrops, desert washes, playas, and riparian habitats. No permanent or perennial surface water features occur on the SEZ or within the area of indirect effects. However, various intermittent streams (washes) and playas are present on the SEZ and throughout the area of indirect effects. In particular, Toquop Wash flows northwest to southeast across the SEZ. Unnamed tributary washes to the Toquop Wash also occur on the SEZ. The nearest permanent or perennial surface water feature is the Virgin River, about 12 mi (19 km) south of the SEZ (Figure 11.5.12.1-1).

All special status species that are known to occur within the proposed East Mormon Mountain SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed (along with their status, nearest recorded occurrence, and habitats) in Appendix J. Thirty-two of these species could be affected by solar energy development on the SEZ on the basis of recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 11.5.12.1-1. The predicted potential occurrence of many of these species in the affected area is based only on a general correspondence between mapped SWReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of special status species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 km) from the SEZ.

NNHP records indicate that three special status species known to occur within the affected area of the proposed East Mormon Mountain SEZ: Las Vegas buckwheat, desert tortoise, and Nelson's bighorn sheep (Table 11.5.12.1-1). There are no groundwater-dependent species in the vicinity of the SEZ based upon NNHP records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the East Mormon Mountain SEZ region (Section 11.5.9).

##### *11.5.12.1.1 Species Listed under the Endangered Species Act That Could Occur in the Affected Area*

In scoping comments on the proposed East Mormon Mountain SEZ, the USFWS expressed concern for impacts of project development within the SEZ on the Mojave population of the desert tortoise—a species listed as threatened under the ESA in the SEZ region (Stout 2009). This species is likely to occur in the affected area of the proposed East Mormon Mountain SEZ. Based upon information from the NNHP and the availability of potentially suitable habitat, no other species listed under the ESA are expected to occur in the affected area of the proposed East Mormon Mountain SEZ. Information on habitats for the desert tortoise and occurrences in relation to the SEZ is presented in Table 11.5.12.1-1; additional basic information on life history, habitat needs, and threats to populations of this species is provided in Appendix J.

The Mojave population of the desert tortoise is known to occur in the SEZ region in desert shrubland habitats. The nearest recorded occurrence of this species is about 2 mi (3 km) south of the SEZ. Designated critical habitat for the desert tortoise occurs within the affected area adjacent to the eastern and southern boundaries of the SEZ in the Beaver Dam Slope and Mormon Mesa critical habitat units, respectively (Figure 11.5.12.1-1).

Desert tortoise surveys in the Mormon Mesa and Beaver Dam Slope critical habitat units conducted by the USFWS have indicated a desert tortoise density of about 3.7 and 1.3 individuals/km$^2$, respectively (Stout 2009). The USFWS assumed that because the proposed East Mormon Mountain SEZ is not separated by elevated areas from the Beaver Dam Slope strata, there would be more connectivity to this critical habitat unit than to the Mormon Mesa unit. Based on the density estimate for the Beaver Dam Slope critical habitat unit (1.3 individuals/km$^2$), about 47 desert tortoises have the potential to occur on the SEZ.

According to the SWReGAP habitat suitability model, about 87,800 acres (355 km$^2$) of potentially suitable habitat for this species occurs in the affected area of the proposed East Mormon Mountain SEZ. The USGS desert tortoise model (Nussear et al. 2009) identifies the SEZ as having overall high habitat suitability for desert tortoise (suitability score greater than or equal to 0.8 out of 1.0). According to the SWReGAP habitat suitability model, about 2,171,300 acres (8,787 km$^2$) of potentially suitable habitat for this species occurs in the SEZ region (Table 11.5.12.1-1).

##### *11.5.12.1.2 Species That Are Candidates for Listing under the ESA*

In scoping comments on the proposed East Mormon Mountain SEZ, the USFWS identified one ESA candidate species that may occur within the affected area of the SEZ—the Las Vegas buckwheat (Stout 2009). This species is endemic to southern Nevada in the vicinity of Las Vegas. It inhabits areas of gypsum soils in washes, drainages, or in areas of low relief at elevations between 1,900 and 3,850 ft (580 and 1,175 m). The nearest recorded occurrence of this species is about 1 mi (1.6 km) east of the SEZ (Figure 11.5.12.1-1; Table 11.5.12.1-1). Additional basic information on life history, habitat needs, and threats to populations of this species is provided in Appendix J.

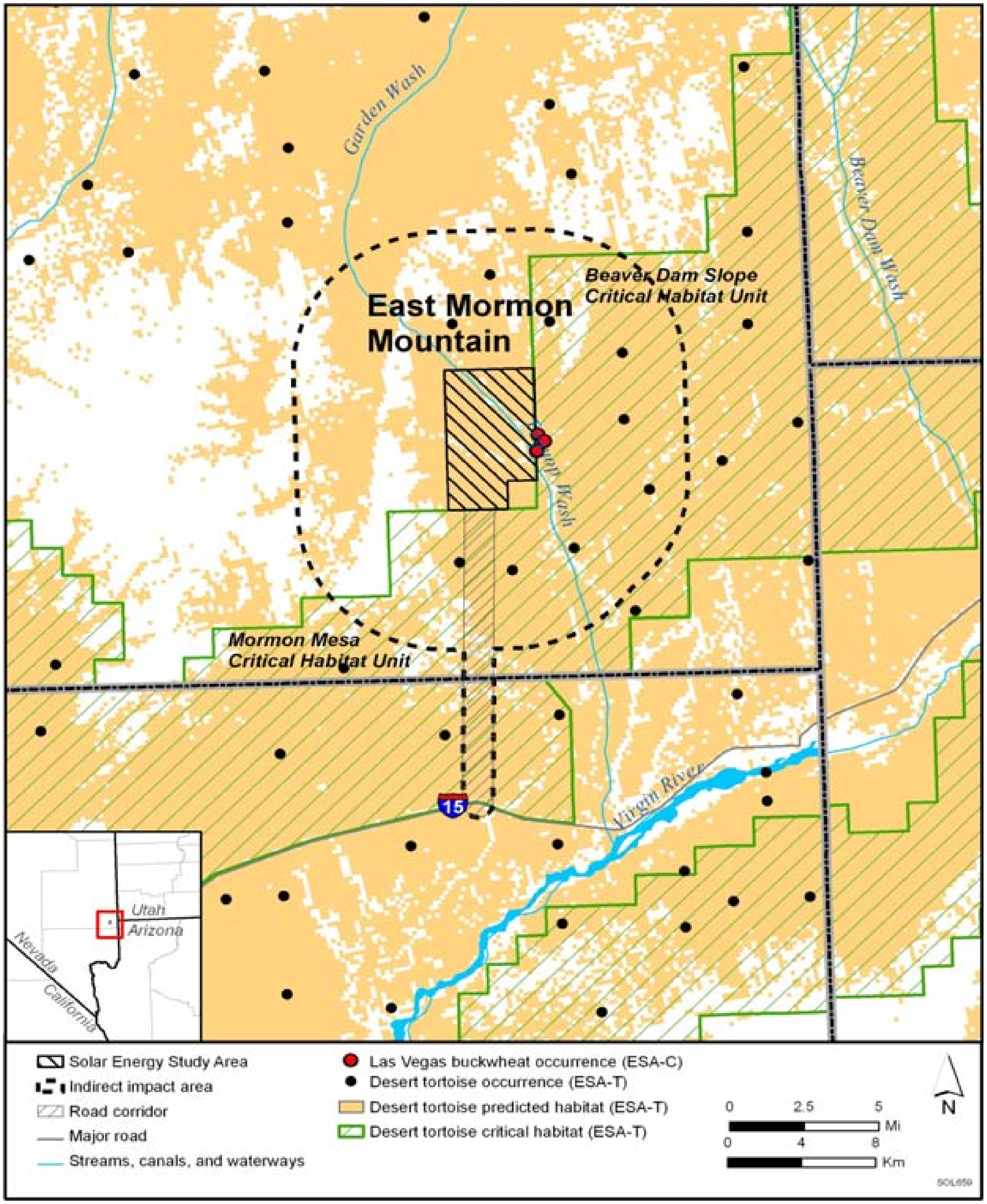


**FIGURE 11.5.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA, Candidates for Listing under the ESA, or Species under Review for ESA Listing in the Affected Area of the Proposed East Mormon Mountain SEZ (Sources: Miskow 2009; USGS 2007)**

**TABLE 11.5.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed East Mormon Mountain SEZ**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e] | Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Plants*** | | | | | | | |
| Antelope Canyon goldenbush | *Ericameria cervina* | NV-S1 | Rock crevices and talus in shadscale and Douglas-fir-bristlecone pine communities, often on calcareous substrates, and less commonly on ash flow tuff. Elevation ranges between 3,100 and 8,800 ft.[i] Nearest recorded occurrence is 12 mi[j] west of the SEZ. About 1,064,900 acres[k] of potentially suitable habitat occurs in the SEZ region. | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 0 acres | 5,300 acres of potentially suitable habitat (0.5% of available potentially suitable habitat) | Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effect; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. |

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TABLE 11.5.12.1-1 (Cont.)

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Plants (Cont.)*** | | | | | | | |
| Bearded screwmoss | *Pseudocrossidium crinitum* | NV-S1 | Known from only 12 occurrences in Nevada. On or near gypsiferous deposits and outcrops or limestone boulders, especially on east to north facing slopes of loose uncompacted soil, often associated with other mosses and lichens at elevations between 1,300 and 2,300 ft. Nearest recorded occurrence is 35 mi southwest of the SEZ. About 209,100 acres of potentially suitable habitat occurs in the SEZ region. | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 0 acres | 5,300 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the Antelope Canyon goldenbush for a list of other potential mitigation measures. |
| Beaver dam breadroot | *Pediomelum castoreum* | FWS-SC | Known from Arizona, California, and Nevada. Occurs in dry, sandy desert communities. Nearest recorded occurrence is 10 mi south of the SEZ. About 2,930,100 acres of potentially suitable habitat occurs in the SEZ region. | 7,175 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) | 70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 95,955 acres of potentially suitable habitat (3.3% of available potentially suitable habitat) | Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effect; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Plants (Cont.)*** | | | | | | | |
| Eastwood milkweed | *Asclepias eastwoodiana* | BLM-S; FWS-SC; NV-S2 | Endemic to Nevada in Esmeralda, Lander, Lincoln, and Nye Counties in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, or shale outcrops, generally barren and lacking competition. Frequently occurs in small washes or other moisture-accumulating microsites at elevations between 4,700 and 7,100 ft. Known to occur in Lincoln County, Nevada. About 496,700 acres of potentially suitable habitat occurs in the SEZ region. | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat); an unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m] | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 9,090 acres of potentially suitable habitat (1.8% of available potentially suitable habitat) | Small to large overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops and desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures. |
| Gold Butte moss | *Didymodon nevadensis* | BLM-S; NV-S1 | On or near gypsiferous deposits and outcrops or limestone boulders, especially on east to north-facing slopes of loose uncompacted soil. Typically associated with other mosses and lichens. Elevation ranges between 1,300 and 2,300 ft. Nearest recorded occurrence is 45 mi south of the SEZ. About 224,500 acres of potentially suitable habitat occurs in the SEZ region. | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 0 acres | 5,300 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the beaver dam breadroot for a list of other potential mitigation measures. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Plants (Cont.)*** | | | | | | | |
| **Las Vegas buckwheat**[l] | ***Eriogonum corymbosum* var. *nilesii*** | ESA-C; BLM-S; NV-S1 | Restricted to southern Nevada, where the species is known from 15 occurrences encompassing an area of less than 1,500 acres. Near gypsum soils, in washes, drainages, or in areas of generally low relief. Elevation ranges between 1,900 and 3,850 ft. Known to occur within 1 mi east of the SEZ. About 68,700 acres of potentially suitable habitat occurs in the SEZ region. | An unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m] | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 2,120 acres of potentially suitable habitat (3.1% of available potentially suitable habitat) | Small to large overall impact. Avoiding or minimizing disturbance to desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures. The potential for impact and need for mitigation should be determined in coordination with the USFWS and NDOW. |

TABLE 11.5.12.1-1 (Cont.)

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Plants (Cont.)*** | | | | | | | |
| Meadow Valley sandwort | *Eremogone stenomeres* | NV-S2 | Endemic to Nevada, where it is restricted to Clark and Lincoln Counties on limestone cliffs at elevations between 2,950 and 3,950 ft. Nearest recorded occurrence is 30 mi west of the SEZ. About 209,100 acres of potentially suitable habitat occurs in the SEZ region. | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 0 acres | 5,300 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the beaver dam breadroot for a list of other potential mitigation measures. |
| Needle Mountains milkvetch | *Astragalus eurylobus* | BLM-S; FWS-SC; NV-S2 | Gravel washes and sandy soils in alkaline desert and arid grasslands at elevations between 4,250 and 6,250 ft. Nearest recorded occurrence is 40 mi north of the SEZ. About 95,500 acres of potentially suitable habitat occurs in the SEZ region. | 25 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat); an unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m] | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 2,230 acres of potentially suitable habitat (2.3% of available potentially suitable habitat) | Small to large overall impact. Avoiding or minimizing disturbance to desert wash and playa habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures. |

TABLE 11.5.12.1-1 (Cont.)

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Plants (Cont.)*** | | | | | | | |
| Nevada willowherb | *Epilobium nevadense* | BLM-S; FWS-SC; NV-S2 | Pinyon-juniper woodlands and oak/mountain mahogany communities, on talus slopes and rocky limestone outcrops. Elevation ranges between 5,000 and 8,800 ft. Nearest recorded occurrence is 35 mi north of the SEZ. About 1,114,900 acres of potentially suitable habitat occurs in the SEZ region. | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 0 acres | 5,300 acres of potentially suitable habitat (0.5% of available potentially suitable habitat) | Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the beaver dam breadroot for a list of other potential mitigation measures. |
| New York Mountains catseye | *Cryptantha tumulosa* | NV-S2 | Gravelly or clay, granitic or carbonate substrates within Mojave Desert scrub, creosotebush scrub, and pinyon-juniper woodland. Elevation ranges between 4,500 and 9,900 ft. Nearest recorded occurrence is 50 mi southwest of the SEZ. About 3,771,200 acres of potentially suitable habitat occurs in the SEZ region. | 8,900 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) | 70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 94,250 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | Small overall impact. See the beaver dam breadroot for a list of potential mitigation measures. |

TABLE 11.5.12.1-1 (Cont.)

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Plants (Cont.)*** | | | | | | | |
| Rock phacelia | *Phacelia petrosa* | BLM-S; NV-S2 | Dry limestone and volcanic talus slopes of foothills, washes, and gravelly canyon bottoms on substrates derived from calcareous material. Inhabits mixed desert scrub, creosotebush, and blackbrush communities at elevations between 2,500 and 5,800 ft. Nearest recorded occurrence is 40 mi southwest of the SEZ. About 3,199,400 acres of potentially suitable habitat occurs in the SEZ region. | 8,900 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) | 75 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 101,700 acres of potentially suitable habitat (3.2% of available potentially suitable habitat) | Small overall impact. See the beaver dam breadroot for a list of potential mitigation measures. |
| Rosy two-tone beardtongue | *Penstemon bicolor* ssp. *roseus* | BLM-S; FWS-SC | Calcareous, granitic, or volcanic soils in washes, roadsides, scree at outcrop bases, rock crevices, or similar places receiving enhanced runoff, within creosote-bursage, blackbrush, and mixed-shrub communities. Elevation ranges between 1,800 and 4,850 ft. Nearest recorded occurrence is 25 mi southwest of the SEZ. About 315,500 acres of potentially suitable habitat occurs in the SEZ region. | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat); an unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m] | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 7,500 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | Small to large overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops and desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e] | Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Plants (Cont.)*** | | | | | | | |
| Threecorner milkvetch | *Astragalus geyeri* var. *triquetrus* | NV-P; FWS-SC; NV-S2 | Known only from Clark County, Nevada, and Mohave County, Arizona, on open, deep sandy soils, desert washes, or dunes, generally stabilized by vegetation and/or a gravel veneer. Elevations range between 1,500 and 2,500 ft. Nearest recorded occurrence is 8 mi south of the SEZ. About 83,900 acres of potentially suitable habitat occurs in the SEZ region. | An unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m] | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 2,120 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | Small to large overall impact. Avoiding or minimizing disturbance to desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Plants (Cont.)*** | | | | | | | |
| Veyo milkvetch | *Astragalus ensiformis* var. *gracilior* | NV-S1 | Restricted to Lincoln County, Nevada, and Washington County, Utah, on stiff clay soil of open washes, valley floors, and hillsides under sagebrush within pinyon-juniper communities. Elevation ranges between 4,200 and 5,000 ft. Nearest recorded occurrence is 20 mi northeast of the SEZ. About 1,273,400 acres of potentially suitable habitat occurs in the SEZ region. | An unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m] | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 2,120 acres of potentially suitable habitat (0.2% of available potentially suitable habitat) | Small to large overall impact. Avoiding or minimizing disturbance to desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. See the beaver dam breadroot for a list of other potential mitigation measures. |
| White bearpoppy | *Arctomecon merriamii* | BLM-S | Endemic to the Mojave Desert of California and Nevada in barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft. Nearest recorded occurrence is 30 mi west of the SEZ. About 225,900 acres of potentially suitable habitat occurs in the SEZ region. | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 0 acres | 5,300 acres of potentially suitable habitat (2.3% of available potentially suitable habitat) | Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects could reduce impacts. See the beaver dam breadroot for a list of other potential mitigation measures. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Invertebrates*** | | | | | | | |
| Mojave gypsum bee | *Andrena balsamorhizae* | BLM-S; NV-S2 | Endemic to Nevada, where the species is restricted to gypsum soils associated with habitats of its single larval host plant *Enceliopsis argophylla*. Such habitats include warm desert shrub communities on dry slopes and sandy washes. Nearest recorded occurrence is 45 mi southwest of the SEZ. About 2,898,175 acres of potentially suitable habitat occurs in the SEZ region. | 8,900 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) | 70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 94,225 acres of potentially suitable habitat (3.3% of available potentially suitable habitat) | Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats may also reduce impacts on this species. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Invertebrates (Cont.)*** | | | | | | | |
| Mojave poppy bee | *Perdita meconis* | BLM-S; NV-S2 | Known only from Clark County, Nevada, where the species is dependent on poppy plants (genus *Arctomecon*) along roadsides, and in washes and barren desert areas on gypsum soils. Nearest recorded occurrence is 30 mi southwest of the SEZ. About 84,400 acres of potentially suitable habitat occurs in the SEZ region. | An unquantified amount of potentially suitable desert wash habitat occurs on the SEZ[m] | 5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 2,120 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | Small to large overall impact. Avoiding or minimizing disturbance to desert wash habitats in the area of direct effects could reduce impacts. The amount of potentially suitable desert wash habitat in the area of direct effects is not quantified. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats may also reduce impacts on this species. |

TABLE 11.5.12.1-1 (Cont.)

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Reptiles*** | | | | | | | |
| **Desert tortoise** | ***Gopherus agassizii*** | ESA-T; NV-P; NV-S2 | Found throughout the Mojave and Sonoran Deserts in desert creosotebush communities on firm soils for digging burrows. Often found along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Known to occur within 2 mi south of the SEZ. About 2,171,300 acres of potentially suitable habitat occurs in the SEZ region. | 8,500 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) | 70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 79,250 acres of potentially suitable habitat (3.6% of available potentially suitable habitat) | Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and NDOW. |
| ***Birds*** | | | | | | | |
| Ferruginous hawk | *Buteo regalis* | BLM-S; FWS-SC | Winter resident in project area in grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodlands throughout the project area. Known to occur in Lincoln County, Nevada. About 660,000 acres of potentially suitable habitat occurs in the SEZ region. | 0 acres | 0 acres | 7,250 acres of potentially suitable foraging habitat (1.1% of available potentially suitable habitat) | Small overall impact; no direct effect. No species-specific mitigation is warranted. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Birds (Cont.)*** | | | | | | | |
| Phainopepla | *Phainopepla nitens* | BLM-S; NV-P; FWS-SC; NV-S2 | Year-round resident in project area in desert scrub, mesquite, pinyon-juniper woodland, desert riparian areas, and orchards. Nests in trees or shrubs. Nearest recorded occurrence is 25 mi southwest of the SEZ. About 1,200,000 acres of potentially suitable habitat occurs in the SEZ region. | 0 acres | 0 acres | 15,500 acres of potentially suitable nesting or foraging habitat (1.1% of available potentially suitable habitat) | Small overall impact; no direct effect. No species-specific mitigation is warranted. |
| Swainson's hawk | *Buteo swainsoni* | BLM-S; NV-P; CA-S2; NV-S2 | Summer resident in project area in savanna, open pine-oak woodlands, grasslands, and cultivated lands. Nests typically in solitary trees, bushes, or small groves; sometimes nests near urban areas. Known to occur in Lincoln County, Nevada. About 1,974,700 acres of potentially suitable habitat occurs in the SEZ region. | 0 acres | 0 acres | 15,200 acres of potentially suitable habitat (0.8% of available potentially suitable habitat) | Small overall impact; no direct effect. No species-specific mitigation is warranted. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Birds (Cont.)*** | | | | | | | |
| Western burrowing owl | *Athene cunicularia hypugaea* | BLM-S; FWS-SC | Summer resident in project area in open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports throughout the SEZ region. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Known to occur in Lincoln County, Nevada. About 3,427,000 acres of potentially suitable habitat occurs in the SEZ region. | 8,950 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) | 70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 96,275 acres of potentially suitable habitat (2.8% of available potentially suitable habitat) | Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts. |
| ***Mammals*** | | | | | | | |
| Allen's big-eared bat | *Idionycteris phyllotis* | BLM-S; NV-P; FWS-SC; NV-S1 | Year-round resident in project area in primarily mountainous wooded areas composed of ponderosa pine, pinyon-juniper, oak brush, as well as cottonwood riparian woodlands within the range of Mohave desert scrub of low desert ranges to white fir forest zones, with summer ranges occurring at higher elevations. Roosts in caverns, rock fissures, and mines. Nearest recorded occurrence is 15 mi southeast of the SEZ. About 2,513,700 acres of potentially suitable habitat occurs in the SEZ region. | 8,900 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) | 75 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 96,525 acres of potentially suitable habitat (3.8% of available potentially suitable habitat) | Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Mammals (Cont.)*** | | | | | | | |
| Brazilian free-tailed bat | *Tadarida brasiliensis* | BLM-S; NV-P | Year-round resident in project area, where it forages in desert grassland, old field, savanna, shrubland, and woodland habitats, as well as urban areas. Roosts in old buildings, caves, mines, and hollow trees. Nearest recorded occurrence is 20 mi south of the SEZ. About 3,784,000 acres of potentially suitable habitat occurs in the SEZ region. | 8,900 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) | 75 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 89,525 acres of potentially suitable habitat (2.4% of available potentially suitable habitat) | Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts. |
| Fringed myotis | *Myotis thysanodes* | BLM-S; NV-P; FWS-SC; NV-S2 | Year-round resident in project area in a wide range of habitats, including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roost sites have been reported in buildings and caves. Known to occur in Lincoln County, Nevada. About 4,864,100 acres of potentially suitable habitat occurs in the SEZ region. | 8,900 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) | 70 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat) | 101,525 acres of potentially suitable habitat (2.1% of available potentially suitable habitat) | Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Access Road (Direct Effects)[e] | Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Mammals (Cont.)*** | | | | | | | |
| **Nelson's bighorn sheep** | ***Ovis canadensis nelsoni*** | BLM-S; FWS-SC | Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, but may use them as corridors for travel between mountain ranges. Known to occur in the Mormon Mountains within 5 mi west of the SEZ. About 1,252,900 acres of potentially suitable habitat occurs in the SEZ region. | 0 acres | 0 acres | 4,400 acres of potentially suitable habitat (0.4% of available potentially suitable habitat) | Small overall impact; no direct affect. Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to important movement corridors within the area of direct effects. |
| Silver-haired bat | *Lasionycteris noctivagans* | BLM-S; FWS-SC | Year-round resident in project area in high-elevation (1,600 to 8,500 ft) forested areas of aspen, cottonwood, white fir, pinyon-juniper, subalpine fir, willow, and spruce. Roosts in tree foliage, cavities, or under loose bark. May also forage in arid shrublands. Nearest recorded occurrence is 25 mi southwest of the SEZ. About 3,755,300 acres of potentially suitable habitat occurs in the SEZ region. | 8,900 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat) | 70 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat) | 87,425 acres of potentially suitable habitat (2.3% of available potentially suitable habitat) | Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect. |

**TABLE 11.5.12.1-1 (Cont.)**

| Common Name | Scientific Name | Listing Status[a] | Habitat[b] | Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d] | Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e] | Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[f] | Overall Impact Magnitude[g] and Species-Specific Mitigation[h] |
|---|---|---|---|---|---|---|---|
| ***Mammals (Cont.)*** | | | | | | | |
| Townsend's big-eared bat | *Corynorhinus townsendii* | BLM-S; NV-P; NV-S2 | Year-round resident in project area near forests and shrubland habitats below 9,000 ft elevation throughout the SEZ region. The species may use caves, mines, and buildings for day roosting and winter hibernation. Nearest recorded occurrence is 30 mi southwest of the SEZ. About 3,529,600 acres of potentially suitable habitat occurs in the SEZ region. | 8,900 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat) | 70 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat) | 87,875 acres of potentially suitable habitat (2.5% of available potentially suitable habitat) | Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts.. |
| Western small-footed myotis | *Myotis ciliolabrum* | BLM-S; FWS-SC | Year-round resident in project area in a variety of woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Known to occur in Lincoln County, Nevada. About 4,715,400 acres of potentially suitable habitat occurs in the SEZ region. | 8,900 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat) | 70 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat) | 101,425 acres of potentially suitable habitat (2.2% of available potentially suitable habitat) | Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops on the SEZ could reduce impacts. |

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

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

**Footnotes continued on next page.**

**TABLE 11.5.12.1-1 (Cont.)**

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

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

[e] For access road development, direct effects were estimated within a 11-mi (8-km), 60-ft (18-m) wide road corridor from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of potentially suitable habitat within the 1-mi (1.6-km) wide road corridor.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portion of the road corridor where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from project developments. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

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

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

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

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

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

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

[m] Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

#### *11.5.12.1.3 Species That Are under Review for Listing under the ESA*

On the basis of information provided by the NNHP, USFWS (Stout 2009), and availability of potentially suitable habitats, no species under review for ESA listing are expected to occur in the affected area of the proposed East Mormon Mountain SEZ.

#### *11.5.12.1.4 BLM-Designated Sensitive Species*

There are 21 BLM-designated sensitive species that may occur in the affected area of the proposed East Mormon Mountain SEZ or may be affected by solar energy development on the SEZ (Table 11.5.12.1-1): (1) plants: Eastwood milkweed, Gold Butte moss, Las Vegas buckwheat, Needle Mountains milkvetch, Nevada willowherb, rock phacelia, rosy two-tone beardtongue, and white bearpoppy; (2) invertebrates: Mojave gypsum bee and Mojave poppy bee; (3) birds: ferruginous hawk, phainopepla, Swainson's hawk, and western burrowing owl; and (4) mammals: Allen's big-eared bat, Brazilian free-tailed bat, fringed myotis, Nelson's bighorn sheep, silver-haired bat, Townsend's big-eared bat, and western small-footed myotis. Of these species, only the Las Vegas buckwheat and the Nelson's bighorn sheep are known to occur in the affected area of the SEZ. Habitats in which BLM-designated sensitive species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are presented in Table 11.5.12.1-1. The Las Vegas buckwheat has been discussed previously in Section 11.5.12.1.2 because of its candidate status under the ESA (Section 11.5.12.1.2). The remaining 20 species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

##### **Eastwood Milkweed**

The Eastwood milkweed is a perennial forb endemic to Nevada on public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties. It occurs in open areas on a wide variety of basic (pH usually greater than 8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, washes, or shale outcrops at elevations between 4,700 and 7,100 ft (1,430 and 2,150 m). According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops and desert wash habitat may occur in the SEZ, access road corridor, and within the area of indirect effects (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

##### **Gold Butte Moss**

The Gold Butte moss is a bryophyte (moss) that is known only from Nevada and Texas on gypsiferous deposits and outcrops or limestone boulders. This species is typically associated with other mosses and lichens at elevations between 1,300 and 2,300 ft (400 and 700 m). This species is known to occur about 45 mi (72 km) south of the SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops may occur in the SEZ and within the area of indirect effects (Table 11.5.12.1-1).

**Needle Mountains Milkvetch**

The Needle Mountains milkvetch is a perennial forb that occurs on gravel washes and sandy soils in alkaline desert and arid grasslands at elevations between 4,250 and 6,250 ft (1,295 and 1,900 m). The species is known to occur about 40 mi (64 km) north of the SEZ. According to the SWReGAP land cover model, potentially suitable desert wash and playa habitats may occur in the SEZ, access road corridor, and within the area of indirect effects (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

**Nevada Willowherb**

The Nevada willowherb is a perennial forb endemic to eastern Nevada and western Utah. It occurs in pinyon-juniper woodlands and oak/mountain mahogany communities, on talus slopes and rocky limestone outcrops at elevations between 5,000 and 8,800 ft (1,525 and 2,680 m). The species is known to occur about 35 mi (56 km) north of the SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops may occur in the SEZ and within the area of indirect effects (Table 11.5.12.1-1).

**Rock Phacelia**

The rock phacelia is an annual forb known only from Arizona, Nevada, and Utah. It inhabits crevices of cliffs and boulders on volcanic substrates in washes of desert shrub communities at elevations between 2,500 and 5,800 ft (750 and 1,750 m). The species is known to occur about 40 mi (64 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat may occur in the SEZ, road corridor, and within the area of indirect effects (Table 11.5.12.1-1).

**Rosy Two-Tone Beardtongue**

The rosy two-tone beardtongue is a perennial forb that is known from Arizona, California, and Nevada. This species occurs on calcareous, granitic, or volcanic substrates in washes, roadsides, scree and outcrop bases, rock crevices, or similar places receiving enhanced runoff at elevations between 1,800 and 4,850 ft (550 and 1,480 m). The species is known to occur about 25 mi (40 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops and desert wash habitat may occur in the

SEZ, access road corridor, and within the area of indirect effects (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

**White Bearpoppy**

The white bearpoppy is a perennial forb endemic to the Mojave Desert of California and Nevada. This species inhabits barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft (610 and 1,800 m). This species is known to occur as close as 30 mi (48 km) west of the SEZ. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops may occur in the SEZ and within the area of indirect effects (Table 11.5.12.1-1).

**Mojave Gypsum Bee**

The Mojave gypsum bee is an insect that is endemic to Nevada, where the species is restricted to gypsum soils associated with habitats of its single larval host plant, silverleaf sunray. Such habitats include warm desert shrub communities; dry, open, relatively barren areas on gypsum badlands; and volcanic gravels. This species is known to occur about 45 mi (72 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat may occur in the SEZ, road corridor, and within the area of indirect effects (Table 11.5.12.1-1).

**Mojave Poppy Bee**

The Mojave poppy bee is an insect known only from Clark County, Nevada, where it is dependent on poppy plants (*Arctemocon* spp.). Suitable habitats include roadsides, washes, and barren desert areas. The nearest recorded occurrence of this species is about 30 mi (48 km) southwest of the SEZ. According to the SWReGAP land cover model, potentially suitable desert wash habitat may occur in the affected area (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

**Ferruginous Hawk**

The ferruginous hawk occurs throughout the western United States. According to the SWReGAP habitat suitability model, only potentially suitable winter habitat for the ferruginous hawk occurs within the affected area of the proposed East Mormon Mountain SEZ, although potentially suitable year-round habitat is expected to occur outside of the affected area within the SEZ region. The species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. This species occurs in Lincoln County, Nevada. According to the

SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ or within the access road corridor. However, potentially suitable foraging habitat may occur in portions of the area of indirect affects (Table 11.5.12.1-1).

**Phainopepla**

The phainopepla occurs in the southwestern United States and Mexico, where it breeds in suitable habitats throughout much of the proposed East Mormon Mountain SEZ region. The species occurs in desert scrub, mesquite, and pinyon-juniper woodland communities, as well as desert riparian areas and orchards. Nests are typically constructed in trees and shrubs from 3 to 45 ft (1 to 15 m) above the ground. This species occurs in Lincoln County, Nevada. According to SWReGAP, potentially suitable habitat does not occur on the SEZ or within the access road corridor. However, potentially suitable foraging or nesting habitat may occur in the area of indirect effects (Table 11.5.12.1-1). According to the SWReGAP land cover model, there are no riparian areas on the SEZ or in the access road corridor that may be potentially suitable nesting habitats. However, about 10 acres (<0.1 $km^2$) of riparian woodlands occur in the area of indirect effects that may provide suitable nesting habitat for the phainopepla.

**Swainson's Hawk**

The Swainson's hawk occurs throughout the southwestern United States. According to the SWReGAP habitat suitability model, only summer breeding habitat occurs in the proposed East Mormon Mountain SEZ region. This species inhabits desert, savanna, open pine-oak woodland, grassland, and cultivated habitats. Nests are typically constructed in solitary trees, bushes, or small groves. This species is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ or within the access road corridor. However, potentially suitable foraging or nesting habitat may occur in portions of the area of indirect affects (Table 11.5.12.1-1).

**Western Burrowing Owl**

According to the SWReGAP habitat suitability model for the western burrowing owl, the species is a summer (breeding) resident in open, dry grasslands and desert habitats in the proposed East Mormon Mountain SEZ region. The species occurs locally in open areas with sparse vegetation, where it forages in grasslands, shrublands, open disturbed areas and nests in burrows typically constructed by mammals. The species is known to occur in Lincoln County, Nevada, and potentially suitable summer breeding habitat may occur in the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

**Allen's Big-Eared Bat**

The Allen's big-eared bat is known from isolated locations throughout the southwestern United States and is considered to be a year-round resident in the proposed East Mormon Mountain SEZ region. The species roosts in caverns, rock fissures, and mines. Foraging occurs primarily in mountainous wooded areas, such as ponderosa pine, pinyon-juniper, oak, and cottonwood riparian woodlands. However, this species may also forage in arid shrublands. This bat species is known to occur about 15 mi (24 km) southeast of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is about 4 acres (<1 $km^2$) of potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, and about 5,300 acres (21 $km^2$) of potentially suitable roosting habitat occurs in the area of indirect effects.

**Brazilian Free-Tailed Bat**

The Brazilian free-tailed bat is known from isolated locations throughout the southwestern United States and is considered to be a year-round resident in the proposed East Mormon Mountain SEZ region. The species roosts in buildings, caves, mines, and hollow trees. Foraging occurs in desert grasslands, old fields, savannas, shrublands, woodlands, and urban areas. This species is known to occur about 20 mi (32 km) south of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, no potentially suitable roosting habitat (rocky cliffs and outcrops) occurs on the SEZ or access road corridor, but about 5,300 acres (21 $km^2$) of potentially suitable roosting habitat occurs in the area of indirect effects.

**Fringed Myotis**

The fringed myotis is a year-round resident in the proposed East Mormon Mountain SEZ region, where it occurs in a variety of habitats including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. Roosting occurs in buildings and caves. This species is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is about 4 acres (<1 $km^2$) of potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, and about 5,300 acres (21 $km^2$) of potentially suitable roosting habitat occurs in the area of indirect effects.

**Nelson's Bighorn Sheep**

The Nelson's bighorn sheep is one of several subspecies of bighorn sheep known to occur in the southwestern United States. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats. It may use desert valleys as corridors for travel between range habitats. This species is known to occur in the Mormon Mountains, about 5 mi (8 km) west of the proposed East Mormon Mountain SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ or within the access road corridor. However, information provided by the NDOW indicates that year-round range habitat within the Mormon Mountains intersects the affected area west of the SEZ. Despite the apparent lack of suitable habitat on the SEZ, this species may use portions of the proposed East Mormon Mountain SEZ as a migratory corridor between range habitats. Potentially suitable habitat for the Nelson's bighorn sheep occurs in the area of indirect effects within 5 mi (8 km) of the SEZ boundary (Table 11.5.12.1-1).

**Silver-Haired Bat**

According to the SWReGAP habitat suitability model, the silver-haired bat is a year-round resident in the proposed East Mormon Mountain SEZ region, where it occurs in montane forested habitats such as aspen, pinyon-juniper, and spruce communities. Foraging may occur in desert shrubland habitats. This species roosts in tree foliage and cavities, or under loose bark. The species is known to occur about 25 mi (40 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (woodlands) on the SEZ or in the access road corridor, but about 5,315 acres (21 $km^2$) of potentially suitable roosting habitat occurs in the area of indirect effects.

**Townsend's Big-Eared Bat**

The Townsend's big-eared bat is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, the species forages year-round in a wide variety of desert and non-desert habitats in the proposed East Mormon Mountain SEZ region. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. Nearest recorded occurrences are about 30 mi (48 km) southwest of the proposed East Mormon Mountain SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is about 4 acres ($<1$ $km^2$) of potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, and about 5,300 acres (21 $km^2$) of potentially suitable roosting habitat occurs in the area of indirect effects.

**Western Small-Footed Myotis**

The western small-footed myotis is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, this species is a year-round resident in southern Nevada, where it occupies a wide variety of desert and non-desert habitats including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, tunnels, buildings, and other man-made structures, and beneath boulders or loose bark. The species is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat may occur on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 11.5.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is about 4 acres (<1 $km^2$) of potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ, and about 5,300 acres (21 $km^2$) of potentially suitable roosting habitat occurs in the area of indirect effects.

##### *11.5.12.1.5 State-Listed Species*

There are eight species listed by the State of Nevada that may occur in the proposed East Mormon Mountain SEZ affected area or may be affected by solar energy development on the SEZ (Table 11.5.12.1-1). These state-listed species include (1) plant: threecorner milkvetch; (2) reptile: desert tortoise; (3) birds: phainopepla and Swainson's hawk; and (4) mammals: Allen's big-eared bat, Brazilian free-tailed bat, fringed myotis, and Townsend's big-eared bat. All of these species are protected in the state of Nevada under NRS 501.110 or NRS 527. Of these state-listed species, only the threecorner milkvetch has not been previously discussed; it is described below. Additional life history information for these species is provided in Appendix J.

The threecorner milkvetch is a perennial forb that is known only from Clark County, Nevada, and Mohave County, Arizona. This species inhabits open, deep sandy soils, desert washes, or dunes, generally stabilized by vegetation and/or a gravel veneer at elevations between 1,500 and 2,500 ft (455 and 760 m). The threecorner milkvetch is a USFWS species of concern and is known to occur about 8 mi (13 km) south of the SEZ. According to the SWReGAP land cover model, potentially suitable desert wash habitat may occur in the access road corridor and within the area of indirect effects (Table 11.5.12.1-1). Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified.

##### *11.5.12.1.6 Rare Species*

There are 28 rare species (i.e., state rank of S1 or S2 in the state of Nevada or a species of concern by the State of Nevada or USFWS) that may be affected by solar energy development on the proposed East Mormon Mountain SEZ (Table 11.5.12.1-1). Six of these species (all plants) have not been previously discussed because of their known or pending status under the ESA (Sections 11.5.12.1.1 or 11.5.12.1.2) or the BLM (Section 11.5.12.1.4). The six species are Antelope Canyon goldenbush, bearded screwmoss, beaver dam breadroot, Meadow Valley sandwort, New York Mountains catseye, and Veyo milkvetch. The habitats and known occurrences of these species relative to the SEZ are shown in Table 11.5.12.1-1. Additional life history information is provided in Appendix J.

### 11.5.12.2 Impacts

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

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 11.5.12.1 and following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 11.5.12.3).

Solar energy development within the proposed East Mormon Mountain SEZ could affect a variety of habitats (see Sections 11.5.9 and 11.5.10). Impacts on these habitats could in turn affect special status species that are dependent on those habitats. Based on NNHP records, the Las Vegas buckwheat, desert tortoise, and Nelson's bighorn sheep are the only special status species known to occur within the affected area of the proposed East Mormon Mountain SEZ boundary. As discussed in Section 11.5.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur there and may, therefore, overestimate impacts on some special status species. No groundwater-dependent species occur within the affected area of the proposed East Mormon Mountain SEZ based upon NNHP records, information provided by the USFWS (Stout 2009), and the evaluation of groundwater resources from the Virgin River Valley groundwater basin within the SEZ region (Section 11.5.9).

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities occur in areas where special status species are known to or could occur. As presented in Section 11.5.1.2, an 11-mi (18-km) long access road corridor is assumed to be needed to serve solar facilities within this SEZ. Impacts of transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

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

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

#### *11.5.12.2.1 Impacts on Species Listed under the ESA*

One species listed under the ESA may be affected by solar energy development on the proposed East Mormon Mountain SEZ—the Mojave population of the desert tortoise. This species is listed as threatened under the ESA and is known to occur about 2 mi (3 km) south of the SEZ (Figure 11.5.12.1-1). According to the USFWS (Stout 2009), desert tortoise populations have the potential to occur in the area of direct effects, and designated critical habitat for this species occurs in the Mormon Mesa and Beaver Dam Slope critical habitat units south and east of the SEZ, respectively (Figure 11.5.12.1-1). According to the SWReGAP habitat suitability model, about 8,500 acres (34 $km^2$) of potentially suitable habitat on the SEZ and 70 acres (0.3 $km^2$) of potentially suitable habitat within the access road corridor could be directly affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). This direct effects area represents about 0.4% of available suitable habitat of the desert tortoise in the region. About 79,250 acres (321 $km^2$) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.6% of the available suitable habitat in the region (Table 11.5.12.1-1).

On the basis of estimates of desert tortoise density in the Beaver Dam Slope critical habitat unit adjacent to the eastern border of the SEZ, the USFWS estimated that full-scale solar energy development on the SEZ may directly affect up to 47 desert tortoises on the SEZ (Stout 2009). In addition to direct impacts, development on the SEZ could indirectly affect desert tortoises by fragmenting and degrading habitats between the Mormon Mesa and Beaver Dam Slope critical habitat units and other potentially suitable habitats in the vicinity of the proposed East Mormon Mountain SEZ. Fragmentation would be exacerbated by the installation of exclusionary fencing at the perimeter of the SEZ or individual project areas.

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

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

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

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

##### *11.5.12.2.2 Impacts on Species That Are Candidates for Listing under the ESA*

One species that is a candidate for listing under the ESA may be affected by solar energy development on the proposed East Mormon Mountain SEZ–the Las Vegas buckwheat. This species is known to occur within 1 mi (1.6 km) east of the SEZ (Figure 11.5.12.1-1) and, according to the USFWS (Stout 2009), has the potential to occur on the SEZ and within the access road corridor. According to the SWReGAP land cover model, potentially suitable desert wash habitat for this species does not occur on the SEZ, but about 5 acres (<0.1 km$^2$) of potentially suitable desert wash habitat in the access road corridor may be directly affected by construction and operations of solar energy facilities on the SEZ. This direct effects area represents less than 0.1% of available suitable habitat in the region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ

(Table 11.5.12.1-1). About 2,120 acres (9 km$^2$) of potentially suitable mapped desert wash habitat occurs in the area of potential indirect effects; this area represents about 3.1% of the available potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the Las Vegas buckwheat cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat in the area of direct effects could reduce direct impacts on this species to negligible levels. In addition, conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization are not feasible options, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development. The potential for impact and need for mitigation should be developed in coordination with the USFWS and NDOW.

#### *11.5.12.2.3 Impacts on Species That Are under Review for Listing under the ESA*

On the basis of information provided by the NNHP, USFWS (Stout 2009), and availability of potentially suitable habitats, there are no species under review for ESA listing that may be affected by solar energy developments on the proposed East Mormon Mountain SEZ.

#### *11.5.12.2.4 Impacts on BLM-Designated Sensitive Species*

BLM-designated sensitive species that may be affected by solar energy development on the proposed East Mormon Mountain SEZ and were not previously discussed as ESA-listed (Section 11.5.12.2.1), candidates for ESA listing (Section 11.5.12.2.2), or under review for ESA listing (Section 11.5.12.2.3) are discussed below.

**Eastwood Milkweed**

The Eastwood milkweed is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 5 acres (<0.1 km$^2$) of potentially suitable habitat on the SEZ and 5 acres (<0.1 km$^2$) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is consists of rocky cliffs and outcrops (SEZ only) and desert wash habitat (road corridor only) and represents less than 0.1% of potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 9,090 acres (37 $km^2$) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 1.8% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the Eastwood milkweed cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to rocky cliffs and outcrops and desert wash habitat in the area of direct effects could reduce direct impacts on the Eastwood milkweed. In addition, conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization are not feasible options, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

**Gold Butte Moss**

The Gold Butte moss is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, about 5 acres (<0.1 $km^2$) of potentially suitable rocky cliffs and outcrops on the SEZ could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. No suitable habitat for this species occurs in the access road corridor. About 5,300 acres (21 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.4% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

The overall impact on the Gold Butte moss from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels. Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

**Needle Mountains Milkvetch**

The Needle Mountains milkvetch is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 25 acres (0.1 $km^2$) of potentially suitable habitat on the SEZ and 5 acres (<0.1 $km^2$) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is composed of desert playa habitat (SEZ only) and desert wash habitat (road corridor only) and represents less than 0.1% of potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 2,230 acres (9 $km^2$) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 2.3% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the Needle Mountains milkvetch cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash and playa habitats in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

**Nevada Willowherb**

The Nevada willowherb is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, about 5 acres (<0.1 $km^2$) of potentially suitable rocky cliffs and outcrops on the SEZ could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. There is no suitable habitat for this species in the access road corridor. About 5,300 acres (21 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.5% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

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

Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

**Rock Phacelia**

The rock phacelia is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, about 8,900 acres (36 $km^2$) of potentially suitable habitat on the SEZ and 75 acres (0.3 $km^2$) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the SEZ region. About 101,700 acres (412 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.2% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

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

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the rock phacelia because potentially suitable desert shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Eastwood milkweed. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

**Rosy Two-Tone Beardtongue**

The rosy two-tone beardtongue is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 5 acres (<0.1 $km^2$) of potentially suitable habitat on the SEZ and 5 acres (<0.1 $km^2$) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is composed of rocky cliffs and outcrops (SEZ only) and desert wash habitat (road corridor only) and represents less than 0.1% of the available potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 7,500 acres (30 $km^2$) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 2.4% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the rosy two-tone beardtongue cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to rocky cliffs and outcrops and desert wash and playa habitats in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

**White Bearpoppy**

The white bearpoppy is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 5 acres (<0.1 $km^2$) of potentially suitable rocky cliffs and outcrops on the SEZ could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. No suitable habitat for this species occurs in the access road corridor. About 5,300 acres (21 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.3% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

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

Avoiding or minimizing disturbance to rocky cliffs and outcrops in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

### Mojave Gypsum Bee

The Mojave gypsum bee is not known to occur in the affected area of the proposed East Mormon Mountain SEZ; however, about 8,900 acres (36 $km^2$) of potentially suitable habitat on the SEZ and 70 acres (0.3 $km^2$) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the SEZ region. About 94,225 acres (381 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.3% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

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

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Mojave gypsum bee because potentially suitable desert shrubland habitat is widespread throughout the area of direct effects. Direct impacts could also be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

### Mojave Poppy Bee

The Mojave poppy bee is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ. However, about 5 acres (<0.1 $km^2$) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is composed of desert wash habitat and represents less than 0.1% of the available potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 2,120 acres (9 $km^2$) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 2.5% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the Mojave poppy bee cannot be quantified without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat in the area of direct effects and the implementation of mitigation measures described previously for the Mojave gypsum bee could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

**Ferruginous Hawk**

The ferruginous hawk is a winter resident in the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ or within the access road corridor (Table 11.5.12.1-1). However, about 7,250 acres (29 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

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

**Phainopepla**

The phainopepla is a year-round resident in the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ or within the access road corridor (Table 11.5.12.1-1). However, about 15,500 acres (63 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

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

**Swainson's Hawk**

The Swainson's hawk is considered a summer breeding resident within the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ or within the access road corridor (Table 11.5.12.1-1). However, about 15,200 acres (62 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

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

**Western Burrowing Owl**

The western burrowing owl is considered a summer breeding resident within the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, about 8,950 acres (36 $km^2$) of potentially suitable habitat on the SEZ and 70 acres (0.3 $km^2$) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.3% of potentially suitable habitat in the SEZ region. About 96,275 acres (390 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.8% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

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

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

**Allen's Big-Eared Bat**

Allen's big-eared bat is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur about 15 mi (24 km) southeast of the SEZ. According to the SWReGAP habitat suitability model, about 8,900 acres (36 km$^2$) of potentially suitable habitat on the SEZ and 75 acres (0.3 km$^2$) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.4% of potentially suitable habitat in the SEZ region. About 96,525 acres (390 km$^2$) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 3.8% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 km$^2$) of potentially suitable roost habitat (rocky cliffs and outcrops) occurs on the SEZ, and about 5,300 acres (21 km$^2$) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the Allen's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the East Mormon Mountain SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoiding or minimizing direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect and readily available in other portions of the affected area. Impacts on the Allen's big-eared bat could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied roosts in the area of direct effects. If avoidance or minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat in the area of direct effects.

**Brazilian Free-Tailed Bat**

The Brazilian free-tailed bat is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur about 20 mi (32 km) south of the SEZ. According to the SWReGAP habitat suitability model, about 8,900 acres (36 $km^2$) of potentially suitable habitat on the SEZ and 75 acres (0.3 $km^2$) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 89,525 acres (362 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.4% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 $km^2$) of potentially suitable roost habitat (rocky cliffs and outcrops) occurs on the SEZ, and about 5,300 acres (21 $km^2$) of potentially suitable roost habitat may occur in the area of indirect effects.

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

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the Brazilian free-tailed bat because potentially suitable habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the Allen's big-eared bat could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

**Fringed Myotis**

The fringed myotis is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, about 8,900 acres (36 $km^2$) of potentially suitable habitat on the SEZ and 70 acres (0.3 $km^2$) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 101,525 acres (411 $km^2$) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 2.1% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 $km^2$) of potentially suitable roost habitat (buildings and caves) occurs on the SEZ, and about 5,300 acres (21 $km^2$) of potentially suitable roost habitat (rocky cliffs and outcrops) may occur in the area of indirect effects.

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

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the fringed myotis because potentially suitable habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the Allen's big-eared bat could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

**Nelson's Bighorn Sheep**

The Nelson's bighorn sheep is known to occur within the affected area of the proposed East Mormon Mountain SEZ, but suitable range habitat is not expected to occur on the SEZ or within the access road corridor. However, about 4,400 acres (18 $km^2$) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 0.4% of the available suitable habitat in the region (Table 11.5.12.1-1). Despite the apparent lack of suitable habitat on the SEZ and the access road corridor, the Nelson's bighorn sheep may use portions of these areas as migratory corridors between range habitats.

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

Impacts on the Nelson's bighorn sheep could be further reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats and important movement corridors within in the area of direct effects. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

### Silver-Haired Bat

The silver-haired bat is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur about 25 mi (40 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, about 8,900 acres (36 $km^2$) of potentially suitable habitat on the SEZ and 70 acres (0.3 $km^2$) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 87,425 acres (354 $km^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.3% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, potentially suitable roost habitat (woodland habitat) does not occur on the SEZ, but about 10 acres (<1 $km^2$) of potentially suitable roost habitat may occur in the area of indirect effects.

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

### Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur about 30 mi (48 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, about 8,900 acres (36 $km^2$) of potentially suitable habitat on the SEZ and 70 acres (0.3 $km^2$) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.3% of potentially suitable habitat in the SEZ region. About 87,875 acres (356 $km^2$) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 2.5% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 $km^2$) of potentially suitable roost habitat (rocky cliffs and outcrops) occurs on the SEZ, and about 5,300 acres (21 $km^2$) of potentially suitable roost habitat may occur in the area of indirect effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed East Mormon Mountain SEZ is considered small because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of such habitat in the SEZ region.

The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the Townsend's big-eared bat because potentially suitable habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the Allen's big-eared bat could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

**Western Small-Footed Myotis**

The western small-footed myotis is a year-round resident within the proposed East Mormon Mountain SEZ region and is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model, about 8,900 acres (36 km$^2$) of potentially suitable habitat on the SEZ and 70 acres (0.3 km$^2$) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area represents 0.2% of potentially suitable habitat in the SEZ region. About 101,425 acres (410 km$^2$) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.2% of the available suitable habitat in the region (Table 11.5.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover data, about 4 acres (<1 km$^2$) of potentially suitable roost habitat (rocky cliffs and outcrops) occurs on the SEZ, and about 5,300 acres (21 km$^2$) of such habitat may occur in the area of indirect effects.

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

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the western small-footed myotis because potentially suitable habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the Allen's big-eared bat could reduce direct impacts on this species to negligible levels. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

#### *11.5.12.2.5 Impacts on State-Listed Species*

There are eight species listed by the State of Nevada that may occur in the proposed East Mormon Mountain SEZ affected area or may be affected by solar energy development on the SEZ (Table 11.5.12.1-1). Of these species, only impacts on the threecorner milkvetch have not been previously discussed. Impacts on the threecorner milkvetch are discussed below.

The threecorner milkvetch is not known to occur in the affected area of the proposed East Mormon Mountain SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ; however, about 5 acres (<0.1 $km^2$) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.5.12.1-1). This direct impact area is composed of desert wash habitat and represents less than 0.1% of the available potentially suitable habitat in the SEZ region. Although SWReGAP did not map any desert wash habitat on the SEZ, there appear to be numerous desert washes that could provide habitat for this species on the SEZ and in the area of indirect effects, including Toquop Wash and its tributaries. The area of these washes has not been quantified, but they could be affected by construction and operations of solar energy development on the SEZ (Table 11.5.12.1-1). About 2,120 acres (9 $km^2$) of potentially suitable mapped habitat occurs in the area of indirect effects; this area represents about 2.5% of the potentially suitable habitat in the SEZ region (Table 11.5.12.1-1).

Impacts of solar energy development in the proposed East Mormon Mountain SEZ on the threecorner milkvetch cannot be determined without quantification of the amount of potentially suitable desert wash habitat in the area of direct effects. Consequently, the overall impact on this species could range from small to large. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to desert wash habitat in the area of direct effects and the implementation of mitigation measures described previously for the Eastwood milkweed (Section 11.5.12.2.4) could reduce direct impacts on this species. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

#### *11.5.12.2.6 Impacts on Rare Species*

There are 28 rare species (state rank of S1 or S2 in Nevada or a species of concern by the State of Nevada or USFWS) that may be affected by solar energy development on the proposed East Mormon Mountain SEZ. Impacts on 22 of these species have been previously discussed because of their known or pending status under the ESA (Sections 11.5.12.2.1 or 11.5.12.2.2) or designation under the BLM (Section 11.5.12.2.4). The remaining six species that have not been previously discussed include the following plants: Antelope Canyon goldenbush, bearded screwmoss, beaver dam breadroot, Meadow Valley sandwort, New York Mountains catseye, and Veyo milkvetch. Impacts and potentially applicable mitigation measures (if necessary) for each of these species is provided in Table 11.5.12.1-1. Additional life history information is provided in Appendix J.

### 11.5.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 11.5.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Avoiding or minimizing disturbance to desert wash and playa habitats, could reduce or eliminate impacts on the following seven special status species: Eastwood milkweed, Las Vegas buckwheat, Needle Mountains milkvetch, rosy two-tone beardtongue, threecorner milkvetch, Veyo milkvetch, and Mojave poppy bee.

- Avoiding or minimizing disturbance to rocky cliffs and outcrops within the area of direct effects could reduce or eliminate impacts on the following twelve special status species: Antelope Canyon goldenbush, bearded screwmoss, Eastwood milkweed, Meadow Valley sandwort, Nevada willowherb, rosy two-tone beardtongue, white bearpoppy, Allen's big-eared bat, Brazilian free-tailed bat, fringed myotis, Townsend's big-eared bat, and western small footed-myotis.

- Consultation with the USFWS and the NDOW should be conducted to address the potential for impacts on the desert tortoise. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Coordination with the USFWS and the NDOW should be conducted for the Las Vegas buckwheat, a candidate species for listing under the ESA. Coordination would identify an appropriate survey protocol and mitigation requirements, which may include avoidance, minimization, translocation, or compensation.

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

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

## 11.5.13 Air Quality and Climate

### 11.5.13.1 Affected Environment

#### *11.5.13.1.1 Climate*

The proposed East Mormon Mountain SEZ is located in the southeast corner of Lincoln County in southeastern Nevada. Nevada lies on the eastern lee side of the Sierra Nevada Range, which markedly influences the climate of the state under the prevailing westerlies (NCDC 2010a). In addition, the mountains east and north of Nevada act as barriers to cold arctic air masses, and thus long periods of extremely cold weather are uncommon. The SEZ lies at an average elevation of about 2,710 ft (826 m) in the northeastern portion of the Mojave Desert, which has an arid climate marked by mild winters and hot summers, large daily temperature swings due to dry air, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Las Vegas McCarran International Airport, about 75 mi (121 km) southwest of the East Mormon Mountain SEZ boundary, and at the Lytle Ranch, Utah, about 15 mi (24 km) northeast, are summarized below.

A wind rose from the Las Vegas McCarran International Airport, based on data collected 33 ft (10 m) above the ground over the 5-year period 2005 to 2009, is presented in Figure 11.5.13.1-1 (NCDC 2010b).[5] During this period, the annual average wind speed at the airport was about 7.1 mph (3.2 m/s); the prevailing wind direction was from the south-southwest (about 15.3% of the time) and secondarily from the southwest (about 12.7% of the time). South-southwesterly winds occurred most frequently throughout the year. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 18.3% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds were highest in spring at 8.6 mph (3.8 m/s); lower in summer and fall at 7.6 mph (3.4 m/s) and 6.2 mph (2.8 m/s), respectively; and lowest in winter at 6.0 mph (2.7 m/s).

In southern Nevada, the summers are long and hot, while the winters are short and mild (NCDC 2010a). For the period 1988 to 2010, the annual average temperature at the Lytle Ranch, Utah, was 60.7°F (15.9°C) (WRCC 2010a). December was the coldest month, with an average minimum of 25.5°F (–3.6°C), and July was the warmest, with an average maximum of 102.3°F

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[5] Associated with the Toquop Energy Project, wind data were collected in the southeastern SEZ between April 20, 2006 and April 30, 2007 (BLM 2009f). Although this represents only one year of data, onsite wind data, which are more affected by nearby mountains to the west, are quite dissimilar to the Las Vegas data. Wind speed onsite is about 10.0 mph (4.5 m/s), about 40% higher than that in Las Vegas, and prevailing wind direction is primarily from the north-northwest (about 32% of the time) and secondarily from the south-southwest (about 15% of the time). Therefore, the wind data summaries and air quality impact analysis presented here, based on Las Vegas wind data, may not be representative for the site. Based on the onsite wind data, prevailing wind direction is toward nearby towns such as Bunkerville and Mesquite, about 12 mi (19 km) from the SEZ. Predicted concentrations using onsite wind data could be lower at site boundaries (due to high wind speeds) but a little higher at nearby towns (due to higher wind speeds and a long distance from the SEZ) than those presented in Section 11.5.13.2.1.

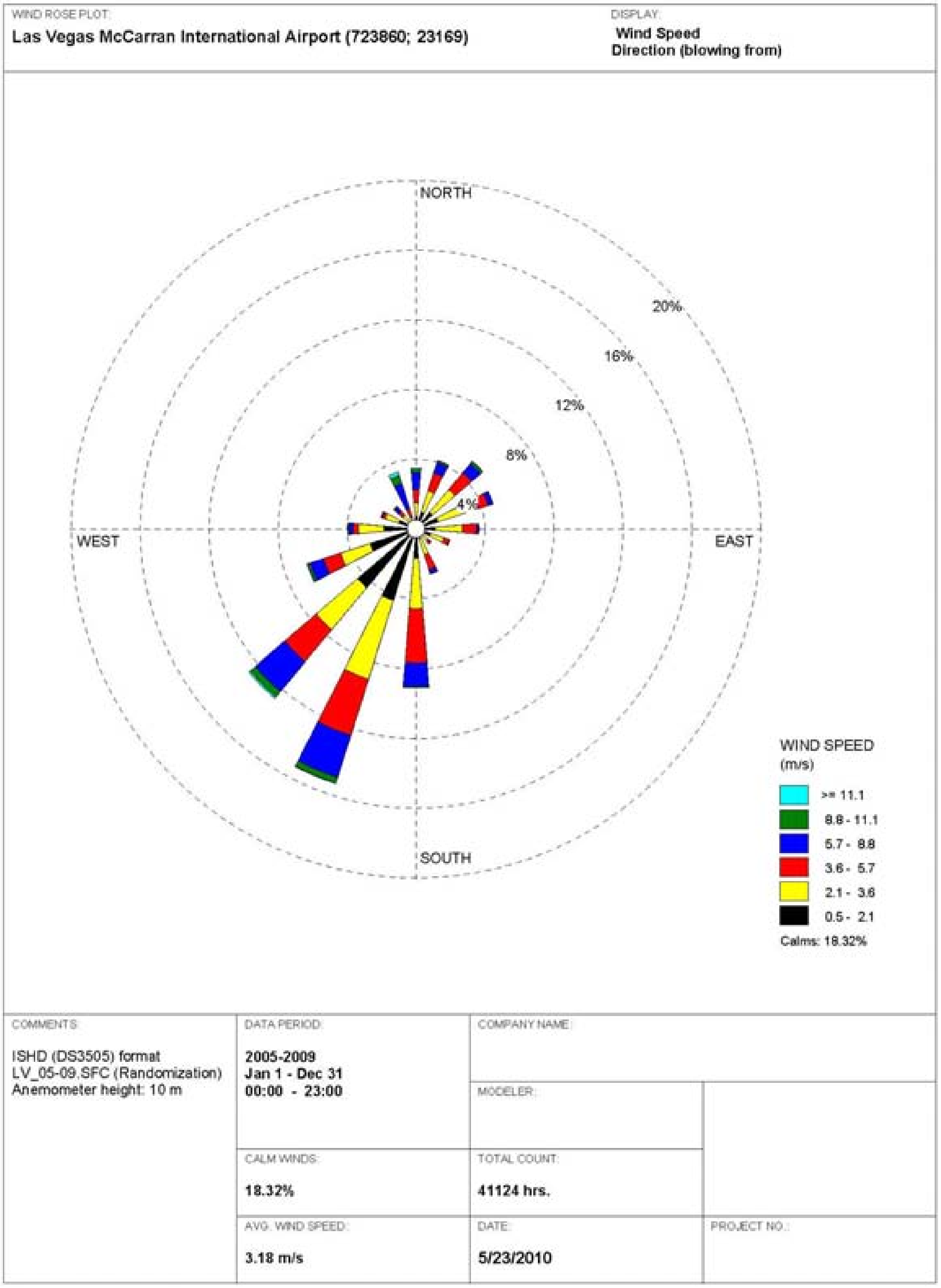


**FIGURE 11.5.13.1-1 Wind Rose at 33 ft (10 m) at the Las Vegas McCarran International Airport, Nevada, 2005 to 2009 (Source: NCDC 2010b)**

(39.1°C). In summer, daytime maximum temperatures higher than 100°F (37.8°C) are common, and minimums are in the mid-50s. The minimum temperatures recorded were below freezing (≤32°F [0°C]) during the colder months (from October to May, with a peak of about 23 days in January and about 26 days in December), but subzero temperatures were never recorded. During the same period, the highest temperature, 115°F (46.1°C), was reached in July 2001 and the lowest, 3°F (−16.1°C), in January 2004. In a typical year, about 125 days had a maximum temperature of at least 90°F (32.2°C), while about 98 days had minimum temperatures at or below freezing.

Because of rain shadow effects caused by the Sierra Nevada Range to the west, very little precipitation occurs in Nevada (NCDC 2010a). For the 1988 to 2010 period, annual precipitation at the Lytle Ranch, Utah, averaged about 10.43 in. (26.5 cm) (WRCC 2010a). On average, 29 days a year have measurable precipitation (0.01 in. [0.025 cm] or higher). Seasonally, precipitation is the highest in winter (about 42% of the annual total), lower in spring (about 24%) and fall (about 19%), and the lowest in summer. Snow occurs mostly from December to February but is a rarity in the area. The annual average snowfall at the Lytle Ranch, Utah, was about 1.1 in. (2.8 cm), with the highest monthly snowfall of 9.0 in. (22.9 cm) in December 2008.

The proposed East Mormon Mountain SEZ is far from major water bodies (more than 310 mi [499 km] to the Pacific Ocean). Severe weather events, such as severe thunderstorms, hurricanes, and tornadoes, are rare in Lincoln County, which encompasses the proposed East Mormon Mountain SEZ (NCDC 2010c).

In Nevada, flooding could occur from melting of heavy snowpack. On occasion, heavy summer thunderstorms also cause flooding of local streams, usually in sparsely populated mountainous areas, but they are seldom destructive (NCDC 2010a). Since 1996, 18 floods (17 flash floods and 1 flood), most of which occurred in July and August (NCDC 2010c), were reported in Lincoln County. These floods caused no deaths or injuries, but they did cause significant property and some crop damage. In January 2005, heavy rain and rapid snow melt caused extensive flooding in southern Lincoln and northeast Clark Counties, which brought about significant property damage.

In Lincoln County, 7 hail events have been reported since 1981, none of which caused property damage (NCDC 2010c). Hail measuring 1.5 in (3.8 cm) in diameter was reported in 1981. In Lincoln County, 22 high wind events have been reported since 1995, which caused some property damage. Such events, with a maximum wind speed of up to 83 mph (37 m/s), have occurred at any time of the year, with a peak during spring months. In addition, 4 thunderstorm wind events have been reported since 1964. Thunderstorm winds, with a maximum wind speed of up to 69 mph (31 m/s), occurred mostly during summer months; one of these caused minor property damage.

In Lincoln County, no dust storm events were reported (NCDC 2010c). However, the ground surface of the SEZ is covered primarily with fine sandy loams of the Mormon Mesa association (covering about 84%) and Bracken gravelly fine sandy loams (covering about 10%), which have relatively moderate dust storm potential. High winds can trigger large amounts of blowing dust in areas of dry and loose soils with sparse vegetation in Lincoln County. Dust storms can deteriorate air quality and visibility and may have adverse effects on health, particularly for people with asthma or other respiratory problems. No dust storm data are available for the Lincoln County, but dust storm data for Clark County might be applicable to the East Mormon Mountain SEZ, considering that the SEZ is located in the Mojave Desert along with Clark County, and such storms are prevalent over a wide area. From 2002 to 2004, Clark County experienced between two and four high-wind events per year when dust levels exceeded federal health standards (Clark County DAQEM 2005). In Clark County, dust storm events with unhealthy $PM_{10}$ levels are likely to occur during late winter and early spring.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes never hit Nevada. Historically, one tropical depression passed within 100 mi (160 km) of the proposed East Mormon Mountain SEZ (CSC 2010). In the period from 1950 to July 2010, a total of six tornadoes (0.1 per year each) were reported in Lincoln County (NCDC 2010c). Most tornadoes occurring in Lincoln County were relatively weak (i.e., one was F [uncategorized[6]], four were F0, and one was F1 on the Fujita tornado scale), and these tornadoes caused no deaths or injuries, although they did cause some property damage. Most of these tornadoes occurred far from the SEZ; the nearest one hit about 27 mi (43 km) southwest of the SEZ.

#### *11.5.13.1.2 Existing Air Emissions*

Lincoln County has several industrial emission sources scattered over the county, but their emissions are relatively small. No emission sources are located around the proposed East Mormon Mountain SEZ. Because of the sparse population, only a handful of major roads exist in Lincoln County; these include U.S. 93 and State Routes 318, 319, and 375. Thus, onroad mobile source emissions are not substantial. Data on annual emissions of criteria pollutants and VOCs in Lincoln County are presented in Table 11.5.13.1-1 for 2002 (WRAP 2009). Emissions data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total $SO_2$ and $NO_x$ emissions (about 56% and 57%, respectively). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions contributed primarily to CO emissions (about 56%) and secondarily to $NO_x$ emissions (about 22%), and accounted for most of the VOC emissions (about 99%). Fire sources were primary contributors to $PM_{10}$ and $PM_{2.5}$ emissions (about 60% and 83%, respectively) and secondary contributors to $SO_2$ and CO emissions (41% and 33%, respectively). Area sources accounted for about 37% of $PM_{10}$ and 13% of $PM_{2.5.}$ In Lincoln County, point sources were minor contributors to criteria pollutants and VOCs.

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6 Not categorized by the Fujita tornado scale because damage level was not reported.

In 2005, Nevada produced about 56.3 MMt of *gross*[7] carbon dioxide equivalent ($CO_2e$)[8] emissions, which is about 0.8% of total U.S. GHG emissions in that year (NDEP 2008). Gross GHG emissions in Nevada increased by about 65% from 1990 to 2005 because of Nevada's rapid population growth, compared to 16.3% growth in U.S. GHG emissions during the same period. In 2005, electrical generation (48%) and transportation (30%) were the primary contributors to gross GHG emission sources in Nevada. Fuel use in the residential, commercial, and industrial sectors combined accounted for about 12% of total state emissions. Nevada's *net* emissions were about 51.3 MMt $CO_2e$, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in Nevada. Its estimate of $CO_2$ emissions from fossil fuel combustion was 49.6 MMt, which was comparable to the state's estimate. Electric power generation and transportation accounted for about 52.7% and 33.6% of the $CO_2$ emissions total, respectively, while the residential, commercial, and industrial sectors accounted for the remainder (about 13.7%).

**TABLE 11.5.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Lincoln County, Nevada, Encompassing the Proposed East Mormon Mountain SEZ, 2002[a]**

| Pollutant[b] | Emissions (tons/yr)[c] |
|---|---|
| $SO_2$ | 230 |
| $NO_x$ | 3,453 |
| CO | 47,458 |
| VOCs | 172,491 |
| $PM_{10}$ | 2,586 |
| $PM_{2.5}$ | 1,604 |

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

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

[c] To convert tons to kilograms, multiply by 907.

Source: WRAP (2009).

### *11.5.13.1.3 Air Quality*

The EPA set NAAQS for six criteria pollutants (EPA 2010a): $SO_2$, $NO_2$, CO, $O_3$, PM ($PM_{10}$ and $PM_{2.5}$), and Pb. Nevada has its own SAAQS, which are similar to the NAAQS with some differences (NAC 445B.22097). In addition, Nevada has set standards for 1-hour $H_2S$, which is not addressed by the NAAQS. The NAAQS and Nevada SAAQS for criteria pollutants are presented in Table 11.5.13.1-2.

Lincoln County is located administratively within the Nevada Intrastate AQCR, along with the 10 other counties in Nevada, other than the Las Vegas Intrastate AQCR (Clark County only), which encompasses Las Vegas, and the Northwest Nevada Intrastate AQCR (five northwest counties), which encompasses Reno. Currently, the area surrounding the proposed SEZ is designated as being in unclassifiable/attainment of NAAQS for all criteria pollutants (40 CFR 81.329).

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

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

**TABLE 11.5.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed East Mormon Mountain SEZ in Lincoln County, Nevada, 2004 to 2008**

| | | | | Background Concentration Level | |
|---|---|---|---|---|---|
| Pollutant[a] | Averaging Time | NAAQS | SAAQS | Concentration[b,c] | Data Source[d] |
| $SO_2$ | 1-hour | 75 ppb[e] | NA[f] | NA | NA |
| | 3-hour | 0.5 ppm | 0.5 ppm | 0.009 ppm (1.8%) | Las Vegas, 2005 |
| | 24-hour | 0.14 ppm | 0.14 ppm | 0.008 ppm (5.7%) | Las Vegas, 2005 |
| | Annual | 0.030 ppm | 0.030 ppm | 0.006 ppm (20%) | Las Vegas, 2005 |
| $NO_2$ | 1-hour | 100 ppb[g] | NA | NA | NA |
| | Annual | 0.053 ppm | 0.053 ppm | 0.007 ppm (13%) | Mesquite, 2007 |
| CO | 1-hour | 35 ppm | 35 ppm | 5.7 ppm (16%) | Las Vegas, 2004 |
| | 8-hour | 9 ppm | 9 ppm | 3.9 ppm (43%) | Las Vegas, 2005 |
| $O_3$ | 1-hour | 0.12 ppm[h] | 0.12 ppm | 0.098 ppm (82%) | Mesquite, 2005 |
| | 8-hour | 0.075 ppm | NA | 0.073 ppm (97%) | Mesquite, 2004 |
| $PM_{10}$ | 24-hour | 150 $\mu g/m^3$ | 150 $\mu g/m^3$ | 142 $\mu g/m^3$ (95%) | Mesquite, 2006 |
| | Annual | NA | 50 $\mu g/m^3$ | 26 $\mu g/m^3$ (52%) | Mesquite, 2005 |
| $PM_{2.5}$ | 24-hour | 35 $\mu g/m^3$ | NA | 10.2 $\mu g/m^3$ (29%) | North Las Vegas, 2005 |
| | Annual | 15.0 $\mu g/m^3$ | NA | 4.1 $\mu g/m^3$ (27%) | North Las Vegas, 2005 |
| Pb | Calendar quarter | 1.5 $\mu g/m^3$ | 1.5 $\mu g/m^3$ | NA | NA |
| | Rolling 3-month | 0.15 $\mu g/m^3$ [i] | NA | NA | NA |

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

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

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

d All air monitoring stations listed are located in Clark County.

e Effective August 23, 2010.

f NA = not applicable or not available.

g Effective April 12, 2010.

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

i Effective January 12, 2009.

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

Because of Lincoln County's low population density, it has no significant emission sources of its own and only minor mobile emissions along major highways. Accordingly, ambient air quality in Lincoln County is relatively good. There are no ambient air-monitoring stations in Lincoln County. To characterize ambient air quality around the SEZ, four monitoring stations in Clark County were chosen. Mesquite is located about 13 mi (21 km) southeast of the SEZ and has recorded ambient concentrations of $NO_2$, $O_3$, and $PM_{10}$. Apex, which is located in the northeast corner of North Las Vegas, about 51 mi (82 km) southwest and upwind of the SEZ, was the closest $PM_{2.5}$ monitoring station. CO concentrations at the East Tonopah station in Las Vegas, which is the farthest downwind station of Las Vegas, were presented. The East Sahara Avenue station, which is on the outskirts of Las Vegas, has the only $SO_2$ monitor in the area. No Pb measurements have been made in the State of Nevada because of low Pb concentration levels after the phaseout of leaded gasoline. The highest background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 11.5.13.1-2 (EPA 2010b). Except for 8-hour $O_3$ and 24-hour $PM_{10}$, which approach their respective standards, the highest concentration levels were lower than their respective standards (up to 82%).

The PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, the EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. Several Class I areas are located in Arizona and Utah; two of these are within 62 mi (100 km) of the proposed SEZ. The nearest is Grand Canyon NP in Arizona (40 CFR 81.403), about 58 mi (93 km) southeast of the East Mormon Mountain SEZ. This Class I area is not located downwind of prevailing winds at the East Mormon Mountain SEZ (Figure 11.5.13.1-1). The next nearest Class I areas include Zion and Bryce Canyon NPs in Utah, which are located about 62 mi (100 km) and 111 mi (178 km) east–northeast of the SEZ, respectively.

### 11.5.13.2 Impacts

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

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed East Mormon Mountain SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.5.13.3 below identifies SEZ-specific design features of particular relevance to the East Mormon Mountain SEZ.

#### *11.5.13.2.1 Construction*

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

**Methods and Assumptions**

Air quality modeling for $PM_{10}$ and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[9] However, no receptors were modeled for PSD analysis at the nearest Class I areas, Grand Canyon NP in Arizona and Zion NP in Utah, because they are about 58 mi (93 km) and 62 mi (100 km) from the SEZ, respectively, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Instead, several regularly spaced receptors in the direction of the Grand Canyon NP and Zion NP were selected as surrogates for the PSD analysis. For the East Mormon Mountain SEZ, the modeling was conducted based on the following assumptions and input:

- Emissions of 3,000 acres (12.1 $km^2$) total were uniformly distributed in the southern portion of the SEZ, close to the nearest residences and towns such Bunkerville and Mesquite;

- Surface hourly meteorological data came from the Las Vegas McCarran International Airport and upper air sounding data came from the Mercury/Desert Rock Airport for the 2005 to 2009 period; and

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

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

**Results**

Modeling results are summarized in Table 11.5.13.2-1 for concentration increments and total concentrations (modeled plus background concentrations) of both $PM_{10}$ and $PM_{2.5}$ that would result from construction-related fugitive emissions. Maximum 24-hour $PM_{10}$ concentration increments modeled to occur at the site boundaries would be an estimated 567 μg/m$^3$, which far exceeds the relevant standard level of 150 μg/m$^3$. Total 24-hour $PM_{10}$ concentrations of 709 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 10 μg/m$^3$ at Mesquite (closest town, about 12 mi [19 km] southeast of the SEZ), about 5 μg/m$^3$ at Bunkerville, and less than 4 μg/m$^3$ at Moapa Valley towns such as Moapa Valley and Overton. Annual average modeled concentration increments and total concentrations (increment plus background) for $PM_{10}$ at the SEZ boundary would be about 63.7 μg/m$^3$ and 89.7 μg/m$^3$, respectively, which are higher than the SAAQS level of 50 μg/m$^3$. Annual $PM_{10}$ increments would be much lower, about 0.1 μg/m$^3$ or less, at all aforementioned towns.

Total 24-hour $PM_{2.5}$ concentrations would be 47.8 μg/m$^3$ at the SEZ boundary, which is higher than the NAAQS level of 35 μg/m$^3$; modeled increments contribute more than three times the amount of background concentration to this total. The total annual average $PM_{2.5}$ concentration would be 10.4 μg/m$^3$, which is lower than the NAAQS level of 15.0 μg/m$^3$. At Mesquite, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 0.1 and 0.01 μg/m$^3$, respectively.

Predicted 24-hour and annual $PM_{10}$ concentration increments at the surrogate receptors for the nearby Class I Area—Zion NP, Utah—would be about 10.8 μg/m$^3$ and 0.17 μg/m$^3$, or 135% and 4.2% of the PSD increments for the Class I area, respectively. These surrogate receptors are more than 33 mi (54 km) from the Zion NP; thus, predicted concentrations in Zion NP would be lower than the above values (about 66% of the PSD increments for 24-hour $PM_{10}$), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual $PM_{10}$ and 24-hour $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Annual $PM_{2.5}$ concentration levels are predicted to be lower than its standard level. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD $PM_{10}$ increments at the nearby federal Class I areas (Grand Canyon NP and Zion NP). Construction activities are not subject to the PSD program, and the comparison provides only a

**TABLE 11.5.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed East Mormon Mountain SEZ**

| | | | Concentration (μg/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 | 567 | 142 | 709 | 150 | 378 | 473 |
| | Annual | –[d] | 63.7 | 26.0 | 89.7 | 50 | 127 | 179 |
| $PM_{2.5}$ | 24 hours | H8H | 37.6 | 10.2 | 47.8 | 35 | 107 | 136 |
| | Annual | – | 6.4 | 4.1 | 10.4 | 15.0 | 42 | 69 |

[a] $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; $PM_{10}$ = particulate matter with a diameter of ≤10 μm.

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

[c] See Table 11.5.13.1-2.

[d] A dash indicates not applicable.

screen for gauging the magnitude of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

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

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 500-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ and over a short distance (about 0.25 mi [0.4 km]) to the regional grid. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison to solar facility construction, and would be temporary in nature.

#### *11.5.13.2.2 Operations*

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

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

Estimates of potential air emissions displaced by solar project development at the East Mormon Mountain SEZ are presented in Table 11.5.13.2-2. Total power generation capacity ranging from 797 to 1,435 MW is estimated for the East Mormon Mountain SEZ for various solar technologies (see Section 11.5.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). It is estimated that if the East Mormon Mountain SEZ would eventually have development on 80% of its land, emissions avoided could range from 3.7 to 6.6% of total emissions of $SO_2$, $NO_x$, Hg, and $CO_2$ from electric power systems in the state of Nevada (EPA 2009c). Avoided emissions could be up to 1.4% of total emissions from electric power systems in the six-state study area. When compared to all source categories, power production from the same solar facilities could displace up to 5.4% of $SO_2$, 2.0% of $NO_x$, and 3.6% of $CO_2$ emissions in the state of Nevada (EPA 2009a; WRAP 2009). These emissions could be up to 0.75% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for about 93% of the total electric power generated in Nevada (EPA 2009c). The contribution of natural gas combustion is about 47%, followed by coal combustion of about 45%. Thus, solar facilities built in the East Mormon Mountain SEZ could displace relatively more fossil fuel emissions than those built in other states that rely less on fossil fuel–generated power.

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

**TABLE 11.5.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed East Mormon Mountain SEZ**

| Area Size (acres) | Capacity (MW)[a] | Power Generation (GWh/yr)[b] | Emissions Displaced (tons/yr; $10^3$ tons/yr for $CO_2$)[c] | | | |
|---|---|---|---|---|---|---|
| | | | $SO_2$ | $NO_x$ | Hg | $CO_2$ |
| 8,968 | 797–1,435 | 1,397–2,514 | 1,970–3,547 | 1,690–3,042 | 0.011–0.020 | 1,085–1,952 |
| Percentage of total emissions from electric power systems in Nevada[d] | | | 3.7–6.6% | 3.7–6.6% | 3.7–6.6% | 3.7–6.6% |
| Percentage of total emissions from all source categories in Nevada[e] | | | 3.0–5.4% | 1.1–2.0% | –[f] | 2.0–3.6% |
| Percentage of total emissions from electric power systems in the six-state study area[d] | | | 0.79-1.4% | 0.46–0.82% | 0.38–0.69% | 0.41–0.74% |
| Percentage of total emissions from all source categories in the six-state study area[e] | | | 0.42–0.75% | 0.06–0.11% | – | 0.13–0.23% |

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

[b] A capacity factor of 20% was assumed.

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

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

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

[f] A dash indicates not estimated.

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

#### *11.5.13.2.3 Decommissioning/Reclamation*

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but occur on a more limited scale and are of shorter duration. Potential impacts on ambient air quality would be correspondingly smaller than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.5).

#### 11.5.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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## 11.5.14 Visual Resources

### 11.5.14.1 Affected Environment

The proposed East Mormon Mountain SEZ is located in Lincoln County in southeastern Nevada. It is located 9.3 mi (15.0 km) west of the Arizona and Utah state borders. The SEZ occupies 8,968 acres (36.29 $km^2$) and extends approximately 5.1 mi (8.2 km) in a north–south direction and is approximately 3.0 mi (4.8 km) wide. The SEZ ranges in elevation from 2,568 ft (782.7 m) in the southeastern portion to 2,840 ft (865.6 m) in the northeastern portion.

The SEZ lies within the Mojave Basin and Range Level III ecoregion, which consists of broad basins and scattered mountains. Heavy use of OHVs and motorcycles in some areas has caused soil erosion, and there is relatively little grazing activity because of the lack of water and forage for livestock. Most land is federally owned. The East Mormon Mountain SEZ is located within the Creosotebush-Dominated Basins Level IV ecoregion, which includes valleys that lie between scattered mountain ranges. These valleys contain stream terraces, floodplains, alluvial fans, isolated hills, mesas, buttes, and eroded washes (Bryce et al. 2003).

The SEZ is located in a valley east of the East Mormon Mountains and south of the Tule Springs Hills. These nearby mountains add significantly to the scenic value of the SEZ. These mountains range in elevation from 3,000 ft (900 m) to more than 5,000 ft (1,500 m). The mountain slopes and peaks surrounding the SEZ generally are visually pristine. The SEZ and surrounding mountain ranges are shown in Figure 11.5.14.1-1.

The SEZ is located within a relatively flat desert floor, with the strong horizon line and surrounding mountain ranges being the dominant visual features. Light-colored, unvegetated playas provide strong color and texture contrast. Toquop Wash is a large, deep wash that roughly bisects the SEZ, running from northwest to southeast, and is a prominent visual feature in some locations within the SEZ. Other washes that generally run from northwest to southeast also add some vertical relief to the SEZ. The surrounding mountains are generally red to brown in color, with distant mountains appearing blue to purple. In contrast, pink to tan gravels dominate the desert floor, which is sparsely dotted with the greens of vegetation. No permanent surface water is present within the SEZ.

Vegetation is generally sparse in much of the SEZ, with widely spaced shrubs growing on more or less barren gravel flats. Vegetation within the SEZ is predominantly scrubland, with creosotebush and other low shrubs dominating the desert floor within the SEZ. Small Joshua trees add short vertical accents and color contrasts that add visual interest to portions of the SEZ. During an August 2009 site visit, the vegetation presented a range of greens (mostly the olive green of creosotebushes) with some grays and tans (from lower shrubs), with medium to coarse textures. Visual interest within the SEZ is generally low.

Other than a few roads and a visually prominent (500-kV) transmission line located outside the SEZ, but within 0.3 mi (0.5 km) of its southeast corner, the area is relatively free of cultural modifications that would detract from scenic qualities of the landscape.

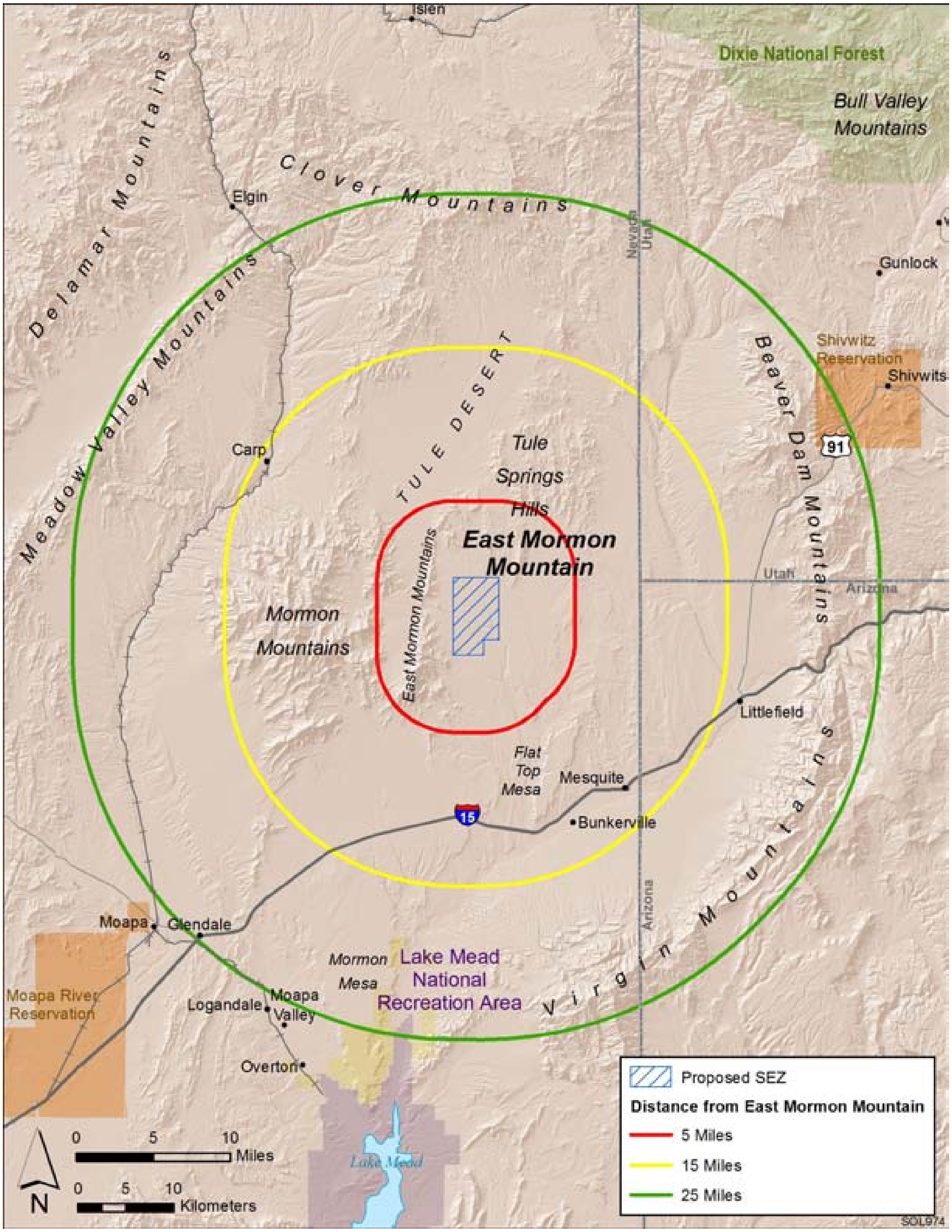


**FIGURE 11.5.14.1-1 Proposed East Mormon Mountain SEZ and Surrounding Lands**

The general lack of topographic relief, water, and physical variety results in low scenic value within the SEZ itself; however, because of the flatness of the landscape, the lack of trees, and the breadth of the open desert, the SEZ presents a vast panoramic landscape with sweeping views of the surrounding mountains that add significantly to the scenic values within the SEZ viewshed. In general, the mountains appear to be devoid of vegetation; their varied and irregular forms and red to brown colors provide visual contrasts to the strong horizontal line, green vegetation, and pink to tan gravels of the valley floor, particularly when viewed from nearby locations within the SEZ. Panoramic views of the SEZ are shown in Figures 11.5.14.1-2 and 11.5.14.1-3.

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

The VRI values for the SEZ are VRI Class III, indicating moderate visual values. Immediately to the west of the SEZ, in the Mormon Mountains, the values are VRI Class II; east of the SEZ, the values are VRI Class IV. The BLM conducted a new VRI for the SEZ and surrounding lands in 2010; however, the VRI was not completed in time for the new data to be included in the draft PEIS. The new VRI data will be incorporated into the analyses presented in the final PEIS.

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

### 11.5.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed East Mormon Mountain SEZ and surrounding lands, and the impacts of related developments (e.g., access roads and transmission lines) outside of the SEZ, are presented in this section.

**FIGURE 11.5.14.1-2 Approximately 180° Panoramic View of the Proposed East Mormon Mountain SEZ Facing North with East Mormon and Mormon Mountains (left) and Tule Hills (center)**

**FIGURE 11.5.14.1-3 Panoramic View of the Proposed East Mormon Mountain SEZ Facing Southwest toward the East Mormon Mountains (foreground) and Mormon Mountains (background)**

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

*Potential Glint and Glare Impacts.* Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of the PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

##### *11.5.14.2.1 Impacts on the Proposed East Mormon Mountain SEZ*

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

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 11.5.22.4.13.

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

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

#### *11.5.14.2.2 Impacts on Lands Surrounding the Proposed East Mormon Mountain SEZ*

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

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

Figure 11.5.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, and dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

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

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

Figure 11.5.14.2-2 shows the results of a GIS analysis that overlays selected federal, state, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds in order to illustrate which of these sensitive visual resource areas would have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analyses were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

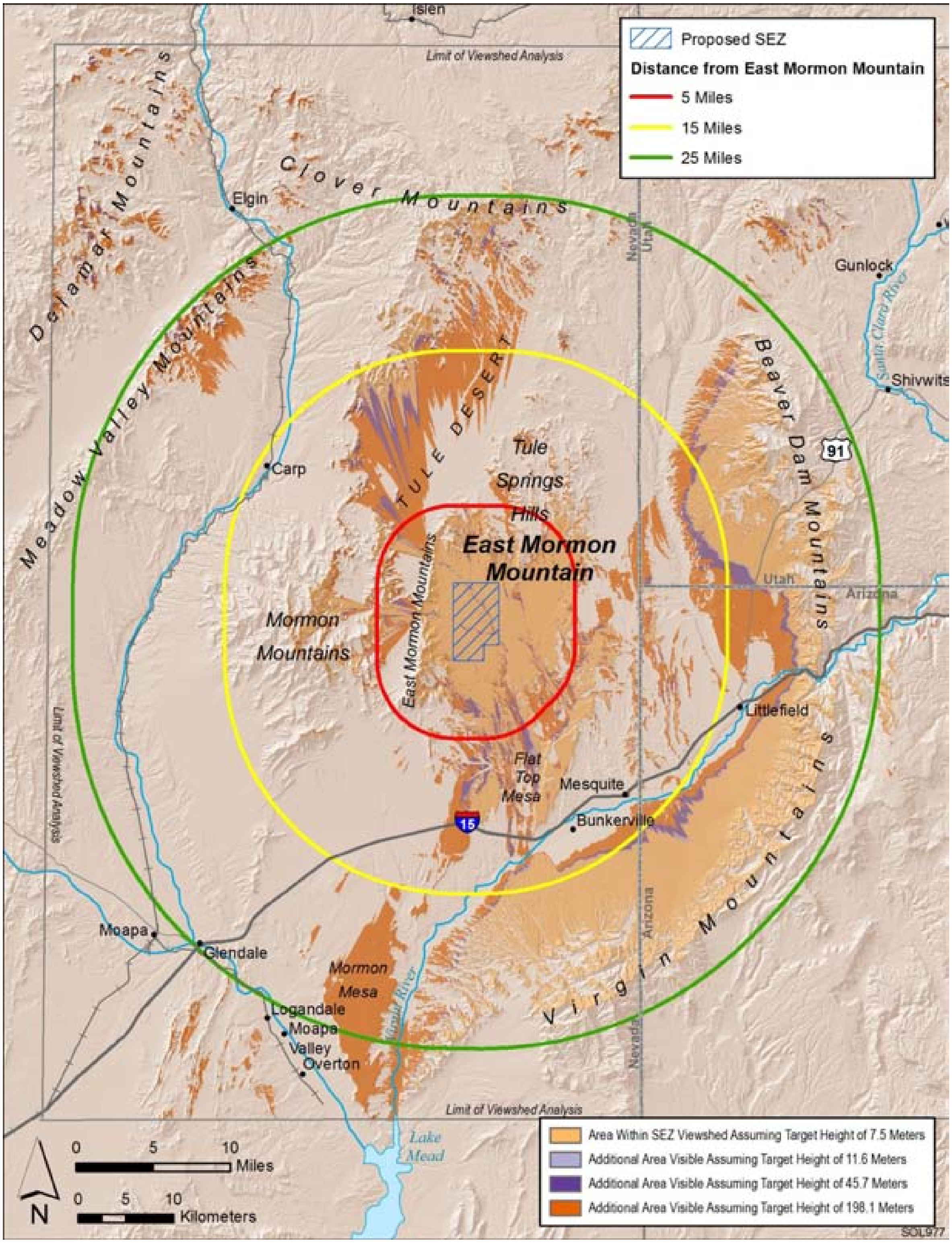


**FIGURE 11.5.14.2-1 Viewshed Analyses for the Proposed East Mormon Mountain SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)**

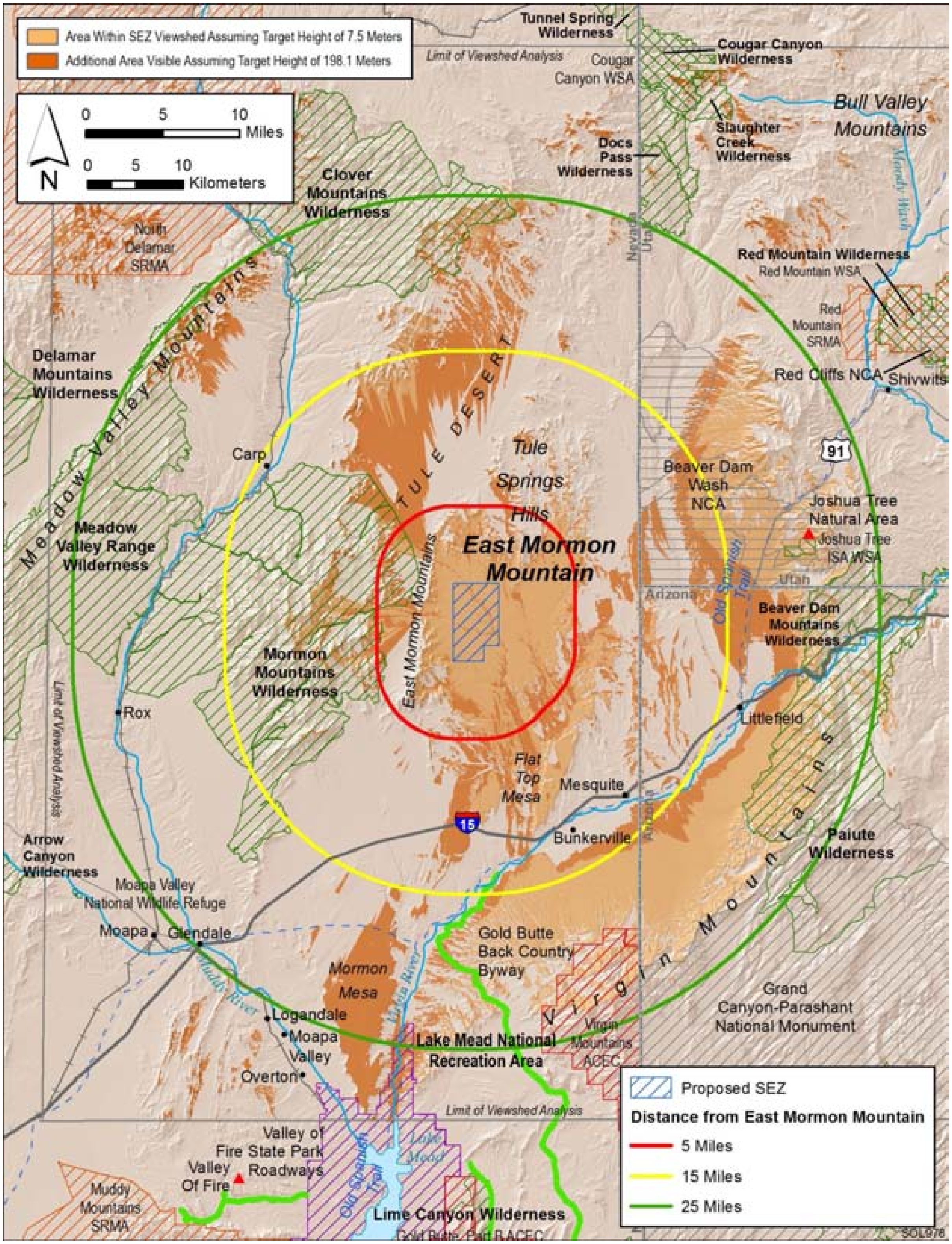


**FIGURE 11.5.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed East Mormon Mountain SEZ**

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

- All-American Roads, National Scenic Byways, State Scenic Highways, and BLM- and USFS-designated scenic highways/byways;

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed East Mormon Mountain SEZ are discussed below. The results of this analysis are also summarized in Table 11.5.14.2-1. Further discussion of impacts on these areas is presented in Sections 11.5.3 (Specially Designated Areas and Lands with Wilderness Character) and Section 11.5.17 (Cultural Resources).

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the landscape as seen by viewers, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations, specific locations from which the project might be viewed, and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12.

**GOOGLE EARTH™ VISUALIZATIONS**

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

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

***National Monument***

- *Grand Canyon-Parashant*—Grand Canyon-Parashant National Monument occupies 1,045,789 acres (4,232 km$^2$) and is located about 22 mi (35 km) southeast of the SEZ at the point of closest approach. The National Monument is located on the northern edge of the Grand Canyon, and is jointly managed by the National Park Service (NPS) and the BLM. The National Monument is remote and undeveloped, providing opportunities for solitude. There are no paved roads into the monument and no visitor services.

  As shown in Figure 11.5.14.2-2, within the National Monument, visibility of solar facilities within the SEZ would be limited to the most northwestern portion of the park. The area with views of the SEZ includes about 447 acres (1.8 km$^2$) in the 650-ft (198.1-m) viewshed, or 0.04% of the total national monument acreage, and 427 acres (1.7 km$^2$), 0.04%, are within the 24.6-ft (7.5-m) viewshed. The visible area of the National Monument is from the point of closest approach, and a small portion extends to beyond 25 mi (40 km) from the southeastern boundary of the SEZ.

  Within the 25-mi (40- km) SEZ viewshed, solar development in the SEZ could be visible from a number of small areas of land, the largest of which covers approximately 145 acres (0.6 km$^2$), and the rest are much smaller in size. These areas are located on the peaks and northwest-facing slopes of Virgin Peak Ridge, Lime Kiln Mountain, the Virgin Mountains, and the ridge immediately northwest of Hatchet Valley.

**TABLE 11.5.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40-km) Viewshed of the Proposed East Mormon Mountain SEZ, Assuming a Target Height of 650 ft (198.1 m)**

| | | Feature Area or Linear Distance[b] | | |
|---|---|---|---|---|
| | | | Visible between | |
| Feature Type | Feature Name (Total Acreage/Highway Length)[a] | Visible within 5 mi | 5 and 15 mi | 15 and 25 mi |
| National Monument | Grand Canyon-Parashant, Arizona (1,045,789 acres) | 0 acres | 0 acres | 447 acres (0.04%) |
| National Recreation Area | Lake Mead National Recreation Area | 0 acres | 0 acres | 558 acres (0.05%) |
| National Conservation Area | Beaver Dam Wash, Utah (20,667 acres) | 0 acres | 329 acres (2%) | 11,631 acres (56%) |
| | Beaver Dam Wash Designated Road Area, Utah (51,373 acres) | 0 acres | 12,335 acres (24%) | 9,565 acres (19%) |
| WAs | Beaver Dam Mountains, Arizona (18,635 acres) | 0 acres | 0 acres | 2,748 acres (15%) |
| | Clover Mountains (85,621 acres) | 0 acres | 0 acres | 3,471 acres (4%) |
| | Meadow Valley Range (123,481 acres) | 0 acres | 0 acres | 1,477 acres (1%) |
| | Mormon Mountains (157,645 acres) | 3,143 acres (2%) | 12,166 acres (10%) | 0 acres |
| | Pauite, Arizona (87,908 acres) | 0 acres | 0 acres | 15,359 acres (18%) |
| National Natural Landmark and ISA | Joshua Tree, Utah (1,047 acres) | 0 acres | 0 acres | 744 acres (71%) |
| National Historic Trail | Old Spanish | 0 mi | 0.5 mi | 15.1 mi (+2.4 mi high potential) |
| ACECs | Virgin Mountains (35,826 acres) | 0 acres | 0 acres | 6,257 acres (18%) |
| Scenic Byways | Gold Butte Backcountry (62 mi) | 0 mi | 0 mi | 1.8 mi |

[a] To convert acres to km$^2$, multiply by 0.004047. To convert mi to km, multiply by 1.609.

[b] Percentage of total feature or road length viewable.

Because of the very long distance to the SEZ, the SEZ would occupy a small amount of the horizontal field of view, and the vertical angle of view would be very low, which would reduce the visible area of solar facilities within the SEZ, tending to reduce visual contrasts. Figure 11.5.14.2-3 is a Google Earth visualization of the SEZ as seen from a point on the ridge immediately northwest of Hatchet Valley in the far northwestern portion of the National Monument, about 23 mi (37 km) from the southeastern corners of the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aid for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (140-m) power tower with an 867-acre (3.5-$km^2$) field of 12-ft (3.7-m) heliostats, and the tower/heliostat system represents about 100 MW of electric generating capacity. Four power tower models were placed in the SEZ for this and other visualizations shown in this section of this PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 2,400 ft (730 m) higher in elevation than the SEZ. Despite the elevated viewpoint, collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge-on because of the long distance to the SEZ, and they would repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is viewed along its narrower south to north axis, and is far enough away from the viewpoint that it would occupy a very small portion of the horizontal field of view. Operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located, or against the base of the East Mormon Mountains and/or the Tule Hills. If more than 200 ft (61 m) tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Visual contrasts associated with solar facilities within the SEZ would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other visibility factors. Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. Weak levels of visual contrast would also be expected for the other areas in the National Monument contained within the SEZ 25-mi (40-km) viewshed.

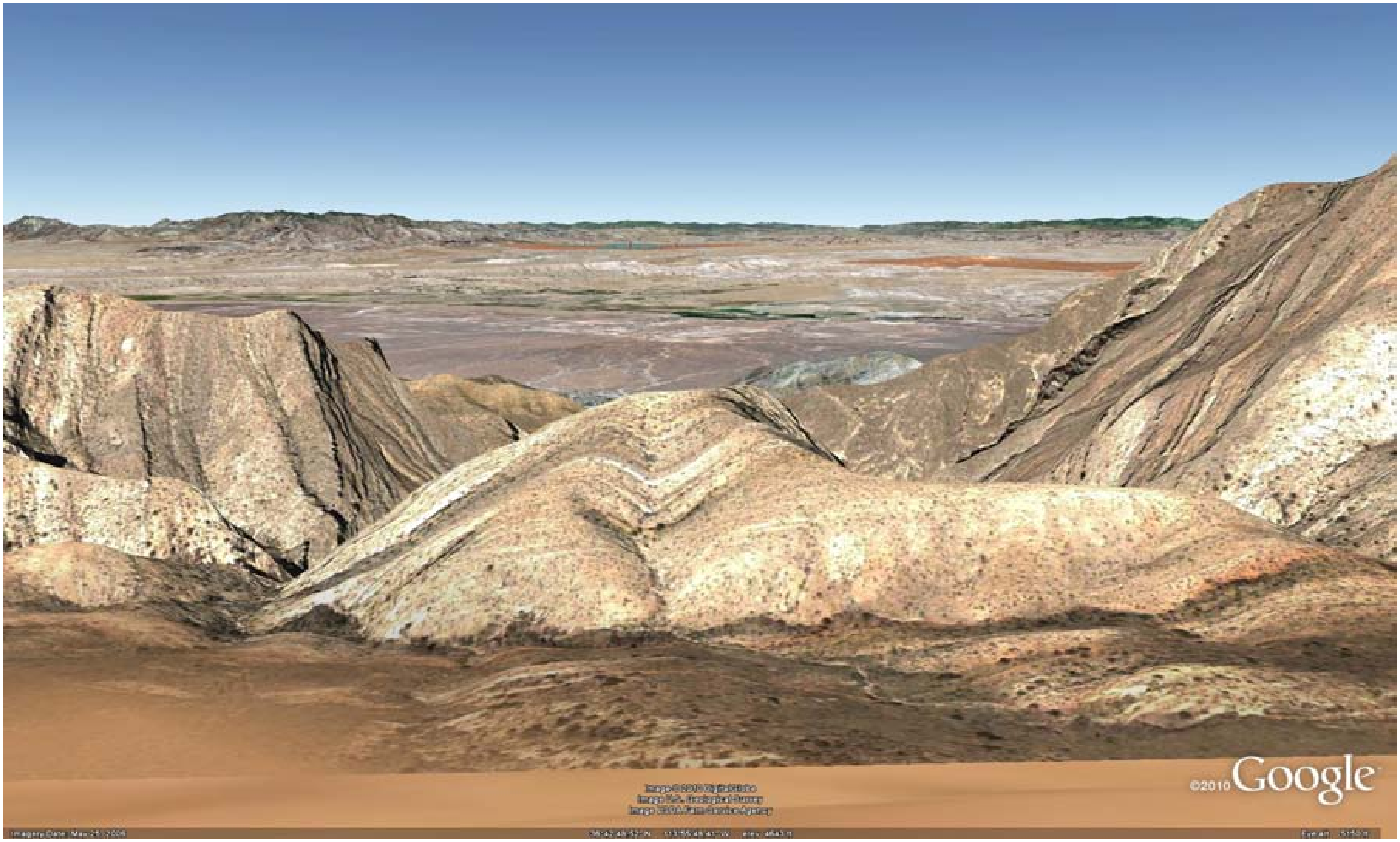


**FIGURE 11.5.14.2-3 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint with blue, at center background only) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Grand Canyon-Parashant National Monument**

***National Recreation Area***

- *Lake Mead National Recreation Area*—Lake Mead NRA contains 1,105,951 acres (4,476 $km^2$) and is located about 24 mi (38 km) south of the SEZ at the point of closest approach. The Lake Mead NRA offers year-round recreational opportunities for boaters, swimmers, and fishermen as well as hikers, wildlife photographers, and roadside sightseers.

  As shown in Figure 11.5.14.2-2, within the NRA, visibility of solar facilities within the SEZ would be limited to the most northern portion of the park. The area within the NRA with views of the SEZ includes about 558 acres (2.3 $km^2$) in the 650-ft (198.1-m) viewshed, or 0.05% of the total NRA acreage. None of the NRA is within the 24.6-ft (7.5-m) viewshed. The visible area of the NRA extends from the point of closest approach to beyond 25 mi (40 km) from the southern boundary of the SEZ.

  The viewshed analysis indicates that the upper portions of tall power towers located within the SEZ could be visible from the farthest northern sections of the Lake Mead NRA, on and along the Virgin River; however, the river valley is about 1,500 ft (460 m) lower in elevation than the SEZ, and at nearly 24 mi (38 km), the angle of view would be extremely low. If power towers were visible within the SEZ, at most they could span only a very small amount of the horizontal field of view. Furthermore, much of the river valley is heavily vegetated, and some views toward the SEZ are likely screened by vegetation. If visible at all, operating power towers in the SEZ would be seen as distant points of light on the northern horizon. If more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from the NRA at night. Under the 80% development scenario analyzed in the PEIS, visual contrast levels from solar energy development within the SEZ would be expected to be minimal for viewpoints within the Lake Mead NRA.

***National Conservation Area***

- *Beaver Dam Wash*—The Beaver Dam Wash National Conservation Area (NCA) was designated by Congress through the Omnibus Public Land Management Act of 2009. It is located in southwestern Utah, along the Nevada and Arizona state lines, and is 9.2 mi (14.8 km) from the SEZ at the point of closest approach. The NCA is within an ecological transition zone between the Mojave Desert and the Great Basin. At this time, there are no developed recreational facilities within the NCA.

  The NCA contains 20,667 acres (83.6 $km^2$), with an additional 51,373 acres (208 $km^2$) as designated road area. Portions of the Beaver Dam Wash NCA within the 650-ft (198.1-m) viewshed for the East Mormon Mountain SEZ include approximately 11,960 acres (48.4 $km^2$), or 58% of the total NCA acreage. Portions of the NCA within the 24.6-ft (7.5-m) viewshed encompass about 10,212 acres (41.3 $km^2$), or 49% of the total NCA acreage. Portions of the Beaver Dam Wash NCA designated road area within the 650-ft (198.1-m) viewshed for the East Mormon Mountain SEZ include approximately 21,900 acres (88.6 $km^2$), or 43% of the total NCA acreage. Portions of the NCA designated road area within the 24.6-ft (7.5-m) viewshed encompass about 10,845 acres (43.9 $km^2$), or 21% of the total NCA acreage. The visible area of the NCA extends from the point of closest approach to about 22 mi (35 km) east of the SEZ.

The NCA consists of low-elevation lands in and along Beaver Dam Wash and on the bajada of the Beaver Dam Mountains on the western side of the NCA, and higher-elevation lands in the Beaver Dam Mountains on the eastern side of the NCA. Near Beaver Dam Wash, elevations are similar to or a few hundred feet lower than the SEZ, so the vertical angles of view are very low, and many views are partially or completely screened by intervening topography. In the Beaver Dam Mountains within the NCA, viewpoints are up to 2,300 ft (700 m) or more higher in elevation than the SEZ, with more open views, and slightly higher vertical angles of view, though farther from the SEZ.

Figure 11.5.14.2-4 is a Google Earth visualization of the SEZ as seen from a road on the Beaver Dam Mountains bajada in the western portion of the NCA, on the boundary between the designated road area and the rest of the NCA, about 15 mi (24 km) east–northeast of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 750 ft (240 m) higher in elevation than the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a thin band at the base of the East Mormon and Mormon Mountains. The northern portion of the SEZ would be partially screened by the intervening Tule Hills. Where visible, the collector/reflector arrays of solar facilities within the SEZ would appear edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the line of the valley floor in which the SEZ is located, all of which would tend to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a very small portion of the horizontal field of view, especially given the partial screening by the Tule Hills. Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present), could be visible projecting above the collector/reflector arrays, but depending on visibility factors might not be noticed by casual observers.

At a distance of 15 mi (32 km) or more, operating power tower receivers within the SEZ would likely appear as points of light against the backdrop of the East Mormon and Mormon Mountains. If sufficiently tall, the power

**FIGURE 11.5.14.2-4 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint on a Road in the Beaver Dam Wash NCA**

towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Given the very low angle of view to the SEZ, the relatively long distance to the SEZ, and partial screening of solar facilities within the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint.

Figure 11.5.14.2-5 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the eastern portion of the NCA, about 19 mi (31 km) east of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 2,400 ft (730 m) higher in elevation than the SEZ, with a slightly elevated and open view of all but the most northern portion of the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a thin band at the base of the East Mormon and Mormon Mountains. The collector/reflector arrays of solar facilities within the SEZ would appear almost edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the line of the valley floor in which the SEZ is located, all of which would tend to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view.

At a distance of 19 mi (31 km) or more, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. In general, under the 80% development scenario analyzed in this PEIS, given the long distance to the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the NCA located within the SEZ 25-mi (40-km) viewshed.

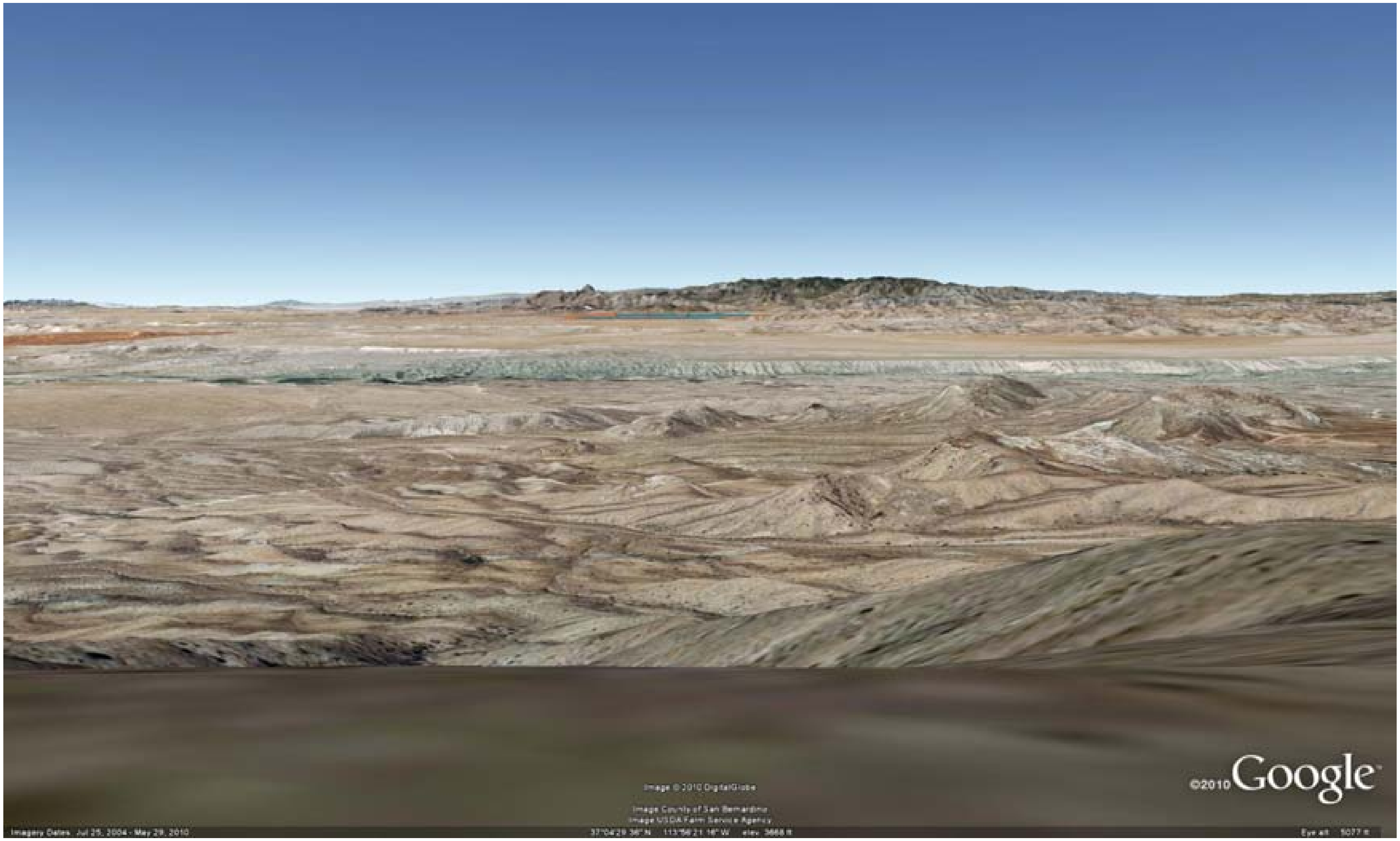


**FIGURE 11.5.14.2-5  Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Beaver Dam Mountains in Beaver Dam Wash NCA**

***Wilderness Areas***

- *Beaver Dam Mountains*—Beaver Dam Mountains is a 18,635-acre (75.4-$km^2$) congressionally designated WA located in Arizona, 19 mi (31 km) east of the SEZ. The WA is an increasingly popular destination for primitive recreation. There are no maintained or developed trails within the WA.

  As shown in Figure 11.5.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the western portions of the WA (about 2,748 acres [11.1 $km^2$] in the 650-ft [198.1-m] viewshed, or 15% of the total WA acreage, and 2,539 acres [10.3 $km^2$] in the 25-ft [7.5-m] viewshed, or 14% of the total WA acreage). The visible area of the WA extends from the point of closest approach to a small portion beyond 25 mi (40 km) from the eastern boundary of the SEZ.

  Within the WA, many peaks and west-facing slopes within the Beaver Dam Mountains would have open views of the proposed SEZ. Figure 11.5.14.2-6 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the western portion of the WA, about 20 mi (32 km) east of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

  The viewpoint in the visualization is about 800 ft (240 m) higher in elevation than the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a thin band at the base of the East Mormon and Mormon Mountains. The collector/reflector arrays of solar facilities within the SEZ would appear edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the line of the valley floor in which the SEZ is located, all of which would tend to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view.

  At a distance of 20 mi (32 km) or more, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

  Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. In general, under the 80% development scenario analyzed in the PEIS, given the long distance to the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.


**FIGURE 11.5.14.2-6 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Beaver Dam Mountains WA**

- *Clover Mountains*—Clover Mountains is a 85,621-acre (346.5-$km^2$) congressionally designated WA located 19 mi (31 km) north to northwest of the SEZ at the point of closest approach. Opportunities for hiking, camping, climbing, and rock scrambling, as well as horseback riding within the WA are outstanding due to the variety of scenic topography.

  As shown in Figure 11.5.14.2-2, within 25 mi (40 km), solar energy facilities within the SEZ could be visible from scattered areas in the southern portion of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total about 3,471 acres (14.1 $km^2$) in the 650-ft (198.1-m) viewshed, or 4% of the total WA acreage, and 2,396 acres (9.7 km), or 3% of the total WA acreage, are visible within the 24.6-ft (7.5-m) viewshed. The visible area of the WA extends from the point of closest approach to beyond 25 mi (40 km) from the northern boundary of the SEZ.

  Except for the highest elevations in the Clover Mountains, solar facilities within the SEZ would be viewed through narrow gaps in the Tule Hills and would be largely screened from view. In some areas, only the upper portions of tall power towers could be visible, while in a few areas, the upper portions of transmission towers and other taller solar facilities might be seen. Because of the screening, only a very small portion of the SEZ would be visible from these areas; at the long distance to the SEZ, expected visual contrasts would be minimal to weak.

  At higher elevations in the Clover Mountains within the SEZ 25-mi (40-km) viewshed, more of the SEZ would be visible, though much of it would still be screened by the Tule Hills. Figure 11.5.14.2-7 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the southern portion of the WA, about 23 mi (37 km) from the northwest corner of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

  The viewpoint in the visualization is about 4,300 ft (1,300 m) higher in elevation than the SEZ. The mountain top is pinyon-juniper forest, which could partially screen views from this location and other nearby viewpoints. Where visible, solar facilities within the SEZ would be seen just above the Tule Hills. Because of the elevated viewpoint, the tops of collector/reflector arrays of solar facilities within the SEZ would be visible, but because of the very long distance to the SEZ, the facilities would be seen at a very low angle, which would reduce their apparent size and cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a very small portion of the horizontal field of view, particularly in view of the partial screening of the SEZ by the Tule Hills.

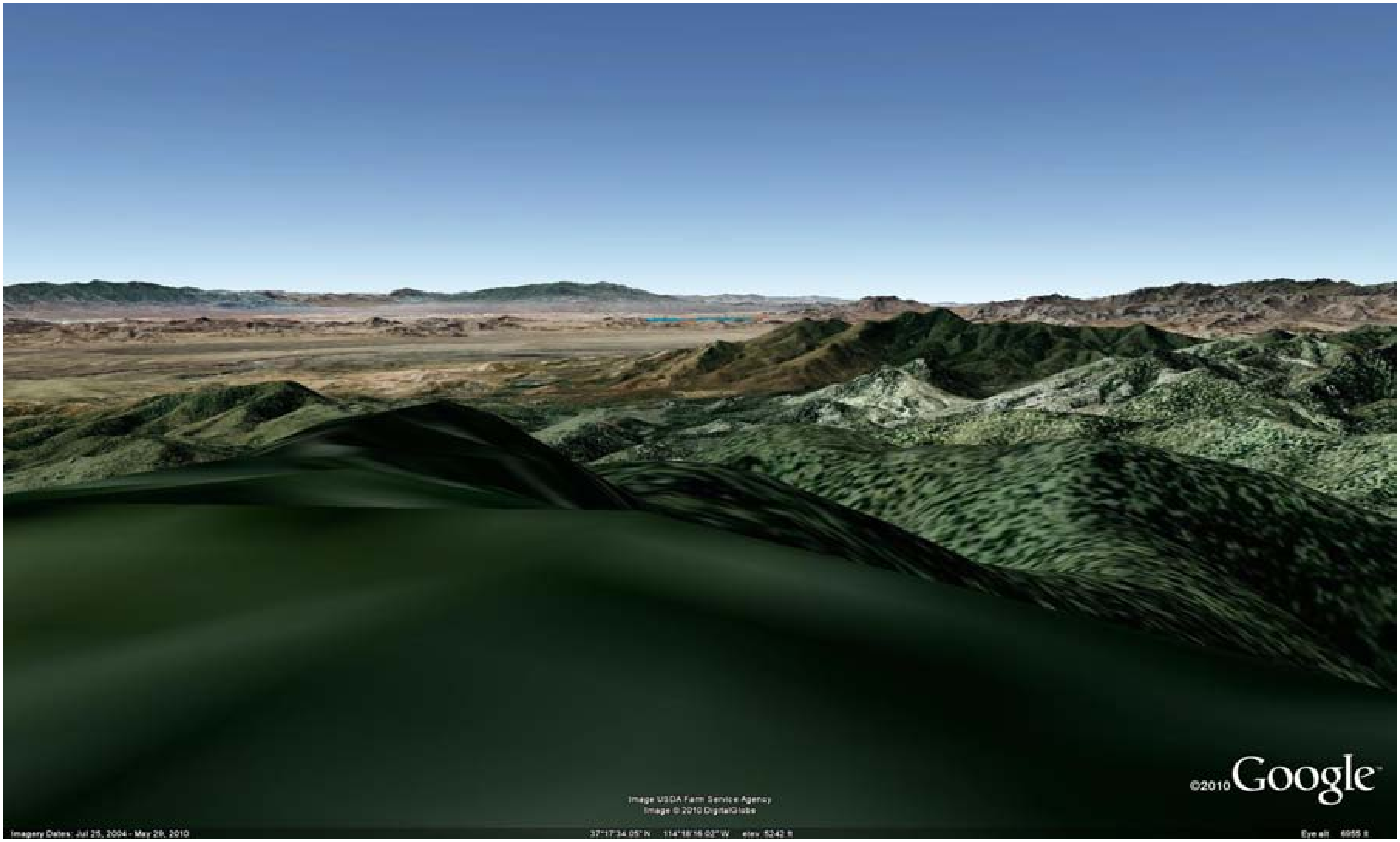


**FIGURE 11.5.14.2-7 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint with blue) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Clover Mountains WA**

At a distance of 23 mi (37 km) or more, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. In general, under the 80% development scenario analyzed in this PEIS, given the partial screening of solar facilities within the SEZ and the long distance to the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.

- *Meadow Valley Range*—Meadow Valley Range is a 123,481-acre (499.7-km$^2$) congressionally designated WA located 17 mi (27 km) west to northwest of the SEZ at the point of closest approach. The long ridgeline offers many peaks, narrow canyons and passes to explore.

  As shown in Figure 11.5.14.2-2, within 25 mi (40 km), solar energy facilities within the SEZ could be visible from scattered areas in the far northern portion of the WA, on the southeast-facing slopes of the Meadow Valley Range. Visible areas of the WA within the 25-mi (40-km) radius of analysis total about 1,477 acres (6.0 km$^2$) in the 650-ft (198.1-m) viewshed, or 1% of the total WA acreage, and 91 acres (0.37 km$^2$), or 0.07%, are visible in the 24.6-ft (7.5-m) viewshed. The visible area of the WA extends from 23 mi (37 km) northwest of the SEZ, to just within 25 mi (40 km) from the northwestern boundary of the SEZ.

  Views of solar facilities within the SEZ would largely be screened by intervening mountains. In more than 93% of the area within the SEZ 25-mi (40-km) viewshed in the WA, views of low-height solar facilities such as parabolic trough and PV arrays, would be screened from view. In most of these areas, only the upper portions of tall power towers could be visible, although the upper portions of transmission towers and other taller solar facilities might be seen in a few areas. In 12 very small areas totaling 91 acres (0.37 km$^2$), low-height solar facilities within the SEZ could be visible, but even at these locations, most of the SEZ is screened from view by the Mormon Mountains and East Mormon Mountains, and as a result, the SEZ would occupy a very small portion of the horizontal field of view.

  Despite the elevated viewpoints in the WA, because of the long distance to the SEZ, collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge on, which would reduce their apparent size, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. At more than 17 mi (27 km) away, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located, or against the base of the Virgin Mountains. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Given the partial screening of solar facilities within the SEZ and the long distance to the SEZ, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.

- *Mormon Mountains*—Mormon Mountains is a 157,645-acre (638.0-$km^2$) congressionally designated WA located 2.4 mi (3.9 km) west of the SEZ at the point of closest approach. The rocky cliffs, narrow drainages, and rolling bajadas provide numerous opportunities for solitude in the Mormon Mountains WA. Recreational opportunities include camping, hiking, backpacking, hunting, and horseback riding.

  As shown in Figure 11.5.14.2-2, visible areas of the WA within the 25-mi (40-km) radius of analysis total about 15,304 acres (61.9 $km^2$) in the 650-ft (198.1-m) viewshed, or 10% of the total WA acreage, and 7,803 acres (31.6 $km^2$) in the 24.6-ft (7.5-m) viewshed, or 5% of the total WA acreage. The visible area of the WA extends from 3.1 mi (5.0 km) to 11 mi (18 km) west of the SEZ's western boundary.

  Solar facilities within the SEZ could be visible from the summits and east-facing slopes of some of the mountains in the eastern part of the WA, at distances from about 3 to 11 mi (5 to 18 km) west of the SEZ's western boundary. From many locations within the WA, views of solar facilities within the SEZ would be largely screened by the intervening East Mormon Mountains, or limited to views of taller solar facilities, or both, but there is a substantial portion of the WA with open or nearly open views of the SEZ. These views are generally through two gaps in the East Mormon Mountains, one directly west of the central portion of the SEZ, and another northwest of the northwest corner of the SEZ.

  Figure 11.5.14.2-8 is a Google Earth visualization of the SEZ as seen through the gap west of the SEZ from a low-elevation viewpoint in the eastern portion of the WA, about 3.9 mi (6.2 km) from the western boundary of the SEZ where visible through the gap. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.


**FIGURE 11.5.14.2-8 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in blue) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Low-Elevation Viewpoint in Mormon Mountain WA**

The viewpoint in the visualization is about 800 ft (240 m) higher in elevation than the SEZ. Solar facilities within the SEZ could be visible through the gap in the East Mormon Mountains, but most of the SEZ would be completely screened from view. Where visible through the gap, collector/reflector arrays of solar facilities within the SEZ would be seen at a very low angle, which would reduce their apparent size, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. However, at 3.9 mi (6.2 km) from the SEZ, if ancillary facilities such as buildings, transmission structures, cooling towers, and plumes (if present) were visible through the gap, they would project above the collector arrays and could create strong visual contrasts with the surrounding landscape in form, line, and color. Furthermore, the view of the SEZ would be "framed" by the gap, which would tend to focus views on the solar facilities within the SEZ, highlighting the contrasts. If operating power towers were visible through the gap, the receivers could appear as brilliant white non-point light sources atop discernable tower structures, viewed against the backdrop of the Virgin Mountains east of the SEZ. They would command visual attention, particularly because of the framed view through the gap. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be conspicuous from this location at night; they would command visual attention, especially given the dark night skies typical of the remote SEZ location. Other lighting associated with solar facilities in the SEZ would likely be visible as well.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, moderate visual contrasts from solar energy development within the SEZ could occur at this viewpoint despite the screening by the East Mormon Mountains if one or more power towers were visible through the gap in the East Mormon Mountains.

Figure 11.5.14.2-9 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the eastern portion of the WA, about 5.6 mi (9.1 km) from the western boundary of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 2,500 ft (760 m) higher in elevation than the SEZ. Solar facilities within the SEZ could be visible through and over the gap in the East Mormon Mountains, and only the southern part of the SEZ would be completely screened from view. From this viewpoint, the SEZ would occupy much of the horizontal field of view. Where visible through and over the gap, collector/reflector arrays of solar facilities within the SEZ would be seen at a relatively high vertical angle, so that the tops of the arrays would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase visual contrast. At 5.6 mi (9.1 km) from the SEZ, ancillary facilities such as buildings, transmission structures, cooling towers, and plumes (if present)

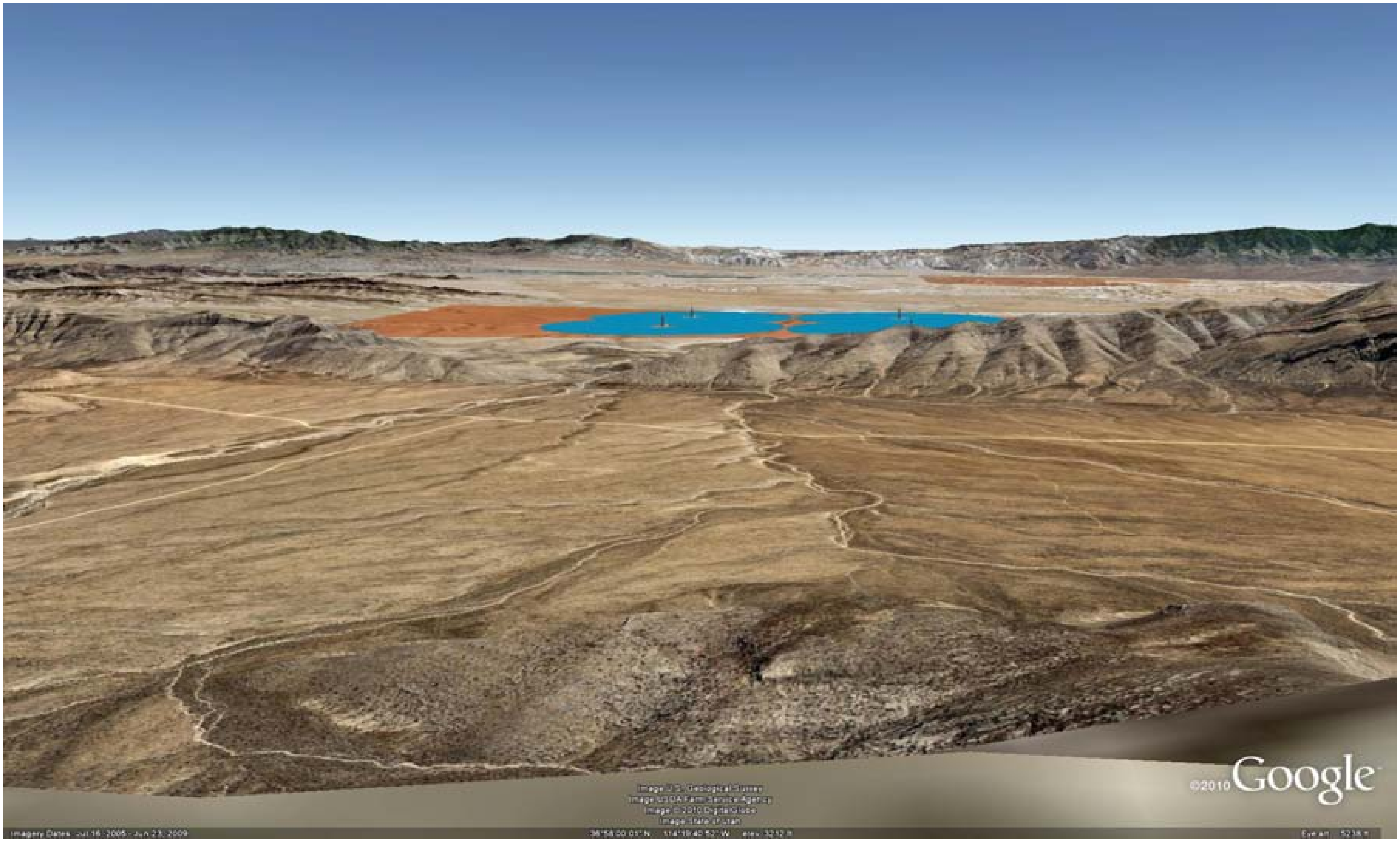


**FIGURE 11.5.14.2-9 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from High-Elevation Viewpoint in Mormon Mountain WA**

would be visible, and could create strong visual contrasts in form, line, and color with the surrounding landscape, and the strongly horizontal collector/reflector arrays. If operating power towers were visible through the gap, the receivers could appear as very bright non-point light sources atop discernable tower structures, viewed against the backdrop of the valley floor in which the SEZ is located. They would likely strongly command visual attention. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be conspicuous from this location at night; they would command visual attention, especially given the dark night skies typical of the remote SEZ location. Other lighting associated with solar facilities in the SEZ would likely be visible as well.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, under the 80% development scenario analyzed in this PEIS, strong visual contrasts from solar energy development within the SEZ could occur at this viewpoint.

In general, visual contrast levels from solar facilities within the SEZ as seen from viewpoints within the WA would be highly dependent on viewpoint elevation. For low-elevation viewpoints, partial screening and low-angle views would tend to cause weak levels of visual contrast, except where clear views of power towers or highly reflective surfaces were visible through gaps in the East Mormon Mountains; where these views occurred, contrasts could rise to moderate levels. Higher elevation viewpoints on some peaks and high ridges within the WA have clearer views of the SEZ and from higher viewing angles, which would be expected to result in moderate to strong visual contrast levels.

- *Pauite*—Pauite is a 87,908-acre (355.8 $km^2$) congressionally designated WA located in Arizona, 19 mi (30 km) southeast of the SEZ at the point of closest approach. Mt. Bangs, the highest peak at 8,012 ft (2,442 m), provides a commanding view of the Basin and Range province to the west and the Colorado Plateau to the east (BLM 1990).

  As shown in Figure 11.5.14.2-2, visible areas of the WA within the 25-mi (40-km) radius of analysis total about 15,359 acres (62.2 $km^2$) in the 650-ft (198.1-m) viewshed, or 18% of the total WA acreage, and 15,087 acres (61.1 $km^2$) in the 24.6-ft (7.5-m) viewshed, or 17% of the total WA acreage. The visible area of the WA extends from the point of closest approach to beyond 25 mi (40 km) of the SEZ's eastern boundary.

  Within the WA, many peaks and west- and northwest-facing slopes within the Virgin Mountains would have open views of the proposed SEZ. Figure 11.5.14.2-10 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the northern portion of the WA, just east of Hedrick's Canyon, and about 22 mi (35 km) east–southeast of the SEZ.

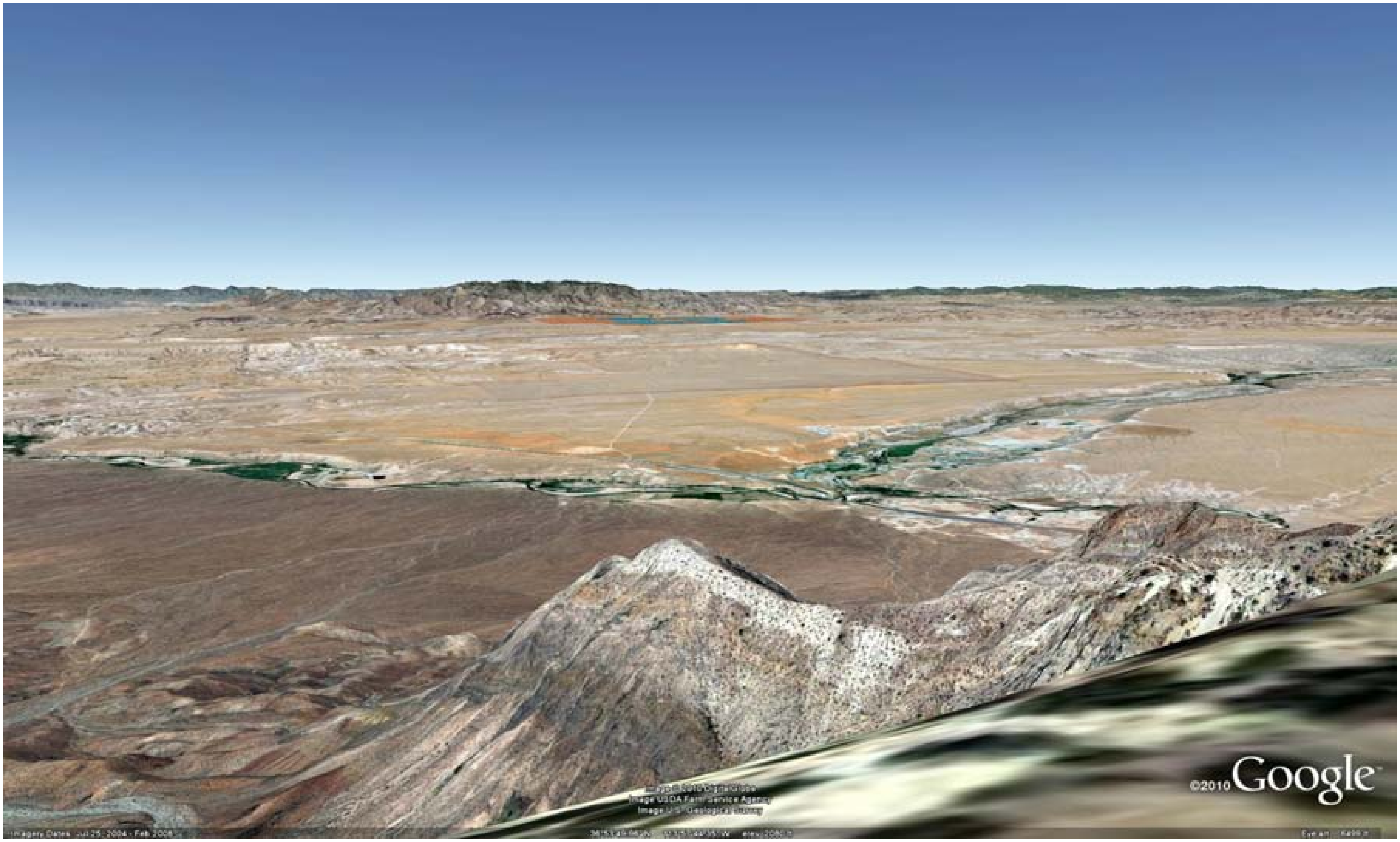


**FIGURE 11.5.14.2-10  Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Paiute WA**

In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 3,800 ft (1,200 m) higher in elevation than the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a thin band at the base of the East Mormon and Mormon Mountains. The collector/reflector arrays of solar facilities within the SEZ would appear nearly edge-on, which would reduce their apparent size, conceal their strong regular geometry, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view.

At a distance of 22 mi (35 km), operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. There are higher elevation viewpoints within the WA that would have higher-angle views of solar facilities within the SEZ, and lower elevation viewpoints that are slightly closer to the SEZ, but in general, because of the long distance to the SEZ, under the 80% development scenario analyzed in this PEIS, weak visual contrasts from solar energy development within the SEZ could be expected for viewpoints in the WA located within the SEZ 25-mi (40-km) viewshed.

***Instant Study Area***

- *Joshua Tree ISA*—Joshua Tree is a 1,047-acre (4.2-km$^2$) congressionally designated ISA located 19 mi (31 km) east of the SEZ at the point of closest approach, on the upper slopes of the Beaver Dam Mountains.

  As shown in Figure 11.5.14.2-2, visible areas of the ISA within the 25-mi (40-km) radius of analysis total about 744 acres (3.0 km$^2$) in the 650-ft (198.1-m) viewshed, or 71% of the total ISA acreage, and 715 acres (2.9 km$^2$) in the 24.6-ft (7.5-m) viewshed, or 68% of the total ISA acreage. The visible area of the ISA extends about 21 mi (33 km) from the northeastern boundary of the SEZ.

Much of the ISA would have open views of the distant SEZ, but despite elevations more than 2,800 ft (850 m) higher than the SEZ in some locations, because of the long distance to the SEZ the vertical angle of view is low, and the SEZ would occupy only a small portion of the horizontal field of view.

At a distance of 19 mi (31 km) or more, operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, where there were unobstructed views, contrasts would be expected to be weak.

***National Historic Trail***

- *Old Spanish National Historic Trail*—The Old Spanish National Historic Trail is a congressionally designated multi-state historic trail that passes within 12 mi (19 km) of the SEZ at the point of closest approach on the east side of the SEZ. A high potential segment of the trail is located about 18 mi (29 km) south of the SEZ. Nearly 18 mi (29 km) of the trail are within the viewshed to the south and east of the SEZ, including 2.4 mi (3.9 km) of the high-potential segment.

  For about 13 mi (21 km) of the trail within the SEZ 25-mi (40 km) viewshed, including the entirety of the high-potential segment, visibility of solar facilities within the SEZ would be limited to the upper portions of taller power towers. Low-height facility components, such as parabolic trough arrays, heliostats, and PV panels would be potentially visible from about 5 mi (8 km) of the trail, but this section of the trail ranges from about 17 to 22 mi (27 to 35 km) from the SEZ, so the views would be from relatively long distances.

  Solar facilities within the SEZ could be visible from the trail in a number of places. The largest segment with visibility is a 12-mi (19-km) stretch closely paralleling U.S. 91 in a north–south direction between 16 and 19 mi (26 and 31 km) east of the SEZ, after the trail leaves the Virgin Valley and before it enters the Beaver Dam Mountains. Within the southernmost 7 mi (11 km) of this trail segment, visibility would be limited to the upper portions of sufficiently tall power towers within the SEZ, and expected visual contrast levels in this portion of the segment would be minimal. The northern 5 mi (8 km) of the segment would have more or less open views of the SEZ, but at distances exceeding 16 mi (26 km), the SEZ would occupy a very small portion of the horizontal field of view, and the vertical angle of view would be very low. Figure 11.5.14.2-11 is a Google Earth visualization of the SEZ as seen from a point on the trail along U.S. 91 on the bajada of the Beaver Dam Mountains about 18 mi (29 km) east-northeast of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 560 ft (170 m) higher in elevation than the SEZ. Because of the long distance to the SEZ, the SEZ would be seen at a very low angle, and solar facilities within the SEZ would be seen in a very thin band at the base of the East Mormon and Mormon Mountains. The collector/reflector arrays of solar facilities within the SEZ would appear edge-on, which would greatly reduce their apparent size, conceal their strong regular geometry, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view.

At a distance of 18 mi (29 km), operating power tower receivers within the SEZ would likely appear as distant points of light against the backdrop of the East Mormon and Mormon Mountains. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location. Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint.

North of this viewpoint on the trail, viewpoint elevations would be slightly higher, but the viewpoints are farther from the SEZ, and in addition, the trail enters a canyon, the walls of which would screen portions of the SEZ from view. Expected visual contrast levels from solar facilities within the SEZ would not be expected to increase.

South of this viewpoint on the trail, the elevation drops, and views of the SEZ are gradually screened by terrain east of Beaver Dam Wash, resulting in lower visual contrast levels. East of Beaver Dam Wash, the trail elevation drops to 900 to 1,300 ft (280 to 400 m) lower in elevation than the SEZ, greatly limiting visibility of solar facilities in the SEZ and causing the angle of view to be extremely low. Only the upper portions of tall power towers could potentially be visible as distant points of light on the northern horizon. For the 13 mi of the trail within the viewshed where visibility is thus limited, and including the high-potential segment of the trail, the expected visual contrast levels would be minimal. In general, under the 80% development scenario analyzed in this PEIS, minimal to weak visual contrasts would be expected for viewpoints on the Old Spanish National Historic Trail within the SEZ 25-mi (40-km) viewshed.

**FIGURE 11.5.14.2-11 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint on Old Spanish National Historic Trail**

***National Natural Landmark***

- *Joshua Tree*—Joshua Tree NNL is about 20 mi (33 km) east of the SEZ, on the upper slopes of the Beaver Dam Mountains. The NNL is located within the Joshua Tree ISA (see analysis above), and where the SEZ is visible within the NNL, expected visual contrasts would be the same as expected for the ISA. Some portions of the NNL may have open views of the distant SEZ, but despite elevations more than 2,800 ft (853 m) higher than the SEZ in some locations, the vertical angle of view is low because of the long distance to the SEZ, and the SEZ would occupy only a small portion of the horizontal field of view. Weak contrast levels would be expected from solar facilities within the SEZ as viewed from the NNL.

***Scenic Byway***

- *Gold Butte Backcountry Byway*—The Gold Butte Backcountry Byway is a BLM-designated scenic byway that begins approximately 14 mi (23 km) south of the SEZ. As shown in Figure 11.5.14.2-2, approximately 1.8 mi (2.9 km) are within the 650-ft (198.1-m) viewshed of the SEZ, and 0.2 mi (0.3 km) of the byway are within the 24.6-ft (7.5-m) viewshed.

  As the Gold Butte Backcountry Byway traverses the lower slopes of the Virgin Mountains near the Virgin River, there are four short stretches of road where solar facilities within the SEZ could be visible. The longest stretch of the byway with visibility is 1.1 mi (1.7 km) long; in this stretch, visibility would be limited to the upper portions of power towers in the SEZ. If visible, operating power towers would likely appear as points of light against the backdrop of the Tule Hills. Total visibility would not last more than a few minutes, and because the viewpoint is nearly 1,000 ft (304 m) lower in elevation than the SEZ, the angle of view would be extremely low, and the lights would not likely be noticed by the casual viewer. Under the 80% development scenario analyzed in the PEIS, visual contrast levels from solar energy development within the SEZ would be expected to be minimal for viewpoints on the Gold Butte Backcountry Byway.

***ACEC Designated because of Outstanding Scenic Qualities***

- *Virgin Mountains*—The 35,826-acre (145.0-$km^2$) Virgin Mountains ACEC is located 19 mi (31 km) southeast of the SEZ at the closest point of approach. The resource values under protection within the Virgin Mountains ACEC include wildlife habitat, scenic, and botanical values (BLM 1998a).

  As shown in Figure 11.5.14.2-2, approximately 6,257 acres (25.32 $km^2$), or 18% of the ACEC, is within the 650-ft (198.1-m) viewshed of the SEZ, and

6,082 acres (24.6 $km^2$) is in the 24.6-ft (7.5-m) viewshed, or 17% of the total ACEC acreage. The visible area of the ACEC extends from the point of closest approach to approximately 24 mi (39 km) from the southeastern boundary of the SEZ.

Figure 11.5.14.2-12 is a Google Earth visualization of the SEZ as seen from an unnamed ridge in the far northern portion of the ACEC, about 19 mi (31 km) from the southeast corner of the SEZ. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is about 1,300 ft (400 m) higher in elevation than the SEZ. Solar facilities within the SEZ would be seen just below the Tule Hills. Despite the elevated viewpoint, because of the long distance to the SEZ, collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge on, which would reduce their apparent size, and would also cause them to appear to repeat the line of the valley floor in which the SEZ is located, tending to reduce visual contrast. The SEZ is far enough away from the viewpoint that it would occupy a small portion of the horizontal field of view. Operating power tower receivers within the SEZ would likely appear as distant points of light against the floor of the valley in which the SEZ is located, or against the base of the Tule Hills. If sufficiently tall, the power towers could have red or white flashing hazard navigation lighting that would likely be visible from this location at night. Despite the distance, the lighting could be noticeable, given the dark night skies typical of the remote SEZ location.

Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, weak visual contrasts from solar energy development within the SEZ could be expected at this viewpoint. Farther south from this viewpoint within the ACEC, the elevation rises rapidly, so that views of the SEZ would be elevated, which would tend to increase visual contrasts from solar facilities within the SEZ; however, the potentially increased contrast from increased viewing angle is offset by the increased distance to the SEZ, such that expected contrasts would not rise above weak levels for the higher elevation viewpoints. In general, under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would also be expected for viewpoints in the ACEC located within the SEZ 25-mi (40-km) viewshed.

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

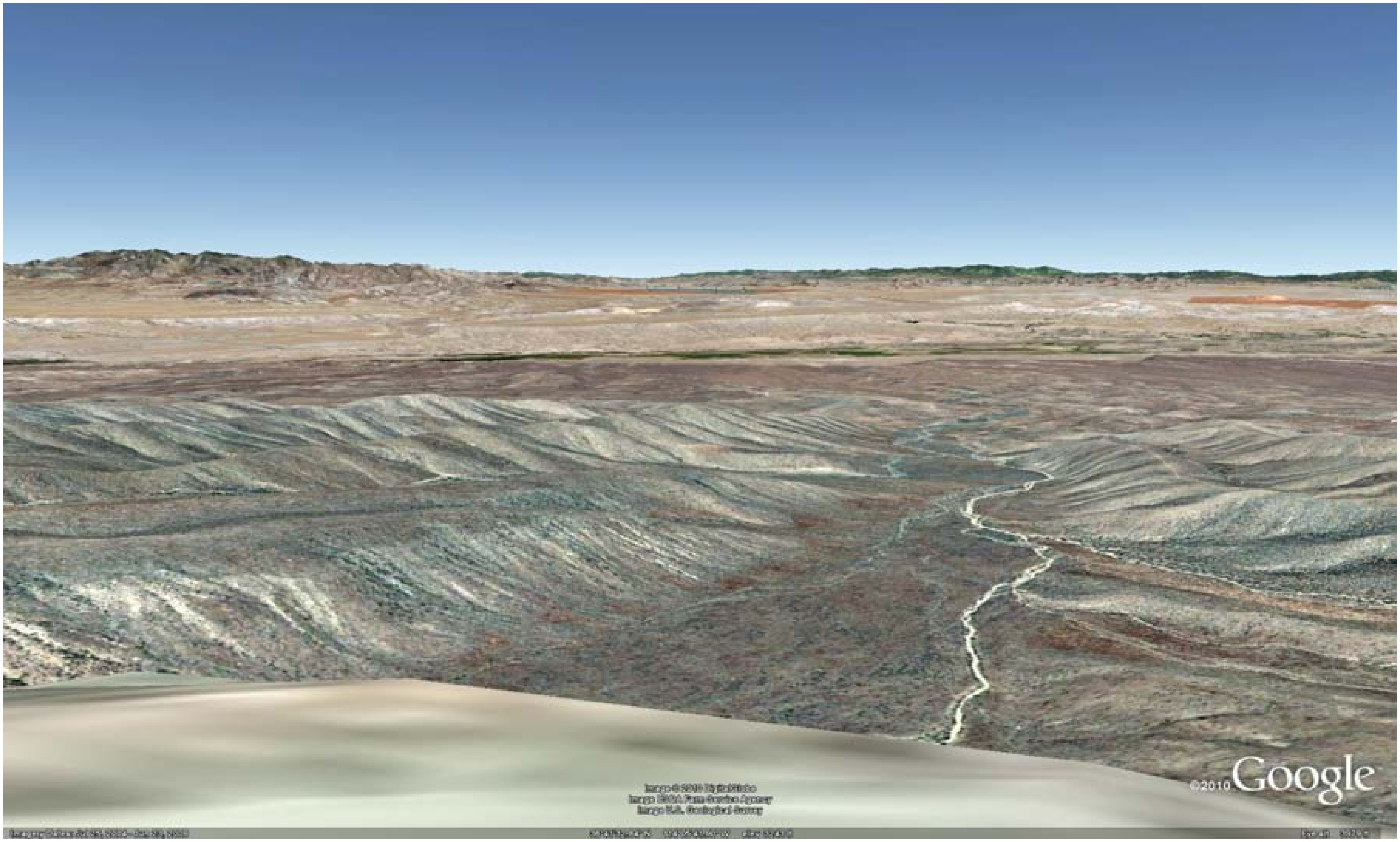

**FIGURE 11.5.14.2-12 Google Earth Visualization of the Proposed East Mormon Mountain SEZ (shown in orange tint with blue, at center background only) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Viewpoint in Virgin Mountains ACEC**

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. There is currently a 500-kV transmission line adjacent to the proposed SEZ, so construction and operation of a transmission line outside the proposed SEZ would not be required; however, transmission lines to connect facilities to the existing line would be required. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 500-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. Note that depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

**Impacts on Selected Other Lands and Resources**

***I-15.*** About 4 mi (6.4 km) of I-15 are within the SEZ viewshed in two segments. One segment a little more than 1 mi (1.6 km) long is located about 11 mi (18 km) south of the SEZ. Visibility of solar facilities within the SEZ in this segment would be limited to the upper portions of tall power towers; views would last less than 1 minute at highway speeds, and expected visual contrast levels would be minimal. The other segment (about 3 mi [5 km] in length) is located about 18 to 20 mi (29 to 32 km) east of the SEZ, east of Littlefield but west of the Beaver Dam Mountains. Visibility of solar facilities within the SEZ in this segment would also be limited to the upper portions of tall power towers. Views would last less than 3 minutes at highway speeds, and expected visual contrast levels would be minimal.

***U.S. 91.*** Almost 11 mi (18 km) of U.S. 91 are within the SEZ viewshed to the east of the SEZ in a stretch running north–south between 16 and 19 mi (26 and 31 km) east of the SEZ, between Littlefield and the Beaver Dam Mountains. Within the southernmost 6 mi (10 km) of the roadway within the viewshed, visibility would be limited to the upper portions of sufficiently tall power towers within the SEZ, and expected visual contrast levels in this portion of the segment would be minimal. The northern 5 mi (8 km) of the segment would have more or less open views of the SEZ, but at distances exceeding 16 mi (26 km) the SEZ would occupy a very small portion of the horizontal field of view, and the vertical angle of view would be very low. Visual contrast levels would be expected to be weak.

***Other Impacts.*** In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

##### *11.5.14.2.3 Summary of Visual Resource Impacts for the Proposed East Mormon Mountain SEZ*

Under the 80% development scenario analyzed in the PEIS, the SEZ would contain multiple solar facilities utilizing differing solar technologies, as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal, relatively uncluttered, and generally natural appearing landscape of the flat valley in which the SEZ is located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development within the proposed East Mormon Mountain SEZ because of major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within and outside the SEZ.

Under the 80% development scenario analyzed in this PEIS, utility-scale solar energy development within the proposed East Mormon Mountain SEZ is likely to result in strong visual contrasts for some viewpoints within the Mormon Mountains WA, which is within 2.4 mi (3.9 km) of the SEZ at the point of closest approach. Minimal to weak visual contrasts would be expected for some viewpoints within other sensitive visual resource areas within the SEZ 25-mi (40 km) viewshed.

Visitors to the area, workers, and residents of nearby communities may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel other area roads.

#### 11.5.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

The presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

While the applicability and appropriateness of some design features would depend on site- and project- specific information that would only be available after a specific solar energy project had been proposed, there is an SEZ-specific design feature that can be identified for the East Mormon Mountains SEZ at this time.

- The development of power tower facilities should be prohibited within the SEZ.

Application of the SEZ-specific design feature above would substantially reduce visual impacts associated with solar energy development within the SEZ and would substantially also reduce potential visual impacts on Mormon Mountains WA. Application of the SEZ-specific design feature would also reduce impacts on the other sensitive visual resource areas listed above.

## 11.5.15 Acoustic Environment

### 11.5.15.1 Affected Environment

The proposed East Mormon Mountain SEZ is located in the southeast corner of Lincoln County in southeastern Nevada. Neither the State of Nevada nor Lincoln County has established quantitative noise-limit regulations applicable to solar energy development.

The proposed East Mormon Mountain SEZ is generally isolated and undeveloped, and its overall character is considered wilderness to rural. No major roads are in proximity to the SEZ. I-15 runs east–west as close as 10 mi (16 km) to the south, and several dirt roads exist in and around the SEZ. A railroad runs north–south 14 mi (23 km) to the northwest. The nearest airport is Mesquite Airport, which is located about 12 mi (19 km) southeast of the SEZ, is under military airspace. The next nearest airport is Overton Municipal Airport, which is located about 27 mi (43 km) south-southwest of the SEZ. There are no agricultural activities in or around the SEZ, but cattle grazing occurs within the SEZ. A local transmission corridor with three large power transmission lines and at least one pipeline runs adjacent to the southeast side of the SEZ. No recreational land use is evident within the SEZ, but some quail and antelope hunting may occur. No sensitive receptors (e.g., residences, hospitals, schools, or nursing homes) exist close to the proposed East Mormon Mountain SEZ. The nearest residences lie about 9 mi (14.5 km) southeast of the SEZ, near Mesquite. Nearby towns include Bunkerville and Mesquite, which are located about 12 mi (19 km) south-southeast and southeast of the SEZ, respectively. Accordingly, noise sources around the SEZ include infrequent road traffic, aircraft flyover, cattle grazing, and possibly hunting. Considering noise sources in and around the SEZ, background noise levels are anticipated to be low.[10] An environmental noise survey has been conducted in the proposed SEZ, and noise levels range from 25 to 50 dBA (BLM 2009f). On the basis of the population density, the day–night average noise level ($L_{dn}$ or DNL) is estimated to be 18 dBA for Lincoln County, well below the range of 33 to 47 dBA $L_{dn}$ typical of a rural area (Eldred 1982; Miller 2002).[11]

### 11.5.15.2 Impacts

Potential noise impacts associated with solar projects in the East Mormon Mountain SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts on the nearest residences (about 9 mi [14.5 km] to the southeast of the SEZ boundary) associated with operation of heavy equipment would be minimal because of the considerable separation distance. During the operations phase, potential impacts on the nearest residences

[10] The Toquop natural gas–fired power plant is proposed within the southeastern corner of the SEZ (BLM 2009f). If this facility were built and operated, the noise level around the southeast corner of the SEZ would be industrial in character.

[11] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as $L_{dn}$ (Eldred 1982). Typically, the nighttime level is 10 dBA lower than the daytime level. This can be interpreted as 33 to 47 dBA (mean 40 dBA) during daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

would be anticipated to be minimal as well. If the proposed East Mormon Mountain SEZ were fully developed, potential noise impacts on residences along the roads from commuter, visitor, support, and delivery vehicular traffic to and from the SEZ would be minimal, compared with the current heavy traffic volume along I-15. However, some potential noise impacts on residences along local roads leading to the SEZ would be anticipated if construction-related vehicles travel through either Bunkerville or Mesquite. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed East Mormon Mountain SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional SEZ-specific design features applied (see Section 11.5.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

##### *11.5.15.2.1 Construction*

The proposed East Mormon Mountain SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area, where key components (e.g., steam turbine/ generator) needed to generate electricity are located; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background levels. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment, and by temperature lapse conditions typical of daytime hours; thus, noise attenuation to a 40-dBA level would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA $L_{dn}$ for residential areas (EPA 1974) would occur about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the residences closest to the southern SEZ boundary, estimated noise levels at the nearest residences would be about 17 dBA, which is well below the typical daytime mean rural background level of 40 dBA. In addition, an estimated 40 dBA $L_{dn}$ at these residences[12] (i.e., no

[12] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in a day–night average noise level ($L_{dn}$) of 40 dBA.

contribution from construction activities) is well below the EPA guidance of 55 dBA $L_{dn}$ for residential areas.

In addition, noise levels were estimated at the specially designated areas within a 5-mi (8-km) range of the East Mormon Mountain SEZ, which is the farthest distance at which noise, other than extremely loud noise, would be discernable. There are three specially designated areas within the range where noise might be an issue: Mormon Mesa ACEC, adjacent to the SEZ's southern boundary; Beaver Dam Slope ACEC, about 0.7 mi (1.1 km) east of the SEZ; and Mormon Mountains WA, about 2.3 mi (3.8 km) west of the SEZ. For construction activities occurring near the SEZ boundary close to the specially designated areas, noise levels are estimated to be approximately 74 and 47 dBA at the boundaries of the Mormon Mesa ACEC and Beaver Dam Slope ACEC, respectively, both of which are higher levels than the typical daytime mean rural background level of 40 dBA. As discussed in Section 5.10.2, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, construction noise from the SEZ is not likely to adversely affect wildlife at nearby specially designated areas, except in areas within Mormon Mesa ACEC directly adjacent to the construction site.

Depending on soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet, in contrast to the impulsive impact pile drivers frequently used at large-scale construction sites. Potential impacts on the nearest residences would be anticipated to be negligible, considering the distance to the nearest residences (about 9 mi [14.5 km] from the southern SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction within the proposed East Mormon Mountain SEZ would cause negligible unavoidable, but localized, short-term noise impacts on neighboring communities, even when construction activities occurred near the southern SEZ boundary, close to the nearest residences.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 500-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ and over a short distance (about 0.25 mi [0.4 km]) to the regional grid. Potential noise impacts on nearby residences would be a minor component of construction impacts in comparison to solar facility construction, and would be temporary in nature.

#### *11.5.15.2.2 Operations*

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area, commuter/visitor/support/delivery traffic within and around the solar facility, and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and firewater pump engines would be additional sources of noise, but their operation would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southern SEZ boundary, the predicted noise level would be about 22 dBA at the nearest residences, located about 9 mi (14.5 km) from the SEZ boundary, which is well below the typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[13]), the EPA guideline level of 55 dBA (as $L_{dn}$ for residential areas) would occur at about 1,370 ft (420 m) from the power block area, and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 40 dBA $L_{dn}$ (i.e., no contribution from facility operation) would be estimated, which is well below the EPA guideline of 55 dBA $L_{dn}$ for residential areas. However, day–night average noise levels higher than those estimated above by using simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed East Mormon Mountain SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[14] within 1 or 2 mi (1.6 or 3 km) of the noise source in

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[13] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

[14] A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are lowest. To estimate the day–night average noise level ($L_{dn}$), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residences (about 9 mi [14.5 km] from the SEZ boundary) would be 32 dBA, which is somewhat higher than the typical nighttime mean rural background level of 30 dBA. The day–night average noise level is estimated to be about 41 dBA $L_{dn}$, which is still well below the EPA guideline of 55 dBA $L_{dn}$ for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 41 dBA $L_{dn}$ at the nearest residences, even if TES were used at a solar facility. Consequently, operating parabolic trough or power tower facilities using TES and located near the southern SEZ boundary would result in minimal adverse noise impacts on the nearest residences, depending on background noise levels and meteorological conditions

Associated with operation of solar facilities located near the southern SEZ boundary and using TES, the estimated daytime level of 51 dBA at the boundary of the Mormon Mesa ACEC is higher than the typical daytime mean rural background level of 40 dBA, while the estimated nighttime level of 61 dBA is much higher than the typical nighttime mean rural background level of 30 dBA. For a solar facility located near the eastern SEZ boundary, daytime and nighttime noise levels at the Beaver Dam Slope ACEC are estimated to be 43 and 53 dBA, respectively. However, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988); thus, operations noise from solar facilities with TES is not likely to adversely affect wildlife at the nearby specially designated areas.

In the permitting process, refined noise propagation modeling might be warranted, along with measurement of background noise levels.

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the proposed East Mormon Mountain SEZ, on the basis of the assumption of dish engine facilities of up to 797-MW total capacity (covering 80% of the total area, or 7,174 acres [29.0 km$^2$]), up to 31,890 25-kW dish engines could be employed. For a large dish engine facility, several hundred step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, about 50 dBA at 1.0 mi (1.6 km) and 46 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field, for example; both values are higher than the typical daytime mean rural background level of 40 dBA. However, these levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed dish engines were placed all over the East Mormon Mountain SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residences, about 9 mi (14.5 km) southeast of the SEZ boundary, would be about 33 dBA, which is below the typical daytime mean rural background level of 40 dBA. On the basis of 12-hr daytime operation, the estimated 40 dBA $L_{dn}$ at these residences (i.e., no contribution from dish engines) is well below the EPA guideline of 55 dBA $L_{dn}$ for residential areas. On the basis of other noise attenuation mechanisms, noise levels at the nearest residences would be lower than the values estimated above. Accordingly, noise from dish engines is not anticipated to cause adverse impacts on the nearest residences, irrespective of background noise levels and meteorological conditions.

For dish engines placed all over the SEZ, estimated noise levels would be about 59 and 50 dBA at the boundaries of the Mormon Mesa ACEC and Beaver Dam Slope ACEC, respectively, both of which are higher levels than the typical daytime mean rural background level of 40 dBA. However, dish engine noise from the SEZ is not likely to adversely affect wildlife at the nearby specially designated areas (Manci et al. 1988), as mentioned above.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the proposed East Mormon Mountain SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be negligible.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and not be heard at the nearest residences, assuming a 9.5-mi (15-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 9 mi [14.5 km] to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be negligible.

For impacts from transmission line corona discharge noise during rainfall events (Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line tower would be about 39 dBA and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. The noise levels at 65 ft (20 m) and 300 ft (91 m) from the center of 500-kV transmission line towers would be about 49 dBA and 42 dBA, typical of high-end and mean, respectively, daytime background noise levels in rural environments. Corona noise includes high-frequency components, which may be judged to be more annoying than other environmental noises. However, corona noise would not likely cause impacts, unless a residence were located close to the source (e.g., within 500 ft [152 m] of a 230-kV transmission line and 0.5 mi [0.8 km] of a 500-kV transmission line). The proposed East Mormon Mountain SEZ is located in an arid desert environment, and incidents of corona discharge would be infrequent. Therefore, potential impacts on nearby residents along the transmission line ROW would be negligible.

#### *11.5.15.2.3 Decommissioning/Reclamation*

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, as well as disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction, but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minimal and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus negligible.

### 11.5.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. Due to the considerable separation distances, activities within the proposed East Mormon Mountain SEZ during construction and operation would be anticipated to cause only minimal increases in noise levels at the nearest residences and to have minor impacts on nearby specially designated areas. Accordingly, SEZ-specific design features are not required.

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## 11.5.16 Paleontological Resources

### 11.5.16.1 Affected Environment

The surface geology of the proposed East Mormon Mountain SEZ is predominantly thick alluvial deposits (more than 100 ft [30 m] thick), ranging in age from the Pliocene to Holocene, with some discontinuous residual deposits developed in sedimentary rocks in the eastern portion of the SEZ. The total acreage of the alluvial deposits include 8,736 acres (35 $km^2$), or more than 97% of the proposed SEZ, and the total acreage of the residual materials is 228 acres (0.9 $km^2$), or 2.5% of the SEZ. Minimal deposits of residual materials developed in fine-grained sedimentary rocks and in igneous and metamorphic rocks occur in the northeast and southwest corners of the SEZ, respectively. These deposits total no more than 2 acres (0.008 $km^2$) each. In the absence of a PFYC map for Nevada, a preliminary classification of PFYC Class 2 is assumed for the young Quaternary alluvial deposits and the residual materials in sedimentary rocks, similar to that assumed for the Amargosa Valley SEZ (Section 11.1.16; see Section 4.14 for a discussion of the PFYC system). Class 2 indicates a low potential for the occurrence of significant fossil material. Volcanic deposits are typically PFYC Class 1, which indicates that the occurrence of significant fossil materials is nonexistent or extremely rare.

### 11.5.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in the proposed East Mormon Mountain SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above and are classified as PFYC Class 2 or lower, further assessment of paleontological resources in the SEZ is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found to be present within the proposed East Mormon Mountain SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely, because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new transmission lines are currently anticipated for the proposed East Mormon Mountain SEZ, assuming an existing corridor would be used, but approximately 11 mi (18 km) of a new access road corridor to connect to the nearest interstate is assessed in this PEIS. Approximately 80 acres (0.3 $km^2$) of disturbance is expected as a result of road construction. The access road corridor would likely be in thick alluvial deposits similar to the SEZ, and would be less likely to impact paleontological resources (preliminary classification of PFYC Class 2). However, depending on the exact location of the access road, some deposits of residual materials developed in carbonate rocks are possible within the corridor, and the potential for paleontological deposits is unknown in these areas. A preliminary classification of PFYC Class 3b is assumed for the residual deposits. A more detailed investigation of the residual deposits is needed prior to project approval. A paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007a, 2008b). Impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

#### 11.5.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features as described in Appendix A, Section A.2.2.

The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations, especially along a potential new access road corridor; however, based on the current level of information, a need for mitigation of areas potentially classified as PFYC Class 2 or lower is not anticipated.

## 11.5.17 Cultural Resources

### 11.5.17.1 Affected Environment

#### *11.5.17.1.1 Prehistory*

The proposed East Mormon Mountain SEZ is located in the northeastern portion of the Mojave Desert, within the basin and range province in eastern Nevada. The earliest known human use of the area was likely during the Paleoindian Period, sometime between 12,000 and 10,000 years B.P. Surface finds of Paleoindian fluted projectile points, the hallmark of the Clovis culture, have been found in the area, but no sites with any stratigraphic context have been excavated. The Clovis culture is characterized by the aforementioned fluted projectile point and a hunting and gathering subsistence economy that followed migrating herds of Pleistocene mega fauna. The Iola site, located on the western side of the Meadow Valley Mountains in the Kane Spring Valley, about 26 mi (42 km) to the west, is one of the closest Paleoindian sites to the proposed East Mormon Mountain SEZ (BLM 2007c). The ephemeral nature of Paleoindian occupation in the Great Basin has given rise to the idea that Paleoindians may have been inclined to subsist off of the lake and marsh habitats provided by the ancient Pleistocene pluvial lakes that occupied a large portion of the Great Basin; consequently, the sites are difficult to find, because they have been buried by the ebb and flow of the pluvial lakes. This slightly later cultural material associated with the pluvial lake habitations is referred to as the Western Pluvial Lakes Tradition or Lake Mohave cultural complex. It is likely that people from this tradition did not rely entirely on marsh habitats, but were nomadic hunters and gatherers who relied on both wetland resources and those resources located in upland areas. The archaeological assemblage associated with this cultural tradition is characterized by stemmed projectile points, leaf-shaped bifaces, scrapers, crescents, and in some cases groundstone tools for milling plant material. Often the projectile points and tools were made from locally procured obsidian, sources of which were not far from the proposed East Mormon Mountain SEZ; two sources are in Kane Spring Valley and another source is in the Meadow Valley Mountains, about 20 mi (32 km) to the west. Collecting obsidian and other raw materials for tool manufacture, in addition to exploiting different ecological niches for various subsistence resources, was a part of a larger resource exploitation system, in which groups moved in seasonal rounds to take advantage of specific resources in different localities (Jones et al. 2003; Haarklau et al. 2005; Fowler and Madsen 1986).

The Archaic Period in the region began with the recession of most of the pluvial lakes in the area, around 8,000 to 6,000 B.P. Archaic Period groups likely still congregated around the marsh areas but also made use of the vast caves that can be found in the mountains of the Great Basin. The settlement system in some areas was likely based around a central base camp, with temporary camps located on the margins of the territory to exploit resources that were not in the immediate vicinity of the base camp. Other groups may not have had a central base, but were mobile “travelers” rather than “processors” (Jones et al. 2003). Some of the key Archaic sites in the area near the proposed East Mormon Mountain SEZ are Stuart Rockshelter in the lower Meadow Valley Wash area, and Etna Cave, Conaway Shelter, and O’Malley Shelter in the upper portion of the Meadow Valley Wash area. The Archaic archaeological assemblages from these sites maintain some cultural continuity with the previous period; they consist of Pinto points, leaf-shaped bifaces, scrapers, drills, gravers, and manos and metates (Fowler and Madsen 1986).

The Middle Archaic Period, 4,000 to 1,500 B.P., saw the climatic shift known as the Little Pluvial, a wetter and cooler climate that caused some of the pluvial lakes to fill back up. The cultural material of this time period is similar to the Early Archaic, with an increased concentration of milling stones, mortars, and pestles, and the appearance of normally perishable items, such as wicker baskets, split-twig figurines, duck decoys, and woven sandals (Neusius and Gross 2007).

In the vicinity of the proposed East Mormon Mountain SEZ, the Late Archaic Period began around 1,500 B.P. and extended until contact with European explorers. This period saw major technological shifts, evidenced by changes in subsistence techniques, particularly in the use of horticulture, and by smaller projectile points that were more useful because groups began using bow-and-arrow technology instead of the atlatl. During this time period in the Muddy and Virgin River valleys, most groups were a part of the Virgin Anasazi cultural group, an extension of the Puebloan groups from the southwest into the Great Basin region. These groups brought with them the knowledge of horticulture, which they practiced on the floodplains of the river valleys they inhabited. Pueblo Grande de Nevada, located near Overton, Nevada, 31 mi (50 km) south of the SEZ, is a prime example of the Virgin Anasazi culture in the vicinity of the SEZ. The South Fork and Toquop Wash areas in the SEZ may have provided a locale that would have been attractive to Virgin Anasazi groups. Characteristic of this period are Anasazi grey-ware ceramics (sometimes decorated), rock art and intaglios, bedrock milling features, and turquoise mining. Several prehistoric rock alignments have been documented in the proposed East Mormon Mountain SEZ, and there are 9 additional rock alignment sites within 5 mi (8 km) of the SEZ. The Virgin Anasazi groups left the region around 1,000 B.P., at which time Numic-speaking groups migrated into the region, but the exact timing of these events is a subject for further research. These Numic-speaking people were the descendents of the Southern Paiute, and the archaeological assemblage associated with this time period consists of Desert series projectile points, brown-ware ceramics, unshaped manos and milling stones, incised stones, mortars, pestles, and shell beads. The following section describes the cultural history of the time period in greater detail.

#### *11.5.17.1.2 Ethnohistory*

The proposed East Mormon Mountain SEZ is located in the heart of the traditional use area of the Southern Paiute. It falls within the territory of the *Paranayi*, or western subtribe, but is close to the lands of the *Yanawant*, or eastern subtribe (Stoffle et al. 1997). It is situated along the Toquop Wash about 13 mi (21 km) upstream from the Virgin River. The Virgin River and its tributaries form the single most important ribbon oasis in Southern Paiute Territory (Stoffle and Dobyns 1983). The proposed SEZ lies in the area where the traditional ranges of the Moapa and the Panaca Bands meet and is close to the territory of the St. George Band (Kelly 1934; Kelly and Fowler 1986). Southern Paiute groups tended to be wide ranging and often shared resources. It is thus likely that neighboring bands were familiar with the area as well. The core settlement and activity areas of the Moapa Band were along the Moapa or Muddy River and the Virgin River. The Panaca Band was centered in Meadow Valley, about 14 mi (23 km) northeast of the proposed SEZ. The St. George Band was centered farther up the Virgin River and on the lower reaches of Santa Clara Creek, about 33 mi (54 km) east-northeast of the proposed SEZ (Kelly 1934).

**Southern Paiute**

A general account of the Southern Paiutes is given in Section 11.1.17.1.2. This section deals primarily with those Southern Paiutes associated with the Moapa and Virgin Rivers and their neighbors. The Southern Paiute practiced a mixed subsistence economy. They established home bases along the ribbon oases formed by the few streams in the area, maintaining both floodplain and irrigated agricultural fields. They also husbanded wild plants through transplanting, pruning, burning, and irrigation (Stoffle and Dobyns 1983). Seasonally, these groups left their base camps to seek wild plant resources as they became available (Kelly and Fowler 1986). The Southern Paiute supplemented their food supply by hunting and fishing (Kelly and Fowler 1986). Although there are springs in the adjacent hills, the proposed East Mormon Mountain SEZ is arid and Toquop Wash is intermittent. Scatters of lithic and ceramic artifacts, along with stone circles, suggest that Native Americans made use of the area for temporary foraging activities.

The sixteenth-century arrival of Europeans in the southwest initially had indirect, although serious, effects on the Southern Paiutes. The Southern Paiute bands suffered from the spread of Old World diseases and the depredations of the slave trade that supplied Spanish and Mexican markets. The Southern Paiutes retreated from areas such as those along the Old Spanish Trail, where there was an increased presence of Euro-American travelers. In the mid-nineteenth century, the Southern Paiute in Nevada were further displaced by Euro-American settlers, who sought the same limited water supplies the southern Paiutes used Mormon settlers established the "Cotton Mission" on the Virgin River at St. George, Utah, in 1861. As Euro-American settlements grew, the Southern Paiute were drawn into the new economy, often serving as transient wage labor. Settlements or colonies of laborers grew up around Euro-American settlements, farms, and mines, often including individuals from across the Southern Paiute homeland (Kelly and Fowler 1986). A Southern Paiute group had formed around St. George by 1868 (Stoffle and Dobyns 1983).

In 1865, an initial attempt by the U.S. government to settle the Southern Paiutes in northeastern Utah among their traditional enemies, the Utes, failed. The Moapa River Reservation was established in 1875 with the intent of settling all Southern Paiutes there, although the original reservation as authorized by President Ulysses S. Grant was severely reduced by Congress to 1,000 acres (4 $km^2$) of mostly unirrigable land. Nonetheless, limited commercial farming was established. Though plagued by disease and poor water, the reservation slowly became more prosperous, attracting Southern Paiutes from a variety of bands. Capitalizing on its share of a judgment awarded by the Indian Claims Commission, and the restoration in 1980 of part of the original reservation, Moapa River Reservation has continued to develop into a center of Southern Paiute activity (Stoffle and Dobyns 1983). In 1891, a small reservation was established southwest of St. George for the Shivwits Band. Members of the St. George Band made their way there, and by the end of the century Southern Paiutes no longer farmed along the Santa Clara River. In the first decades of the twentieth century, small reservations were created for the Indian Peak, Koosharem, Kanosh, and Kaibab Bands, and the Southern Paiute colony at Cedar City, Utah, had acquired a small land base. Members of the Panaca Band tended to join the Indian Peak reservation. Where feasible, the Southern Paiute farmed or ranched on these reservations, but mostly the Paiutes served as wage laborers, sometimes travelling great distances. This mobile lifestyle allowed the various bands to retain social and ceremonial ties with one another. In 1954, the four Utah reservations were terminated by the Federal Government and their lands distributed among Tribal members, resulting in the loss of much of the land. The Southern Paiute successfully filed claims with the Indian Claims Commission in the same decade. In 1980, the Paiute Indian Tribe of Utah was created from the terminated Utah bands and the Cedar City colony and restored to federal trust status (Stoffle and Dobyns 1983; Kelly and Fowler 1986).

#### *11.5.17.1.3 History*

The earliest documented European presence in the Great Basin region was the Dominguez-Escalante Expedition that began in July of 1776.[15] Two Catholic priests, Fathers Francisco Atanasio Dominguez and Silvestre Velez de Escalante, were looking for a route from the Spanish capital city of Santa Fe to the Spanish settlement of Monterey on the California coast. The group did not initially complete their goal of reaching California. They turned back to Santa Fe when the weather got too bad; however, the maps and journals describing their travels and encounters would prove valuable to later expeditions that traversed the area. These included Spanish/New Mexican traders and Anglo-American fur trappers traveling the Old Spanish Trail in the 1820s and 1830s (BLM 1976).

The Old Spanish National Historic Trail was an evolving trail system generally established in the early nineteenth century. It tended to follow previously established paths used by earlier explorers like Dominguez and Escalante, but also followed those established by Native Americans. Due to a desire to avoid hostile Indian Tribes, as well as natural land formations such as the Grand Canyon, the trail is not a direct route. Several forks and cutoffs were established as more and more travelers made use of the trail system. The 2,700-mi (4,345-km) trail network crosses through six states, and includes various paths between Santa Fe and Los Angeles. It was used primarily between 1829 and 1848 by New Mexican traders exchanging textiles for horses. In 1829, while following the Old Spanish Trail, Antonio Armijio found an oasis that served as a crucial stopping point along the trail. This oasis was named Las Vegas, Spanish for "The Meadows." By utilizing this oasis, groups traveling on the trail were able to significantly shorten their trip through the harsh desert (Fehner and Gosling 2000). The Old Spanish National Historic Trail is a congressionally designated route; consequently, the trail, trail resources, and setting must be managed in accordance with the National Trail System Act. The closest section of the trail passes about 12 mi (19 km) to the south and east of the

[15] Although it was technically illegal, traders from New Spain (New Mexico) would travel north to acquire Native American slaves for New Mexican settlers from at least the mid-1700s.

proposed East Mormon Mountain SEZ as it follows the Virgin River. A portion of the congressionally designated trail about 15 mi (24 km) southwest of the SEZ near Littlefield, Utah, has been designated a high-potential segment.

With the ratification of the Treaty of Guadalupe Hidalgo in 1848 closing out the Mexican-American War, the area came under American control. In 1847, the first American settlers arrived in the Great Basin, among them Mormon immigrants under the leadership of Brigham Young, who settled in the Valley of the Great Salt Lake in Utah. They sought to bring the entire Great Basin under their control, establishing an independent State of Deseret. From its center in Salt Lake City, the church sent out colonizers to establish agricultural communities in surrounding valleys and missions to acquire natural resources such as minerals and timber. Relying on irrigation to support their farms, the Mormons often settled in the same places as the Fremont and Virgin Anasazi centuries before. The result was a scattering of planned agricultural communities from northern Arizona to southern Idaho and parts of Wyoming, Nevada, and southern California. In 1855, Brigham Young sent 30 men, led by William Bringhurst, to the Las Vegas valley, southwest of the proposed East Mormon Mountain SEZ, in an effort to establish a mission in the southern portion of Nevada. They called their mission Las Vegas Fort, but only stayed in the area for a few years before abandoning the mission because of the harsh climate and the closing of the nearby Potosi mine that provided the majority of the income and patronage at the mission. About 30 mi (48 km) north of the proposed East Mormon Mountains SEZ was a small Mormon settlement, Clover Valley, where Mormons farmed and raised stock beginning in the late 1860s. Neighboring Washington County in Utah was home to the Mormon Cotton Mission, an area that was intensively cultivated for the procurement of cotton in the early 1860s in an effort to allow the Mormons to become more self-sufficient (Paher 1970; Fehner and Gosling 2000).

Nevada's nickname is the "Silver State," so named for the Comstock Lode strike near Virginia City in 1859, about 280 mi (451 km) northwest of the proposed East Mormon Mountain SEZ. This was the first major silver discovery in the United States, and with the news of the strike hopeful prospectors flocked to the area in an effort to capitalize on the possible wealth under the surface of the earth. The discovery of the Comstock Lode led to the creation of Virginia City and other nearby towns that served the burgeoning population. The population increase due to mining was so dramatic that while in 1850 there were less than a dozen non-native people in the State of Nevada, by 1860 there were 6,857, and by 1875 an estimated 75,000 people had settled in the state. The Comstock Lode strike is important to the history of Nevada, not just because of the population growth and significant amount of money that was consequently brought to the area, but also because of technological innovations that were created and employed in the mines. The use of square-set timbering, which kept loose soil from collapsing on miners, was one concept that was eventually employed in other mines around the world (Paher 1970).

Mining for valuable deposits occurred in all regions of the state of Nevada, including in the vicinity of the proposed East Mormon Mountain SEZ. The most notorious mining district in Lincoln County was Pioche, about 65 mi (105 km) north of the proposed East Mormon Mountain SEZ. Pioche was a violent, Wild West town that was one of the most prosperous districts in the county. The closest mining district to the proposed SEZ was the Gourd Spring Mining District.

Located on the eastern slopes of the East Mormon Mountains, this mine produced tungsten, barite, gypsum, and magnesium. Other notable mines near the SEZ were the Whitmore mine in the Mormon Mountains to the west, the Key West Mine, a copper mine near Glendale, Nevada, the Viola and Vigo Mining Districts in the Clover Mountains to the north of the SEZ, and the Delamar Mine about 45 mi (72 km) northwest of the SEZ, which accounted for over half of the state's ore output during the down years at the turn of the nineteenth century. Mining today is not a major concern in the area, and the mineral production was never sufficient to attract large numbers of miners to the area or allow them to construct any permanent camps; most of the camps in the vicinity of the SEZ were temporary and short lived. The construction of railroads in Nevada was often directly related to the mining activities that occurred in the state; the San Pedro–Los Angeles–Salt Lake Railroad acted as a stimulant to the depraved mining economy with its construction in 1905. The still-used railroad runs through the Meadow Valley Wash area, about 20 mi (32 km) to the west of the proposed East Mormon Mountain SEZ (Paher 1970; Tingley 1998; Rusco and Muñoz 1983).

Nevada's desert-mountain landscape has made it a prime region for use by the U.S. government for several decades. In October of 1940, President Franklin D. Roosevelt established the Las Vegas Bombing and Gunnery Range, a 3.5-million-acre (14,000-$km^2$) parcel of land northwest of Las Vegas, near Indian Springs, Nevada, 82 mi (132 km) southwest of the SEZ. At the start of the Cold War in 1948, the range was renamed the Nellis Air Force Base; three years later, the Nevada Test Site (NTS), a U.S. Department of Energy facility, was established within Nellis Air Force Base. For the next 41 years, testing of nuclear weapons occurred throughout regions of the NTS, in addition to regular Air Force training missions. Although the proposed East Mormon Mountain SEZ does not fall within the specific boundaries of these government installations, they are important contributors to the overall history and context of the region.

#### *11.5.17.1.4 Traditional Cultural Properties—Landscape*

The Southern Paiutes have traditionally taken a holistic view of the world, in which the sacred and profane are inextricably intertwined. According to their traditions, they were created in their traditional use territory and have a divine right to the land, along with a responsibility to manage and protect it. Landscapes as a whole are often culturally important. An adverse effect on one part diminishes the rest (Stoffle 2001). From a Southern Paiute perspective, landscapes include places of power. Among the most important such places are sources of water; peaks, mountains, and elevated features; caves; distinctive rock formations; and panels of rock art. Places of power are important to the religious beliefs of the Southern Paiute. They may be sought out for individual vision quests or healing and may also be associated with culturally important plant and animal species. The view from such a point of power or the ability to see from one important place to another can be an important element of its integrity (Stoffle and Zedeño 2001b). Landscapes as a whole are tied together by a network of culturally important trails (Stoffle and Dobyns 1983; Stoffle and Zedeño 2001a).

The proposed East Mormon Mountain SEZ is located in an arid area bisected by Toquop Wash. Scattered archaeological remains of Native American activities within the SEZ suggest that they foraged there. The area was in reach of Southern Paiute base camps, or rancherias, located along the Virgin and Santa Clara Rivers and Meadow Valley Wash. Springs, rock shelters, caves, petroglyphs, and pictographs have been found in the East Mormon Mountains to the west of the proposed SEZ, forming a cultural landscape potentially important to the Southern Paiute. The Salt Song Trail, ritually of great importance to the Southern Paiute, approaches this part of Nevada (BLM 2009f). Consultation with affected Tribes will be necessary to determine whether it will be affected by the development of solar facilities in the proposed SEZ. Descendants of the Moapa, Panaca, and St. George Bands have placed high cultural importance on springs, burial sites, religious sites, trails, shrines, and rock art (Stoffle and Dobyns 1983).

#### *11.5.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources*

The proposed East Mormon Mountain SEZ has had seven surveys conducted within its boundaries, encompassing 78 acres (0.31 $km^2$) and covering 0.9% of the SEZ. An additional 41 surveys have been conducted within 5 mi (8 km) of the SEZ. These surveys have resulted in the recording of four sites within the proposed East Mormon Mountain SEZ and 45 sites within 5 mi (8 km) of the SEZ boundary. The four sites located in the proposed East Mormon Mountain SEZ are all prehistoric in nature; three of the sites are rock alignments and one is a lithic scatter; the sites were determined not to be eligible for listing in the NRHP (de Dufour 2009).

Most of the sites (37 of 45) that have been documented within 5 mi (8 km) of the SEZ are prehistoric, and the remaining eight sites are historic. At least 11 of these 45 sites are potentially eligible for listing in the NRHP. Most of the prehistoric sites are rock shelters, roasting pits, or rock alignments, and the historic sites are either trash scatters or road features (de Dufour 2009).

A portion of the congressionally designated Old Spanish National Historic Trail passes about 12 mi (19 km) to the south of the proposed East Mormon Mountain SEZ, as the trail follows the Virgin River. Some portions of this congressionally designated trail are high potential segments; they are located approximately 15 mi (24 km) to the southeast of the proposed SEZ.

The proposed East Mormon Mountain SEZ has the potential to contain significant cultural resources, in addition to the four previously mentioned sites. The areas near the South Fork and Toquop Wash could have provided temporary sources of water. Petroglyphs have been documented on the eastern portion of the East Mormon Mountains and in the Toquop Gap area, indicating that the area was used by indigenous groups throughout the course of the history of the region.

The BLM has designated an ACEC in the vicinity of the proposed East Mormon Mountain SEZ to protect cultural resource values. This is the Virgin River ACEC 12 mi (19 km) to the south of the SEZ, portions of which are also located in nearby Arizona and maintained by the Arizona Strip Field Office. There are several other ACECs with important cultural resources in the area, but they are more than 25 mi (40 km) from the SEZ.

*National Register of Historic Places*

There are no sites listed in the NRHP in the proposed East Mormon Mountain SEZ, or within 5 mi (8 km); however, the aforementioned 11 sites that are located within 5 mi (8 km) of the SEZ are considered potentially eligible.

Several sites listed in the NRHP are located in the Mesquite and Bunkerville areas, communities situated about 12 mi (19 km) to the south of the proposed East Mormon Mountain SEZ, along the Virgin River in neighboring Clark County. These sites include the Desert Valley Museum and the Mesquite High School Gymnasium, in Mesquite, and the Hunt, Parley House and Levitt, Thomas House in Bunkerville, as well as the Old Spanish National Historic Trail. Lincoln County maintains nine properties in the NRHP, all of which are farther than 25 mi (40 km) away from the proposed SEZ. Three of the properties are archaeological sites between 45 and 75 mi (72 and 121 km) from the SEZ; the Black Canyon Petroglyph Site in the Pahranagat National Wildlife Refuge west of the SEZ, the Panaca Summit Archaeological District north of the SEZ, and the White River Narrows Archaeological District northwest of the SEZ. The other six properties are historic sites near the towns of Caliente and Pioche.

### 11.5.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed East Mormon Mountain SEZ; however, further investigation is needed in a number of areas. A cultural resources survey of the entire APE of a proposed project would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP. The proposed East Mormon Mountain SEZ has a high potential for containing archaeological sites in the South Fork and Toquop Wash areas. Possible impacts from solar energy development on cultural resources that are encountered within the SEZ or along related ROWs are described in more detail in Section 5.15. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

Programmatic design features to reduce water runoff and sedimentation would reduce the likelihood of indirect impacts on cultural resources resulting from erosion outside of the SEZ boundary (including along ROWs). No needs for new transmission lines have currently been identified, assuming an existing line would be used. An access road would need to be constructed to the SEZ, the closest road being I-15, about 11 mi (18 km) to the south. The construction of this road would result in the disturbance of approximately 80 acres (0.32 $km^2$). Impacts on cultural resources are possible in areas related to the access road, since new areas of potential cultural significance could be directly impacted by construction or opened to increased access due to road construction and use. Indirect impacts are also possible from unauthorized collection of artifacts or vandalism, depending on the proximity of the road to historic properties. Impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

The congressionally designated Old Spanish National Historic Trail and aforementioned NRHP sites in the Mesquite/Bunkerville area are located south of the proposed East Mormon Mountain SEZ, and would likely not be physically affected by solar development in the SEZ. However, these cultural resources could be affected from a visual standpoint, although the Flat Top Mesa would probably screen or block the view of the solar development from the southeast portion of the SEZ. The rock art sites that are located on the eastern portions of the East Mormon Mountains and in the Toquop Gap area could potentially be affected. Depending on the significance of these sites and whether they are considered sites of traditional cultural importance, there is a potential for visual and auditory effects on these locations as a result of solar energy development in the proposed SEZ.

#### 11.5.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features, cultural awareness training for the workforce, and measures for addressing possible looting/vandalism issues through formalized agreement documents, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

- Avoidance of the South Fork and Toquop Wash areas is recommended because these areas have a higher potential for containing significant sites.

- Coordination with the Trail Administration for the Old Spanish Trail and Old Spanish Trail Association is recommended to identify potential mitigation strategies for avoiding or minimizing potential impacts, if impacts are identified in future studies, on the congressionally designated Old Spanish National Historic Trail.

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## 11.5.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns that are specific to Native Americans or to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. Topics of general concern are addressed in Section 4.16. Specifically for the proposed East Mormon Mountain SEZ, Section 11.5.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 11.5.8 discusses mineral resources; Section 11.5.9.1.3 discusses water rights and water use; Section 11.5.10 discusses plant species; 11.5.11 discusses wildlife species, including wildlife migration patterns; Section 11.5.13 discusses air quality; Section 11.5.14 discusses visual resources; Sections 11.5.19 and 11.5.20 discuss socioeconomics and environmental justice, respectively. Issues of human health and safety are discussed in Section 5.21.

### 11.5.18.1 Affected Environment

The proposed East Mormon Mountain SEZ is within the Tribal traditional use area generally attributed to the Southern Paiute (Kelly and Fowler 1986). All federally recognized Tribes with Southern Paiute roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 11.5.18.1-1. Details of government-to-government consultation efforts are presented in Chapter 14; a listing of all federally recognized Tribes contacted for this PEIS is provided in Appendix K.

**TABLE 11.5.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed East Mormon Mountain SEZ**

| Tribe | Location | State |
|---|---|---|
| Chemehuevi Indian Tribe | Lake Havasu | California |
| Kaibab Paiute Tribe | Fredonia | Arizona |
| Las Vegas Paiute Tribe | Las Vegas | Nevada |
| Moapa Band of Paiutes | Moapa | Nevada |
| Pahrump Paiute Tribe | Pahrump | Nevada |
| Paiute Indian Tribe of Utah | Cedar City | Utah |
| Cedar Band | Cedar City | Utah |
| Indian Peak Band | Cedar City | Utah |
| Kanosh Band | Kanosh | Utah |
| Koosharem Band | Cedar City | Utah |
| Shivwits Band | Ivins | Utah |
| San Juan Southern Paiute Tribe | Tuba City | Arizona |

#### *11.5.18.1.1 Southern Paiute Territorial Boundaries*

The traditional territory of the Southern Paiute lies mainly in the Mojave Desert, stretching from California to the Colorado Plateau. It generally follows the northern and western banks of the Colorado River, including its tributary streams and canyons in southern Nevada and Utah. It includes most of Clark and Lincoln Counties in Nevada and extends as far north as Beaver County in Utah (Kelly and Fowler 1986). Most of their traditional range, including the lands for the proposed East Mormon Mountain SEZ, has been judicially recognized as the traditional use area of the Southern Paiute by the Indian Claims Commission (Royster 2008).

#### *11.5.18.1.2 Plant Resources*

The Southern Paiutes continue to make use of a wide range of indigenous plants for food, medicine, construction materials, and other uses. The vegetation present at the proposed East Mormon Mountain SEZ is described in Section 11.5.10. The cover type present at the SEZ is almost entirely Sonora–Mojave Creosotebush–White Bursage Desert Shrub, with small pockets of North American Warm Desert Playa (USGS 2005a). The proposed SEZ is sparsely vegetated, at least in part because much of it burned in 2005. The deeply cut Toquop Wash runs diagonally from northwest to southeast across the proposed SEZ. Smaller tributary washes cross much of the SEZ. Creosotebush and white bursage are the dominant species; of these, creosotebush has Native American medicinal uses. As shown in Table 11.5.18.1-2, there are likely to be some plants used by Native Americans for food in the SEZ (Stoffle et al. 1999; Stoffle and Dobyns 1983). Project-specific analyses will be needed to determine the presence of these plants at any proposed building site. Traditional plant knowledge is found most abundantly among Tribal elders, especially female elders (Stoffle et al. 1999).

#### *11.5.18.1.3 Other Resources*

Members of the Moapa Band of the Southern Paiutes rate springs as the most important cultural resource in their cultural landscape. Water is an essential prerequisite for life in the arid areas of the Great Basin. As a result, water is a keystone of desert cultures' religion. They consider all water sacred and a purifying agent. Water sources are often associated with rock art. Springs are often associated with powerful beings, and hot springs in particular figure in Southern Paiute creation stories. Water sources are seen as connected, so damage to one damages all (Fowler 1991; Stoffle and Zedeño 2001a). Tribes are also sensitive regarding the use of scarce local water supplies for the benefit of far-distant communities and recommend determination of adequate water supplies as a primary consideration in determining whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

Wildlife likely to be found in the proposed East Mormon Mountain SEZ is described in Section 11.5.11. Although now restricted, in the past, the hunting of sheep was an important part of Southern Paiute culture and had religious significance, as reflected in the many panels of sheep petroglyphs found throughout Southern Paiute territory. Bighorn sheep are present in the East Mormon Mountains and Mormon Mountains of the SEZ and in the Tule Spring Hills to the

**TABLE 11.5.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed East Mormon Mountain SEZ**

| Common Name | Scientific Name | Status |
|---|---|---|
| **Food** | | |
| Desert trumpet (buckwheat) | *Eriogonum inflatum* | Observed |
| Dropseed | *Sporobolus* spp. | Possible |
| Indian rice grass | *Oryzopsis hymenoides* | Observed |
| Iodine bush | *Allenrolfea occidentalis* | Possible |
| Joshua tree | *Yucca brevifolia* | Observed |
| Prickly pear cactus | *Opuntia* spp. | Possible |
| Saltbush | *Atriplex canescens* | Observed |
| Seablite | *Suaeda diffusa* | Possible |
| Wolfberry | *Lycium andersonii* | Possible |
| **Medicine** | | |
| Creosotebush | *Larrea tridentata* | Observed |
| Mormon tea | *Ephedra nevadaensis* | Possible |
| Palmer's phacelia | *Phacelia palermi* | Possible |

Sources: Field visit; USGS (2005a); Fowler (1986); Stoffle and Dobyns (1983); Stoffle et al. (1999).

north. Mule deer habitat occurs in the Mormon Mountains about 5 mi (8 km) west (BLM 2009f). The desert tortoise was once a food source for the Moapa Band, but it is now often mentioned by the Moapa Band as a species that should be protected (Stoffle and Dobyns 1983). The SEZ is desert tortoise habitat and borders critical habitat to the south (BLM 2009f). Because of the general aridity of the SEZ, few game species traditionally important to Native Americans occur within the SEZ (see Table 11.5.18.1-3). Among the most important is the black-tailed jack rabbit (*Lepus californicus*) (Stoffle and Dobyns 1983; Kelly and Fowler 1986). Other small game species important to Native Americans that can be found in the SEZ include desert cottontails (*Sylvilagus audubonii*) and woodrats (*Neotoma lepida*). Other animals traditionally important to the Southern Paiute include lizards, which are likely to occur in the SEZ, and the golden eagle (*Aquila chrysaetos*).

Other natural resources traditionally important to Native Americans include clay for pottery, salt, naturally occurring mineral pigments for the decoration and protection of the skin, and turquoise for ritual purposes (Stoffle and Dobyns 1983)

### 11.5.18.2 Impacts

The Southern Paiutes tend to take a holistic view of their traditional homeland. For them, cultural and natural features are inextricably bound together. Effects on one part have ripple effects on the whole. Western distinctions between the sacred and the secular have no meaning

**TABLE 11.5.18.1-3 Animal Species Used by Native Americans as Food with Ranges That Include the Proposed East Mormon Mountain SEZ**

| Common Name | Scientific Name | Status |
|---|---|---|
| **Mammals** | | |
| Badger | *Taxidea taxus* | All year |
| Black-tailed jackrabbit | *Lepus californicus.* | All year |
| Bobcat | *Lynx rufus* | All year |
| Desert cottontail | *Silvilagusaudubonii* | All year |
| Desert woodrat | *Neotoma lepida* | All year |
| Kangaroo rats | *Dipodomys* spp. | All year |
| Kit fox | *Vulpes macotis* | All year |
| Mule deer | *Odocoileus hemionus* | All year |
| Pocket gopher | *Thomomys bottae* | All year |
| Pocket mouse | *Perognathus* sp. | All year |
| Pocket mouse | *Chaetodipus* spp. | All year |
| Porcupine | *Erethizon dorsatum* | All year |
| Red fox | *Vulpes vulpes* | All year |
| Rock squirrel | *Spermophilus variegates* | All year |
| **Birds** | | |
| Golden eagle | *Aquila chrysaetos* | All year |
| Greater roadrunner | *Geococcyx californianus* | All year |
| Mourning dove | *Zenaida macroura* | All year |
| **Reptiles** | | |
| Large lizards | Various species | All year |

Sources USGS (2005b); Fowler (1986); Stoffle and Dobyns (1983).

in their traditional worldview (Stoffle and Dobyns 1983). While no comments specific to the proposed East Mormon Mountain SEZ have been received from Native American Tribes to date, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. Typically, the Southern Paiute have concerns over adverse effects on a wide range of resources. They consider springs and burial grounds of highest importance (Stoffle and Dobyns 1983). Other sites and features are often seen as important because they are the location of or have ready access to a range of plant, animal, and mineral resources (Stoffle et al. 1997). Resources considered important include plants used for food, medicine, basketry, and in construction; large and small game animals; birds; and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those resources likely to occur within the proposed East Mormon Mountain SEZ are discussed in Section 11.5.18.1.2. Geophysical features and physical cultural remains are discussed in Section 11.5.17.1.4.

The development and operation of utility-scale solar energy facilities in the proposed East Mormon Mountain SEZ would require tapping into the water resources at Tule Spring just north of the SEZ. Other springs are located in the Tule Springs Hills and East Mormon Mountains. Significant drawdown from Tule Springs or groundwater could affect these culturally important traditional resources. However, implementation of programmatic design features, as discussed in Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

The most likely traditional use of the lands proposed for the East Mormon Mountain SEZ is foraging. The development of a solar energy facility would result in the loss of some plants traditionally used by Native Americans. However, vegetation is sparse in the proposed SEZ. The state would require that the developer allow any Joshua trees that would be uprooted to be transplanted prior to the start of development. The same vegetation cover types are wide-spread in the surrounding area. It is therefore likely that effects on these resources would be minimal (see Section 11.5.10). Similarly, although the habitat of traditionally important animal species, such as the black-tailed jackrabbit, would be disturbed, there likewise is an abundance of similar habitat in the area (see Section 11.5.11). This should be confirmed by consultation with affected Native American Tribes when specific projects are proposed.

As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express additional concerns over potential visual, acoustic and other effects on specific resources and any culturally important landscapes within or adjacent to the proposed SEZ.

#### 11.5.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features that would address impacts of potential concern to Native Americans, such as avoidance of sacred sites, water sources, and tribally important plant and animal species, are provided in Appendix A, Section A.2.2. Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 11.5.17.3, in addition to the programmatic design features for historic properties presented in Section A.2.2 in Appendix A.

The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with affected Tribes listed in Table 11.5.18.1-1.

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## 11.5.19 Socioeconomics

### 11.5.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed East Mormon Mountain SEZ. The ROI is a three-county area comprising Clark and Lincoln Counties in Nevada and Washington County in Utah. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

#### *11.5.19.1.1 ROI Employment*

In 2008, employment in the ROI stood at 984,248 (Table 11.5.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was higher in Lincoln County (5.1%) than in Washington County (4.8%) and Clark County (3.2%). At 3.3%, the growth rate in the ROI as a whole was higher than the average rate for Nevada (2.7%) and Utah (2.1%).

In the ROI in 2006, the services sector provided the highest percentage of employment at 58.7%, followed by wholesale and retail trade at 15.1% and construction at 11.9% (Table 11.5.19.1-2). Within the three counties in the ROI, the distribution of employment across

**TABLE 11.5.19.1-1 ROI Employment in the Proposed East Mormon Mountain SEZ**

| Location | 1999 | 2008 | Average Annual Growth Rate, 1999–2008 (%) |
|---|---|---|---|
| Clark County, Nevada | 675,693 | 922,878 | 3.2 |
| Lincoln County, Nevada | 1,048 | 1,731 | 5.1 |
| Washington County, Utah | 37,351 | 59,639 | 4.8 |
| ROI | 714,362 | 984,248 | 3.3 |
| Nevada | 978,969 | 1,282,012 | 2.7 |
| Utah | 1,080,441 | 1,336,556 | 2.1 |

Sources: U.S Department of Labor (2009a,b).

**TABLE 11.5.19.1-2  ROI Employment in the Proposed East Mormon Mountain SEZ by Sector, 2006**

| Industry | Clark County, Nevada | | Lincoln County, Nevada | | Washington County, Utah | | ROI | |
|---|---|---|---|---|---|---|---|---|
| | Employment | % of Total | Employment | % of Total | Employment | % of Total | Employment | % of Total |
| Agriculture[a] | 213 | 0.0 | 130 | 16.1 | 381 | 0.9 | 724 | 0.1 |
| Mining | 522 | 0.1 | 38 | 4.7 | 20 | 0.1 | 580 | 0.1 |
| Construction | 100,817 | 11.6 | 60 | 7.4 | 7,838 | 7.2 | 108,715 | 11.9 |
| Manufacturing | 25,268 | 2.9 | 0 | 0.0 | 3,202 | 3.0 | 28,470 | 3.1 |
| Transportation and public utilities | 38,529 | 4.4 | 70 | 8.7 | 2,832 | 20.6 | 41,131 | 4.5 |
| Wholesale and retail trade | 128,498 | 14.8 | 259 | 32.1 | 9,292 | 24.1 | 138,049 | 15.1 |
| Finance, insurance, and real estate | 56,347 | 6.5 | 51 | 6.3 | 2,139 | 8.3 | 58,537 | 6.4 |
| Services | 516,056 | 59.6 | 376 | 46.7 | 18,818 | 33.0 | 535,250 | 58.7 |
| Other | 105 | 0.0 | 0 | 0.0 | 10 | 0.0 | 115 | 0.0 |
| Total | 866,093 | | 806 | | 44,495 | | 911,394 | |

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009a,b).

sectors is different from that of the ROI as a whole, with employment in services (59.6%) and construction (11.6%) higher in Clark County than in the other two counties in the ROI, while employment in transportation and public utilities (4.4%), and agriculture (0.0%) were lower than in the other counties in the ROI.

#### *11.5.19.1.2 ROI Unemployment*

The average rate in Lincoln County over the period over the period 1999 to 2008 was 5.2%, slightly higher than the rate in Clark County (5.0%), and higher than the rate for Washington County (Table 11.5.19.1-3). The average rate in the ROI over this period was 5.0%, the same as the average rate for Nevada. Unemployment rates for the first 11 months of 2009 contrast with rates for 2008 as a whole; in Clark County the unemployment rate increased to 11.1%, while in Lincoln County the rate reached 8.0%, and in Washington County it increased to 7.1%. The average rates for the ROI (10.8%) and for Nevada (11.0%) and Utah (5.2%) as a whole were also higher during this period than the corresponding average rates for 2008.

#### *11.5.19.1.3 ROI Urban Population*

The population of the ROI in 2008 was 59% urban. The largest city, Las Vegas, had an estimated population of 562,849; other large cities in Clark County are Henderson (253,693) and North Las Vegas (217,975) (Table 11.5.19.1-4). In addition, there are two smaller cities in the county, Mesquite (16,528) and Boulder City (14,954). There are a number of unincorporated urban areas in Clark County that are not included in the urban population, meaning that the percentage of the county population not living in urban areas is overstated. The largest urban area in Washington County, St. George, had an estimated 2008 population of 71,702; other

**TABLE 11.5.19.1-3 ROI Unemployment Rates for the Proposed East Mormon Mountain SEZ (%)**

| Location | 1999–2008 | 2008 | 2009[a] |
|---|---|---|---|
| Clark County, Nevada | 5.0 | 6.6 | 11.1 |
| Lincoln County, Nevada | 5.2 | 5.4 | 8.0 |
| Washington County, Utah | 4.1 | 4.6 | 7.1 |
| ROI | 5.0 | 6.5 | 10.8 |
| Nevada | 5.0 | 6.7 | 11.0 |
| Utah | 4.1 | 3.4 | 5.2 |

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

**TABLE 11.5.19.1-4 ROI Urban Population and Income for the Proposed East Mormon Mountain SEZ**

| City | Population 2000 | Population 2008 | Population Average Annual Growth Rate, 2000–2008 (%) | Median Household Income ($ 2008) 1999 | Median Household Income ($ 2008) 2006–2008 | Median Household Income ($ 2008) Average Annual Growth Rate, 1999 and 2006–2008 (%)[a] |
|---|---|---|---|---|---|---|
| Apple Valley | NA[b] | 460 | NA | NA | NA | NA |
| Boulder City | 14,966 | 14,954 | 0.0 | 65,049 | NA | NA |
| Caliente | 1,123 | 1,191 | 0.7 | 33,260 | NA | NA |
| Enterprise | 1,285 | 1,617 | 2.9 | 45,957 | NA | NA |
| Henderson | 175,381 | 253,693 | 4.7 | 72,035 | 67,886 | –0.7 |
| Hilldale | 1,895 | 1,952 | 0.4 | 42,010 | NA | NA |
| Hurricane | 8,250 | 13,149 | 6.0 | 42,314 | NA | NA |
| Ivins | 4,450 | 7,729 | 7.1 | 53,171 | NA | NA |
| La Verkin | 3,392 | 4,448 | 3.4 | 46,285 | NA | NA |
| Las Vegas | 478,434 | 562,849 | 2.1 | 56,739 | 55,113 | –0.3 |
| Leeds | 547 | 756 | 4.1 | 53,110 | NA | NA |
| Mesquite | 9,389 | 16,528 | 7.3 | 52,005 | NA | NA |
| North Las Vegas | 115,488 | 217,975 | 8.3 | 56,299 | 60,506 | 0.2 |
| Rockville | 247 | 261 | 0.7 | 48,819 | NA | NA |
| Santa Clara | 4,630 | 6,767 | 4.9 | 67,942 | NA | NA |
| Springdale | 457 | 573 | 2.9 | 53,570 | NA | NA |
| St. George | 49,663 | 71,702 | 4.7 | 47,001 | 47,308 | 0.1 |
| Toquerville | 910 | 1,351 | 5.1 | 43,824 | NA | NA |
| Virgin | 394 | 551 | 4.3 | 47,578 | NA | NA |
| Washington | 8,816 | 17,452 | 9.9 | 45,502 | NA | NA |

[a] Data are averages for the period 2006 to 2008.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009b–d).

urban areas in the county are Washington (17,452) and Hurricane (13,149) (Table 11.5.19.1-4). In addition, there are 12 other urban areas in the county. Most of these cities are less than 100 mi (160 km) from the site of the proposed SEZ.

Population growth rates in the ROI have varied over the period 2000 to 2008 (Table 11.5.19.1-4). Washington grew at an annual rate of 9.9% during this period, with higher-than-average growth also experienced in North Las Vegas (8.3%), Mesquite (7.3%), Ivins (7.1%) Hurricane (6.0%), and Henderson (4.7%). The cities of Las Vegas (2.1%), Caliente (0.7%), and others experienced a lower growth rate, while Boulder City (0.0%) experienced a static growth rate between 2000 and 2008.

#### *11.5.19.1.4 ROI Urban Income*

Median household incomes vary across urban areas in the ROI. Of the four cities for which data are available for 2006 to 2008, Henderson ($67,886) and North Las Vegas ($60,506) had median incomes higher than the average for Nevada ($56,348), while median incomes in Las Vegas ($55,113) were slightly lower than the state average. Median incomes in St. George ($47,308) were also lower than the state average for Utah ($56,484) (Table 11.5.19.1-4).

Growth rates between 1999 and 2006 to 2008 were small in North Las Vegas (0.2%), and St. George (0.1%), and negative in Henderson (–0.7%), and Las Vegas (–0.3%). The average median household income growth rate as a whole over this period was –0.2% for Nevada, and –0.5% in Utah.

#### *11.5.19.1.5 ROI Population*

Table 11.5.19.1-5 presents recent and projected populations in the ROI and for the two states as a whole. Population in the ROI stood at 2,019,414 in 2008, having grown at an average annual rate of 4.0% since 2000. Growth rates for ROI were higher than those in Nevada (3.4%) and Utah (2.5%) over the same period.

Each county in the ROI experienced growth in population between 2000 and 2008; population in Clark County grew at an annual rate of 4.0%, while population in Washington County grew by 5.2% and 1.4% in Lincoln County. The ROI population is expected to increase to 2,977,752 by 2021 and to 3,079,077 by 2023.

**TABLE 11.5.19.1-5 ROI Population for the Proposed East Mormon Mountain SEZ**

| Location | 2000 | 2008 | Average Annual Growth Rate, 2000–2008 (%) | 2021 | 2023 |
|---|---|---|---|---|---|
| Clark County, Nevada | 1,375,765 | 1,879,093 | 4.0 | 2,710,303 | 2,791,161 |
| Lincoln County, Nevada | 4,165 | 4,643 | 1.4 | 5,350 | 5,412 |
| Washington County, Utah | 90,354 | 135.678 | 5.2 | 262,099 | 282,504 |
| ROI | 1,470,284 | 2,019,414 | 4.0 | 2,977,752 | 3,079,077 |
| Nevada | 1,998,257 | 2,615,772 | 3.4 | 3,675,890 | 3,779,745 |
| Utah | 2,233,169 | 2,727,343 | 2.5 | 3,546,228 | 3,666,248 |

Sources: U.S. Bureau of the Census (2009e,f); Nevada State Demographers Office (2008).

#### *11.5.19.1.6 ROI Income*

Total personal income in the ROI stood at $77.5 billion in 2007 and has grown at an annual average rate of 5.0% over the period 1998 to 2007 (Table 11.5.19.1-6). Per-capita income also rose over the same period at a rate of 0.7%, increasing from $35,664 to $38,327.

Per-capita incomes were higher in Clark County ($40,307) than in Lincoln County ($24,121) and Washington County ($23,499) in 2007. Growth rates in total personal income have been higher in Clark County (5.0%) and Washington County (5.1%) than in Lincoln

**TABLE 11.5.19.1-6 ROI Personal Income for the Proposed East Mormon Mountain SEZ**

| Location | 1998 | 2007 | Average Annual Growth Rate, 1998–2007 (%) |
|---|---|---|---|
| Clark County, Nevada | | | |
| Total income[a] | 45.7 | 74.1 | 5.0 |
| Per-capita income | 36,509 | 40,307 | 1.0 |
| Lincoln County, Nevada | | | |
| Total income[a] | 0.1 | 0.1 | 0.7 |
| Per-capita income | 24,711 | 24,121 | -0.2 |
| Washington County, Utah | | | |
| Total income[a] | 2.0 | 3.3 | 5.1 |
| Per-capita income | 23,726 | 23,499 | –0.1 |
| ROI | | | |
| Total income[a] | 47.8 | 77.5 | 5.0 |
| Per-capita income | 35,664 | 39,250 | 1.0 |
| Nevada | | | |
| Total income[a] | 68.9 | 105.3 | 4.3 |
| Per-capita income | 37,188 | 41,022 | 1.0 |
| Utah | | | |
| Total income[a] | 61.9 | 82.4 | 2.9 |
| Per-capita income | 28,567 | 31,003 | 0.8 |

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of the Census (2009e,f).

County (0.7%). Personal income growth rates were higher in the ROI (5.0%) than in Nevada (4.3%) and Utah (2.9%), but per-capita income growth rate in Clark and Lincoln Counties were the same, or slightly less than in Nevada (1.0%) and in Utah (0.8%). The per-capita income growth rates for Lincoln County (-0.2%) and Washington County (−0.1%) were both negative.

Median household income in 2006 to 2008 varied from $41,173 in Lincoln County, to $49,747 in Washington County, to $56,954 in Clark County (U.S. Bureau of the Census 2009d).

#### *11.5.19.1.7 ROI Housing*

In 2007, more than 808,400 housing units were located in the three ROI counties; about 93% of these were in Clark County (Table 11.5.19.1-7). Owner-occupied units compose approximately 60% of the occupied units in the three counties, with rental housing making up 40% of the total. Vacancy rates in 2007 were 29.3% in Lincoln County, 17.1% in Washington County, and 12.2% in Clark County; with an overall vacancy rate of 12.6% in the ROI There were 101,695 vacant housing units in the ROI in 2007, of which 40,476 are estimated to be rental units that would be available to construction workers. There were 13,082 units in seasonal, recreational, or occasional use in the ROI at the time of the 2000 Census, with 1.5% of vacant housing units in Clark County, 12.0% in Washington County, and 14.0% in Lincoln County used for seasonal or recreational purposes.

Housing stock in the ROI as a whole grew at an annual rate of 4.4% over the period 2000 to 2007, with 209,990 new units added to the existing housing stock (Table 11.5.19.1-7).

The median value of owner-occupied housing in 2006 to 2008 varied from $80,300 in Lincoln County, $139,500 in Clark County to $139,800 in Washington County (U.S. Bureau of the Census 2009g).

#### *11.5.19.1.8 ROI Local Government Organizations*

The various local and county government organizations in the ROI are listed in Table 11.5.19.1-8. In addition, three Tribal governments are located in the ROI; members of other Tribal groups are located in the county, but their Tribal governments are in adjacent counties or states.

#### *11.5.19.1.9 ROI Community and Social Services*

This section describes educational, health-care, law enforcement, and firefighting resources in the ROI.

**TABLE 11.5.19.1-7 ROI Housing Characteristics for the Proposed East Mormon Mountain SEZ**

| Parameter | 2000 | 2007 |
|---|---|---|
| Clark County, Nevada | | |
| Owner-occupied | 302,834 | 393,453 |
| Rental | 209,419 | 268,572 |
| Vacant units | 47,546 | 92,144 |
| Seasonal and recreational use | 8,416 | NA[a] |
| Total units | 559,799 | 754,169 |
| Lincoln County, Nevada | | |
| Owner-occupied | 1,156 | 1,204 |
| Rental | 384 | 400 |
| Vacant units | 638 | 664 |
| Seasonal and recreational use | 305 | NA |
| Total units | 2,178 | 2,268 |
| Washington County, Utah | | |
| Owner-occupied | 22,128 | 30,795 |
| Rental | 7,811 | 12,326 |
| Vacant units | 6,539 | 8,887 |
| Seasonal and recreational use | 4,362 | NA |
| Total units | 36,478 | 52,008 |
| ROI | | |
| Owner-occupied | 326,118 | 425,452 |
| Rental | 217,614 | 281,298 |
| Vacant units | 54,732 | 101,695 |
| Seasonal and recreational use | 13,082 | NA |
| Total units | 598,455 | 808,455 |

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h-j).

### Schools

In 2007, the three-county ROI had a total of 375 public and private elementary, middle, and high schools (NCES 2009). Table 11.5.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Washington County schools (22.1) is higher than that in Clark County (19.0) and Lincoln County schools (13.3), while the level of service is much higher in Lincoln County (18.2) than elsewhere in the ROI, where there are fewer teachers per 1,000 population (Clark County, 8.7; Washington County, 7.8).

**TABLE 11.5.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed East Mormon Mountain SEZ**

| Governments | |
|---|---|
| ***City*** | |
| Apple Valley, Utah | Mesquite, Nevada |
| Boulder City, Nevada | North Las Vegas, Nevada |
| Caliente, Nevada | Rockville, Utah |
| Enterprise, Utah | Santa Clara, Utah |
| Henderson, Nevada | Springdale, Utah |
| Hilldale, Utah | St. George, Utah |
| Hurricane, Utah | Toquerville, Utah |
| Ivins, Utah | Virgin, Utah |
| La Verkin, Utah | Washington, Utah |
| Las Vegas, Nevada | |
| ***County*** | |
| Clark County, Nevada | Washington County, Utah |
| Lincoln County, Nevada | |
| ***Tribal*** | |
| Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada | |
| Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada | |
| Paiute Indian Tribe of Utah | |

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

**TABLE 11.5.19.1-9 ROI School District Data for the Proposed East Mormon Mountain SEZ, 2007**

| Location | Number of Students | Number of Teachers | Student-Teacher Ratio | Level of Service[a] |
|---|---|---|---|---|
| Clark County, Nevada | 303,448 | 15,930 | 19.0 | 8.7 |
| Lincoln County, Nevada | 1,074 | 81 | 13.3 | 18.2 |
| Washington County, Utah | 24,357 | 1,103 | 22.1 | 7.8 |
| ROI | 328,879 | 17,113 | 19.2 | 8.7 |

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

### Health Care

The total number of physicians and the number of physicians per 1,000 population is higher in Clark County (4,220; 2.3) than in Washington County (277; 2.0) and in Lincoln County (2; 0.4) (Table 11.5.19.1-10).

### Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 11.5.19.1-11). Lincoln County has 26 officers and would provide law enforcement services to the SEZ; there are 3,214 officers in Clark County and 45 officers in Washington County. Levels of service of police protection per 1,000 population are 5.8 in Lincoln County, 1.7 in Clark County, and 0.3 in Washington County. Currently, there are 1,002 professional firefighters in the ROI (Table 11.5.19.1-11).

#### *11.5.19.1.10 ROI Social Structure and Social Change*

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism, illicit drug use, mental health, and divorce, which might be used as indicators of social change, are presented in Tables 11.5.19.1-12 and 11.5.19-1.13, respectively.

There is some variation in the level of crime across the ROI, with higher rates of violent crime in Clark County (8.3 per 1,000 population) than in Washington County (2.0) and Lincoln County (1.3) (Table 11.5.19.1-12). Property-related crime rates are also higher in Clark County

**TABLE 11.5.19.1-10 Physicians in the Proposed East Mormon Mountain SEZ ROI, 2007**

| Location | Number of Primary Care Physicians | Level of Service[a] |
|---|---|---|
| Clark County, Nevada | 4,220 | 2.3 |
| Lincoln County, Nevada | 2 | 0.4 |
| Washington County, Utah | 277 | 2.0 |
| ROI | 4,499 | 2.3 |

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

**TABLE 11.5.19.1-11 Public Safety Employment in the Proposed East Mormon Mountain SEZ ROI**

| Location | Number of Police Officers[a] | Level of Service[b] | Number of Firefighters[c] | Level of Service |
|---|---|---|---|---|
| Clark County, Nevada | 3,214 | 1.7 | 991 | 0.5 |
| Lincoln County, Nevada | 26 | 5.8 | 1 | 0.2 |
| Washington County, Utah | 45 | 0.3 | 10 | 0.1 |
| ROI | 3,285 | 1.7 | 1,002 | 0.5 |

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

(34.5) than in Washington County (23.6) and Lincoln County (7.3); overall crime rates in Clark County (42.5) were higher than in Washington County (25.6) and Lincoln County (8.6).

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located. There is slight variation across the three regions in which the three counties are located; rates for alcoholism and mental health are slightly higher in the region in which Clark County is located (Table 11.5.19.1-13).

#### *11.5.19.1.11 ROI Recreation*

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 11.5.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, basing the value of recreational resources in these areas solely on the number of recorded visitors is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar facilities, by

**TABLE 11.5.19.1-12 County and ROI Crime Rates for the Proposed East Mormon Mountain SEZ[a]**

| | Violent Crime[b] | | Property Crime[c] | | All Crime | |
|---|---|---|---|---|---|---|
| | Offenses | Rate | Offenses | Rate | Offenses | Rate |
| Clark County, Nevada | 15,505 | 8.3 | 66,905 | 34.5 | 82,410 | 42.5 |
| Lincoln County, Nevada | 6 | 1.3 | 34 | 7.3 | 40 | 8.6 |
| Washington County, Utah | 270 | 2.0 | 3,197 | 23.6 | 3,467 | 25.6 |
| ROI | 15,781 | 7.8 | 70,136 | 34.7 | 85,917 | 42.5 |

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

**TABLE 11.5.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed East Mormon Mountain SEZ ROI[a]**

| Geographic Area | Alcoholism | Illicit Drug Use | Mental Health[b] | Divorce[c] |
|---|---|---|---|---|
| Clark County, Nevada | 8.2 | 2.7 | 10.5 | NA[d] |
| Nevada rural (includes Lincoln County) | 8.0 | 2.7 | 9.5 | NA |
| Utah southwest region (includes Washington County) | 5.6 | 2.5 | 11.3 | NA |
| Nevada | | | | 6.5 |
| Utah | | | | 3.6 |

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] NA = data not available.

Sources: SAMHSA (2009); CDC (2009).

identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands; some activity occurs on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 248,507 people were employed in the ROI in the various sectors identified as recreation, constituting 25.8% of total ROI employment (Table 11.5.19.1-14). Recreation spending also produced more than $9,552 million in income in the ROI in 2007. The primary sources of recreation-related employment were hotels and lodging places and eating and drinking places.

### 11.5.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including those on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of facilities employing various solar energy technologies are analyzed in detail in subsequent sections.

#### *11.5.19.2.1 Common Impacts*

Construction and operation of a solar energy facility at the proposed SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and

**TABLE 11.5.19.1-14 Recreation Sector Activity in the Proposed East Mormon Mountain SEZ ROI, 2007**

| ROI | Employment | Income ($ million) |
|---|---|---|
| Amusement and recreation services | 4,933 | 151.1 |
| Automotive rental | 2,927 | 119.9 |
| Eating and drinking places | 111,946 | 3,291.2 |
| Hotels and lodging places | 117,616 | 5,640.1 |
| Museums and historic sites | 315 | 18.7 |
| Recreational vehicle parks and campsites | 398 | 11.1 |
| Scenic tours | 5,519 | 224.0 |
| Sporting goods retailers | 4,853 | 96.2 |
| Total ROI | 248,507 | 9,552.3 |

Source: MIG, Inc. (2010).

operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy facilities are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Section A.2.2 of Appendix A.

**Recreation Impacts**

Estimating the impact of solar facilities on recreation is problematic, because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar facilities in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodation otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

### Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy developments in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures and a consequent increase in alcoholism, depression, suicide, social conflict, divorce, and delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of less than 0.1% in regional population during construction of the trough technology, with smaller increases for the power tower, dish engine and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, because of the lack of available housing to accommodate all in-migrating workers and families in smaller rural communities in the ROI and insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar facilities are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

### Livestock Grazing Impacts

Cattle ranching and farming supported 202 jobs, and $1.3 million in income in the ROI in 2007 (MIG, Inc. 2010). The construction and operation of solar facilities in the East Mormon Mountain SEZ could result in a decline in the amount of land available for livestock grazing, resulting in total (direct plus indirect) impacts of the loss of seven jobs and less than $0.1 million in income in the ROI. There would also be a decline in grazing fees payable to the BLM and to the USFS by individual permittees based on the number of AUMs required to support livestock on public land. Assuming the 2008 fee of $1.35 per AUM, grazing fee losses would amount to $667 annually on land dedicated to solar facilities in the SEZ.

**Access Road Impacts**

The impacts of construction of an access road connecting the SEZ could include the addition of 234 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 11.5.19.2-1). Construction activities in the peak year would constitute less than 1% of total ROI employment. Access road construction would also produce $9.1 million in ROI income. Direct sales taxes would be $0.3 million; direct income taxes in Utah would be less than $0.1 million.

Total operations (maintenance) employment impacts in the ROI (including direct and indirect impacts) of an access road would be less than 1 job during the first year of operation (Table 11.5.19.2-1) and would also produce less than $0.1 million in income. Direct sales taxes would be less than $0.1 million in the first year; direct income taxes less than $0.1 million.

Construction and operation of an access road would not require the in-migration of workers and their families from outside the ROI; consequently, no impacts on housing markets in the ROI would be expected, and no new community service employment would be required in order to meet existing levels of service in the ROI.

### *11.5.19.2.2 Technology-Specific Impacts*

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), BLM acreage rental and capacity payments, population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis can be found in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km$^2$/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km$^2$/MW) would be required for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of one project could be constructed within a given year, with a corresponding maximum land disturbance of up to 3,000 acres (12 km$^2$). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower and 2022 for the minimum facility size and 2023 for the maximum facility size for dish engine and PV. The years of construction and operations were selected as representative of the entire 20-year study period, because they are the approximate midpoint; construction and operations could begin earlier.

**TABLE 11.5.19.2-1 ROI Socioeconomic Impacts of an Access Road Connecting the Proposed East Mormon Mountain SEZ[a]**

| Parameter | Construction | Operations |
|---|---|---|
| Employment (no.) | | |
| Direct | 134 | <1 |
| Total | 234 | <1 |
| Income[b] | | |
| Total | 9.1 | <0.1 |
| Direct state taxes[b] | | |
| Sales | 0.3 | <0.1 |
| Income | <0.1 | <0.1 |
| In-migrants (no.) | 0 | 0 |
| Vacant housing[c] (no.) | 0 | 0 |
| Local community service employment | | |
| Teachers (no.) | 0 | 0 |
| Physicians (no.) | 0 | 0 |
| Public safety (no.) | 0 | 0 |

[a] Construction impacts assume 11 mi (18 km) of access road is required for the East Mormon Mountain SEZ. Construction impacts are assessed for the peak year of construction. Although gravel surfacing might be used, the analysis assumes the access road will be paved.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

### Solar Trough

***Construction.*** Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 4,438 jobs (Table 11.5.19.2-2). Construction activities would constitute 0.3% of total ROI employment. A solar facility would also produce $268.7 million in income. Direct sales taxes would be $8.7 million; direct income taxes in Utah would be $1.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 743 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 371 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.6% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, seven new teachers, two physicians, and two public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

***Operations.*** Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 496 jobs (Table 11.5.19.2-2). Such a solar facility would also produce $18.9 million in income. Direct sales taxes would be $0.2 million; direct income taxes in Utah would be $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.6 million, and solar generating capacity payments at least $9.4 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 40 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 36 owner-occupied units expected to be occupied in the ROI.

**TABLE 11.5.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed East Mormon Mountain SEZ with Trough Facilities[a]**

| Parameter | Maximum Annual Construction Impacts | Operations Impacts |
|---|---|---|
| Employment (no.) | | |
| Direct | 1,744 | 313 |
| Total | 4,438 | 496 |
| Income[b] | | |
| Total | 268.7 | 18.9 |
| Direct state taxes[b] | | |
| Sales | 8.7 | 0.2 |
| Income | 1.0 | 0.1 |
| BLM payments[b] | | |
| Rental | NA[d] | 0.6 |
| Capacity[e] | NA | 9.4 |
| In-migrants (no.) | 743 | 40 |
| Vacant housing[c] (no.) | 371 | 36 |
| Local community service employment | | |
| Teachers (no.) | 7 | 0 |
| Physicians (no.) | 2 | 0 |
| Public safety (no.) | 2 | 0 |

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 600 MW (corresponding to 3,000 acres [12 km$^2$] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,435 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] NA = data not available.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability and full build-out of the site. Projects with 3 or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

No new community service employment would be required to meet existing levels of service in the ROI.

### Power Tower

***Construction.*** Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 1,768 jobs (Table 11.5.19.2-3). Construction activities would constitute 0.1% of total ROI employment. Such a solar facility would also produce $107.0 million in income. Direct sales taxes would be $3.5 million; direct income taxes in Utah would be $0.4 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 296 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 148 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.2 % of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, three new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

***Operations.*** Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 221 jobs (Table 11.5.19.2-3). Such a solar facility would also produce $7.6 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.6 million, and solar generating capacity payments would total at least $5.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 21 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied

**TABLE 11.5.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed East Mormon Mountain SEZ with Power Tower Facilities[a]**

| Parameter | Maximum Annual Construction Impacts | Operations Impacts |
|---|---|---|
| Employment (no.) | | |
| Direct | 695 | 161 |
| Total | 1,768 | 221 |
| Income[b] | | |
| Total | 107.0 | 7.6 |
| Direct state taxes[b] | | |
| Sales | 3.5 | <0.1 |
| Income | 0.4 | <0.1 |
| BLM payments[b] | | |
| Rental | NA[d] | 0.6 |
| Capacity[e] | NA | 5.2 |
| In-migrants (no.) | 296 | 21 |
| Vacant housing[c] (no.) | 148 | 19 |
| Local community service employment | | |
| Teachers (no.) | 3 | 0 |
| Physicians (no.) | 1 | 0 |
| Public safety (no.) | 1 | 0 |

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 $km^2$] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 797 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] NA = data not available.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability and full build-out of the site. Projects with 3 or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

housing units would not be expected to be large, with 19 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

**Dish Engine**

***Construction.*** Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 719 jobs (Table 11.5.19.2-4). Construction activities would constitute less than 0.1% of total ROI employment. Such a solar facility would also produce $43.5 million in income. Direct sales taxes would be $1.4 million; direct income taxes in Utah would be $0.2 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 120 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 60 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in these occupations.

***Operations.*** Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 214 jobs (Table 11.5.19.2-4). Such a solar facility would also produce $7.4 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.6 million, and solar generating capacity payments would total at least $5.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 20 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number

**TABLE 11.5.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed East Mormon Mountain SEZ with Dish Engine Facilities[a]**

| Parameter | Maximum Annual Construction Impacts | Operations Impacts |
|---|---|---|
| Employment (no.) | | |
| Direct | 282 | 157 |
| Total | 719 | 214 |
| Income[b] | | |
| Total | 43.5 | 7.4 |
| Direct state taxes[b] | | |
| Sales | 1.4 | <0.1 |
| Income | 0.2 | <0.1 |
| BLM payments[b] | | |
| Rental | NA[d] | 0.6 |
| Capacity[e] | NA | 5.2 |
| In-migrants (no.) | 120 | 20 |
| Vacant housing[c] (no.) | 60 | 18 |
| Local community service employment | | |
| Teachers (no.) | 1 | 0 |
| Physicians (no.) | 0 | 0 |
| Public safety (no.) | 0 | 0 |

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 $km^2$] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 797 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] NA = data not available.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability and full build-out of the site. Projects with 3 or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 18 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

**Photovoltaic**

***Construction.*** Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 444 jobs (Table 11.5.19.2-5). Construction activities would constitute less than 0.1% of total ROI employment. Such solar development would also produce $28.1 million in income. Direct sales taxes would be $0.7 million; direct income taxes in Utah would be $0.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 101 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 50 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

***Operations.*** Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 21 jobs (Table 11.5.19.2-5). Such a solar facility would also produce $0.7 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.6 million, and solar generating capacity payments would total at least $4.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with two persons in-migrating into the ROI. Although

**TABLE 11.5.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed East Mormon Mountain SEZ with PV Facilities[a]**

| Parameter | Maximum Annual Construction Impacts | Operations Impacts |
|---|---|---|
| Employment (no.) | | |
| Direct | 237 | 16 |
| Total | 444 | 21 |
| Income[b] | | |
| Total | 28.1 | 0.7 |
| Direct state taxes[b] | | |
| Sales | 0.7 | <0.1 |
| Income | 0.1 | <0.1 |
| BLM payments[b] | | |
| Rental | NA[d] | 0.6 |
| Capacity [e] | NA | 4.2 |
| In-migrants (no.) | 101 | 2 |
| Vacant housing[c] (no.) | 50 | 2 |
| Local community service employment | | |
| Teachers (no.) | 1 | 0 |
| Physicians (no.) | 0 | 0 |
| Public safety (no.) | 0 | 0 |

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km$^2$] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 797 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[c] Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

[d] NA = data not available.

[e] The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming full build-out of the site.

in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with two owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

#### 11.5.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed East Mormon Mountain SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

### 11.5.20 Environmental Justice

#### 11.5.20.1 Affected Environment

On February 11, 1994, the President signed Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register*, Volume 59, page 76297, Feb. 11, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons who identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origins may choose up to six racial groups as the basis of their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income.** Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 11.5.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

Minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Nevada, 26.4% of the population is classified as minority, while 12.0% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

In the Utah portion of the 50-mi (80-km) radius, 21.8% of the population is classified as minority, while 10.2% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does

**TABLE 11.5.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed East Mormon Mountain SEZ**

| Parameter | Arizona | Nevada | Utah |
|---|---|---|---|
| Total population | 1,588 | 22,739 | 81,757 |
| White, non-Hispanic | 1,169 | 17,780 | 74,222 |
| Hispanic or Latino | 376 | 3,930 | 4,454 |
| Non-Hispanic or Latino minorities | 43 | 1,029 | 3,081 |
| One race | 22 | 747 | 2,128 |
| Black or African American | 0 | 159 | 168 |
| American Indian or Alaskan Native | 15 | 320 | 1,183 |
| Asian | 2 | 185 | 357 |
| Native Hawaiian or Other Pacific Islander | 1 | 42 | 348 |
| Some other race | 4 | 41 | 72 |
| Two or more races | 21 | 282 | 953 |
| Total minority | 419 | 4,959 | 7,535 |
| Low-income | 190 | 2,314 | 8,675 |
| Percentage minority | 26.4 | 21.8 | 9.2 |
| State percentage minority | 36.2 | 34.8 | 14.0 |
| Percentage low-income | 12.0 | 10.2 | 10.6 |
| State percentage low-income | 13.9 | 10.5 | 9.4 |

Source: U.S Bureau of the Census (2009k,l).

not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

In the Arizona portion of the 50-mi (80-km) radius, 9.2% of the population is classified as minority, while 10.6% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

Figures 11.5.20.1-1 and 11.5.20.1-2 show the locations of the low-income and minority population groups, respectively, within the 50-mi (80-km) radius around the boundary of the SEZ.

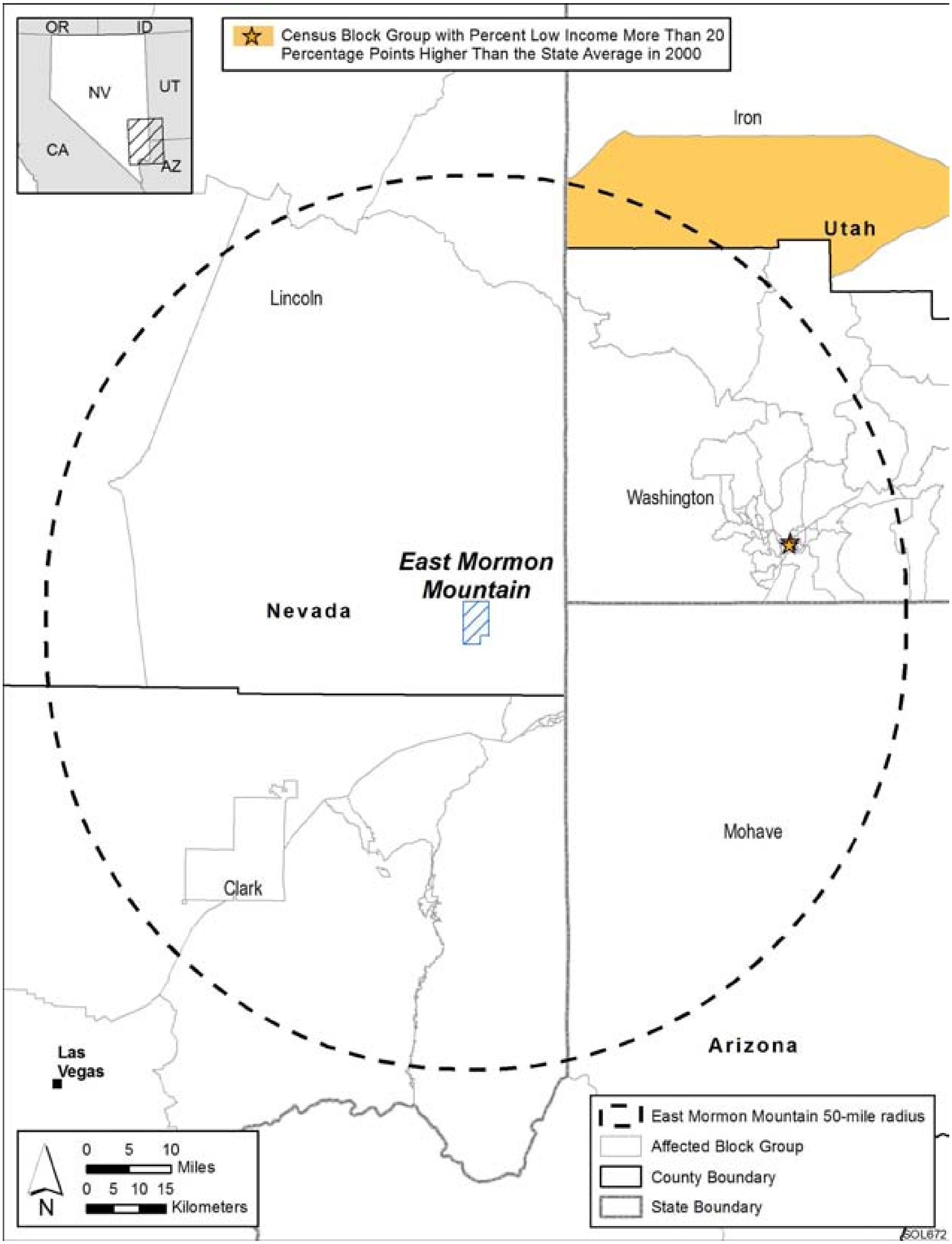


**FIGURE 11.5.20.1-1 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed East Mormon Mountain SEZ**

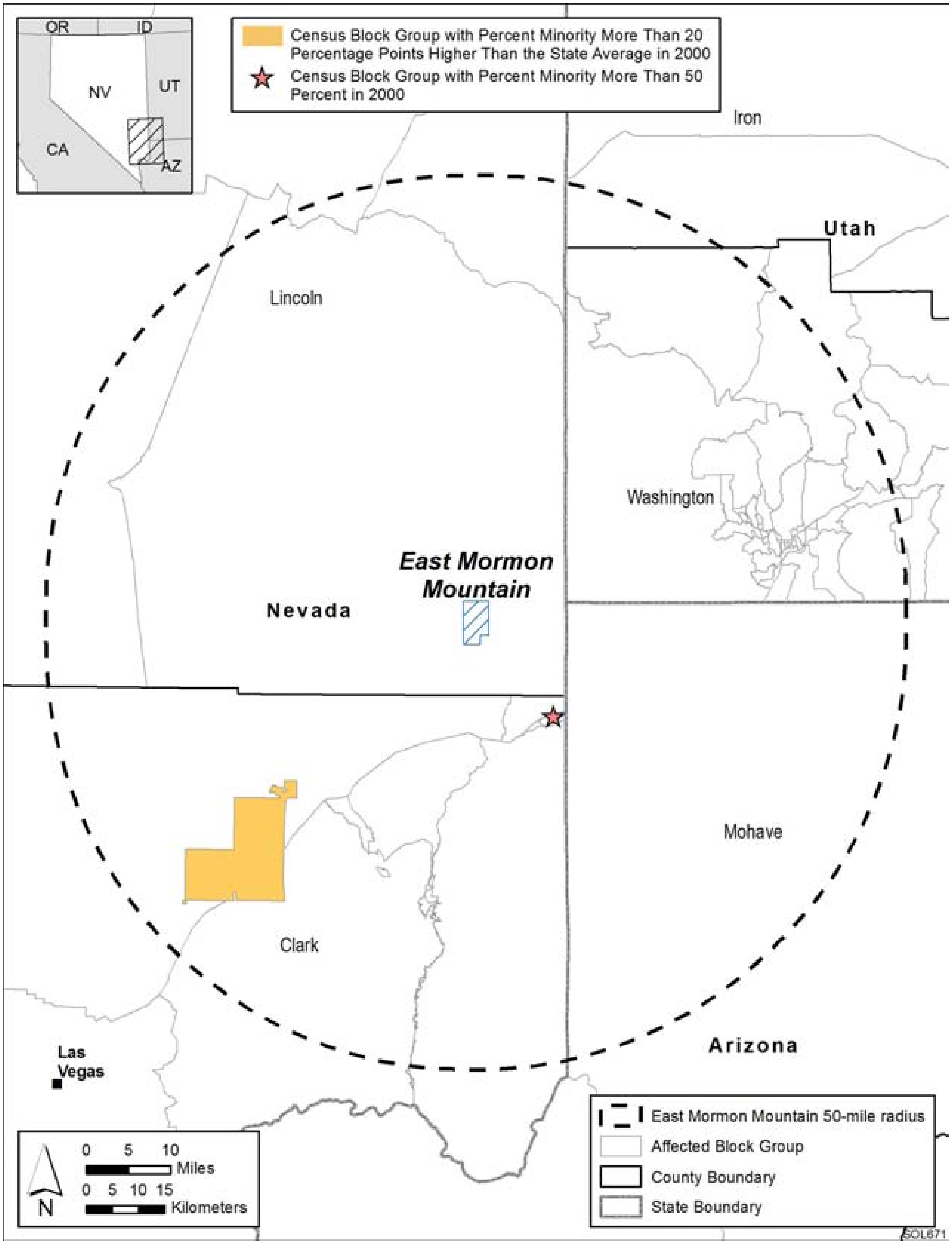


**FIGURE 11.5.20.1-2 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed East Mormon Mountain SEZ**

### 11.5.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of the programmatic design features described in Section A.2.2 of Appendix A, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed SEZ include noise and dust during the construction; noise and EMF effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (Section 11.5.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects could disproportionately affect minority populations. Because there are low-income populations within the 50-mi (80-km) radius, there could also be impacts on low-income populations.

### 11.5.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed East Mormon Mountain SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

## 11.5.21 Transportation

Although the region of the proposed East Mormon Mountain SEZ contains interstate highways, major railroads, and a major airport, these features are not readily accessible from the SEZ. The interstate highway is 11 mi (18 km) to the south of the SEZ. The nearest rail access is approximately 25 mi (40 km) southwest of the SEZ, and the nearest major airport is about 70 mi (113 km) to the southwest, although several smaller airports are located closer to the SEZ. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

### 11.5.21.1 Affected Environment

I-15 runs southwest–northeast approximately 11 mi (18 km) to the southeast of the SEZ, as shown in Figure 11.5.21-1. The closest existing exits to the SEZ on I-15 are Exits 112 and 120, with Exit 120 serving the western edge of Mesquite. The Las Vegas metropolitan area is approximately 62 mi (100 km) southwest of the SEZ along I-15. In the opposite direction, Salt Lake City is approximately 340 mi (547 km) away along I-15. There are several local unimproved dirt roads in the vicinity of the SEZ. OHV use in the SEZ and surrounding area has been designated as "Limited to travel on designated roads and trails" (BLM 2008a). As listed in Table 11.5.21-1, I-15 carries an average traffic volume of about 17,000 vehicles per day in the vicinity of the East Mormon Mountain SEZ (NV DOT 2010).

The UP Railroad serves the region. The main line passes through Las Vegas on its way between Los Angeles and Salt Lake City; the railroad passes about 20 mi (32 km) west of the East Mormon Mountain SEZ. The nearest rail access is in Moapa, approximately 25 mi (40 km) southwest of the SEZ.

There are seven public use airports within a driving range of about 80 mi (129 km) of the East Mormon Mountain SEZ, as listed in Table 11.5.21-2. Five of these airports do not have scheduled passenger service; the nearest of these is the Mesquite Airport, a small airport near I-15. North Las Vegas Airport, 70 mi (113 km) to the southwest, does not have scheduled commercial passenger service, but caters to smaller private and business aircraft (Clark County Department of Aviation 2010). In 2008, 22,643 and 23,950 passengers arrived at and departed from North Las Vegas Airport, respectively (BTS 2009).

The nearest airport with scheduled passenger service is the St. George Municipal Airport, 43 mi (69 km) to the northeast in St. George, Utah. Passenger service is provided by Delta Airlines and its partners (City of St. George Airport 2010). In 2008, 47,086 and 46,613 passengers arrived at and departed from this airport, respectively (BTS 2009). In the same year, 485,000 lb (220,000 kg) and 506,000 lb (229,000 kg) of freight arrived at and departed from St. George Airport, respectively (BTS 2009). Farther away in the opposite direction, McCarran International Airport in Las Vegas is served by all major U.S. airlines. In 2008, 20.43 million and 20.48 million passengers arrived at and departed from McCarran International Airport, respectively (BTS 2009). About 83.2 million lb (37.7 million kg) of freight departed and 117 million lb (53.2 million kg) arrived at McCarran in 2008 (BTS 2009).

**TABLE 11.5.21-1 AADT on Major Roads Near the Proposed East Mormon Mountain SEZ for 2009**

| Road | General Direction | Location | AADT |
|---|---|---|---|
| I-15 | Southwest–northeast | Between Valley of Fire Highway (exit 75) and Ute interchange (exit 80) | 18,000 |
| | | Between the Ute and Glendale interchanges (exits 80 and 91) | 19,000 |
| | | Between the W. Mesa Rest Area (northeast of exit 93) and the West Mesquite interchange (exit 120) | 17,000 |
| | | Section of I-15 in Arizona | 19,000[a] |
| U.S. 93 | North–south | North of I-15 junction (I-15 exit 64) | 1,900 |
| Valley of Fire Highway | East–west | 5 mi east of I-15 junction (I-15 exit 75) | 530 |
| State Route 144 (Mesquite Blvd.) | East–west | 0.4 mi west of State Route 170 junction | 11,000 |
| State Route 168 | Northwest–southeast | At I-15 Glendale interchange (exit 91) | 940 |
| State Route 169 | North–south | South of I-15 exit 93 | 4,500 |
| State Route 170 (Bunkerville Road) | North–south | South of I-15 exit 112 | 240 |
| | | 0.8 mi south of State Route 144 (southern approach to Mesquite) | 4,000 |

[a] Data for 2008, taken from AZ DOT (2009).

Source: NV DOT (2010).

1

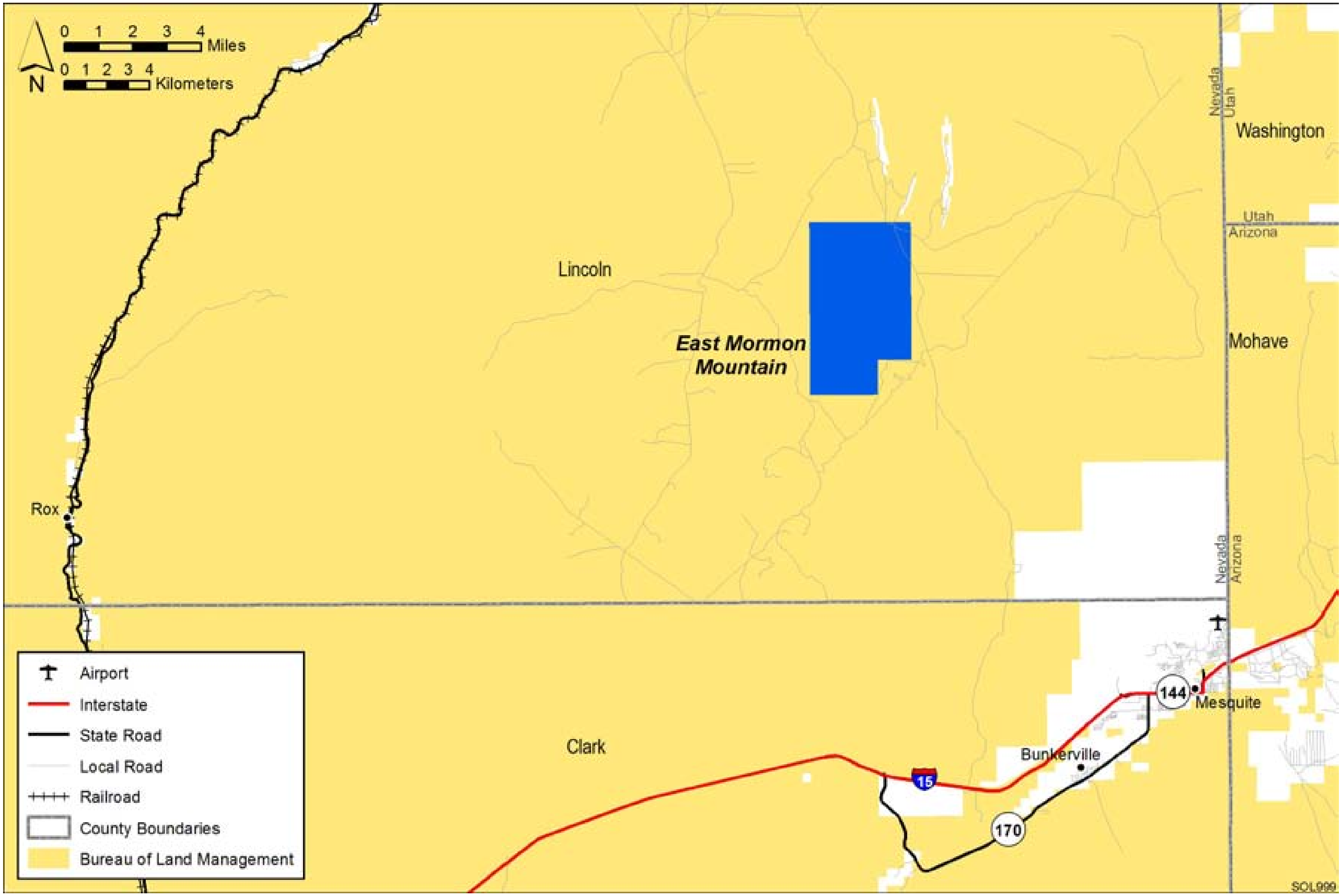


**FIGURE 11.5.21.1-1 Local Transportation Network Serving the Proposed East Mormon Mountain SEZ**

**TABLE 11.5.21-2 Airports Open to the Public in the Vicinity of the Proposed East Mormon Mountain SEZ**

| | | | Runway 1[a] | | | Runway 2[a] | | |
|---|---|---|---|---|---|---|---|---|
| Airport | Location | Owner/Operator | Length (ft [m]) | Type | Condition | Length (ft [m]) | Type | Condition |
| Mesquite | Near I-15, within several miles of any site access road off I-15 | City of Mesquite | 5,121 (1,561) | Asphalt | Good | –[b] | – | – |
| Perkins Field | I-15 southwest to State Route 169, south on State Route 169, 31 mi (50 km) | Clark County | 4,800 (1,463) | Asphalt | Good | – | – | – |
| St. George Municipal | To the northeast, 43 mi (69 km) up I-15 | City of St. George, Utah | 6,606 (2,014) | Asphalt/ Grooved | Good | – | – | – |
| Echo Bay | South-southwest of the SEZ by Lake Mead, a 52-mi (84-km) drive on State Route 167 | Lake Mead National Recreational Area | 3,400 (1,036) | Asphalt | Good | – | – | – |
| General Dick Stout Field | Northeast of the SEZ in Hurricane, Utah; 60 mi (97 km) | City of Hurricane, Utah | 3,410 (1,039) | Asphalt | Poor | – | – | – |
| North Las Vegas | Near I-15 in North Las Vegas, a 70-mi (113-km) drive from the SEZ | Clark County | 4,202 (1,281) | Asphalt | Good | 5,000 (1,524) | Asphalt | Good |
| | | | 5,004 (1,525) | Asphalt | Good | – | – | – |
| McCarran International | Off I-15 in Las Vegas, about 78 mi (126 km) | Clark County | 8,985 (2,739) | Concrete | Good | 9,775 (2,979) | Concrete | Good |
| | | | 10,526 (3,208) | Asphalt | Good | 14,510 (4,423) | Asphalt | Good |
| | | | 6,196 (1,889) | Asphalt | Good | 7,161 (2,183) | Asphalt | Good |

[a] Source: FAA (2010).

[b] A dash indicates not applicable.

### 11.5.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The volume of traffic on I-15 would represent an increase in traffic of about 12% in the area of the SEZ for one solar project. Because higher traffic volumes would be experienced during shift changes, traffic on I-15 could experience minor slowdowns during these time periods in the area of exits in the vicinity of the SEZ where a project is located. Local road improvements would be necessary in the vicinity of exits from I-15 so as not to overwhelm the local access roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any designated as open within the proposed SEZ, such open routes crossing areas issued ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

### 11.5.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed East Mormon Mountain SEZ. The programmatic design features described in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

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## 11.5.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed East Mormon Mountain SEZ in Lincoln County, Nevada. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental effects of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The land surrounding the East Mormon Mountain SEZ is undeveloped with few permanent residents living in the area. The nearest population centers are the small communities of Mesquite (population 21,253) and Bunkerville (population 1,330), approximately 12 mi (19 km) southeast of the southern boundary of the SEZ. The Moab Valley National Wildlife Refuge is 30 mi (48 km) southwest of the SEZ; the Desert National Wildlife Range is 40 mi (64 km) west of the SEZ; the Lake Mead National Recreation Area is about 30 mi (48 km) south of the SEZ; Valley of Fire State Park is 30 mi (48 km) southwest of the SEZ; and Grand Canyon-Parashant National Monument in Arizona is 25 mi (40 km) southeast of the SEZ. The Mormon Mountains WA is a few miles west of the SEZ. Three other WAs are within 50 mi (80 km) of the SEZ. The BLM administers approximately 82% of the lands in the Ely District, which contains the East Mormon Mountain SEZ. In addition, the Delamar Valley SEZ is located about 40 mi (64 km) to the northwest of the East Mormon Mountain SEZ and the proposed Dry Lake SEZ is located about 40 mi (64 km) to the southwest, and for some resources, the geographic extents of impacts from multiple SEZs overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the East Mormon Mountain SEZ is identified in Section 11.5.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 11.5.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 11.5.22.3. Cumulative impacts for each resource area are discussed in Section 11.5.22.4.

### 11.5.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the East Mormon Mountain SEZ is provided in Table 11.5.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (e.g., the evaluation of air quality may have a greater regional extent of impact than visual resources). Most of the lands around the SEZ are administered by the BLM, the USFWS, or the NPS; there are also some Tribal Lands nearby: the Moapa River Indian Reservation, about 30 mi (48 km) southwest of the SEZ, and the Paiute Shivwits Reservation,

**TABLE 11.5.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed East Mormon Mountain SEZ**

| Resource Area | Geographic Extent |
|---|---|
| Land Use | Southeast Lincoln County |
| Specially Designated Areas and Lands with Wilderness Characteristics | Within a 25-mi (40-km) radius of the East Mormon Mountain SEZ |
| Rangeland Resources | |
| Grazing | Grazing allotments within 5 mi (8 km) of the East Mormon Mountain SEZ |
| Wild Horses and Burros | A 50-mi (80-km) radius from the Center of the East Mormon Mountain SEZ |
| Recreation | Southeast Lincoln County |
| Military and Civilian Aviation | Southeast Lincoln County |
| Soil Resources | Areas within and adjacent to the East Mormon Mountain SEZ |
| Minerals | Southeast Lincoln County |
| Water Resources | |
| Surface Water | Toquop Wash, South Fork Toquop Wash, and the Virgin River Valley basin |
| Groundwater | Lower Virgin River Valley and Tule Desert groundwater basins |
| Air Quality and Climate | A 31-mi (50-km) radius from the center of the East Mormon Mountain SEZ |
| Vegetation, Wildlife and Aquatic Biota, Special Status Species | A 50-mi (80-km) radius from the center of the East Mormon Mountain SEZ, including portions of Lincoln and Clark in Nevada, Washington County in Utah, and Mohave County in Arizona |
| Visual Resources | Viewshed within a 25-mi (40-km) radius of the East Mormon Mountain SEZ |
| Acoustic Environment (noise) | Areas adjacent to the East Mormon Mountain SEZ |
| Paleontological Resources | Areas within and adjacent to the East Mormon Mountain SEZ |
| Cultural Resources | Areas within and adjacent to the East Mormon Mountain SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the East Mormon Mountain SEZ for other properties, such as traditional cultural properties |
| Native American Concerns | Areas within and adjacent to the East Mormon Mountain SEZ; viewshed within a 25-mi (40-km) radius of the East Mormon Mountain SEZ |
| Socioeconomics | A 50-mi (80-km) radius from the center of the East Mormon Mountain SEZ |
| Environmental Justice | A 50-mi (80-km) radius from the center of the East Mormon Mountain SEZ |
| Transportation | I-15 |

22 mi (35 km) northeast of the SEZ in Utah. The BLM administers approximately 78.3% of the lands within a 50-mi (80-km) radius of the SEZ.

### 11.5.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable"; that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;

- Proposals in a detailed design phase;

- Proposals listed in formal NOIs published in the *Federal Register* or state publications;

- Proposals for which enabling legislations has been passed; and

- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects that are in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to renewable energy and energy distribution, including potential solar energy projects under the proposed action (Section 11.5.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to fossil energy production, mining and mineral processing, pipelines, water management systems, communication systems, and residential developments (Section 11.5.22.2.2). Together, these actions and trends have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

#### *11.5.22.2.1 Energy Production and Distribution*

On February 16, 2007, Governor Gibbons signed an Executive Order to encourage the development of renewable energy resources in Nevada (Gibbons 2007a). The Executive Order requires all relevant state agencies to review their permitting processes to ensure the timely and expeditious permitting of renewable energy projects. On May 9, 2007, and June 12, 2008, the Governor signed Executive Orders creating the Nevada Renewable Energy Transmission Access Advisory Committee Phase I and Phase II, which will propose recommendations for improved access to the grid system for renewable energy industries (Gibbons 2007b, 2008). On May 28, 2009, the Nevada Legislature passed Senate Bill 358 modifying the Renewable Energy Portfolio

Standards. The bill requires that 25% of the electricity sold to be produced by renewable energy sources by 2025.

Reasonably foreseeable future actions related to renewable energy production and energy distribution within 50 mi (80 km) of the proposed East Mormon Mountain SEZ are identified in Table 11.5.22.2-1 and described in the following sections. Three foreseeable solar energy projects on private land were identified, but no solar, wind, or geothermal projects on public land were identified. Four proposed transmission line projects are also discussed.

**Renewable Energy Development**

Renewable energy applications are considered in two categories, fast-track and regular-track applications. Fast-track applications, which apply principally to solar and wind energy facilities, are those applications on public lands for which the environmental review and public participation process is under way and the applications could be approved by December 2010. A fast-track project would be considered foreseeable, because the permitting and environmental review processes would be under way. Regular-track proposals are considered potential future projects but not necessarily foreseeable projects, since not all applications would be expected to be carried to completion. These pending proposals are considered together as a general level of interest in development of renewable energy in the region.

No fast-track solar, wind, or geothermal projects on public land were identified. However, three reasonably foreseeable solar projects on private land within 50 mi (80 km) of the proposed SEZ were identified, as listed in Table 11.5.22.2-1 and described in the following sections.

***BrightSource Energy Coyote Springs Project.*** BrightSource Energy is planning to build a 960-MW, solar, thermal-power facility on private land at the Coyote Springs Investment Planned Development Project at the junction of U.S. 93 and State Route 168. The facility would utilize the Luz Power Tower, which consists of thousands of mirrors that reflect sunlight onto a boiler filled with water sitting on top of a tower. The high-temperature steam produced would be piped to a conventional turbine that generates electricity. The station would utilize a dry-cooling system. The site, approximately 7,680 acres (31 $km^2$), would be 38 mi (61 km) southwest of the SEZ (BrightSource Energy 2009).

***BrightSource Energy Overton Project.*** BrightSource Energy is planning to build three 400-MW solar thermal power facilities on private land east of the airport at Overton, Nevada. The facility would utilize the Luz Power Tower, which consists of thousands of mirrors that reflect sunlight onto a boiler filled with water sitting on top of a tower. The high-temperature steam produced would be piped to a conventional turbine that generates electricity. The station would utilize a dry-cooling system. The site would be 30 mi (48 km) southwest of the SEZ. The plan is for initial operation in 2012 (Cleantech 2008).

**TABLE 11.5.22.2-1  Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed East Mormon Mountain SEZ[a]**

| Description | Status | Resources Affected | Primary Impact Location |
|---|---|---|---|
| ***Renewable Energy Projects on Private Lands*** | | | |
| BrightSource Coyote Springs Project, 960 MW, solar tower, 7,680 acres | Planning stage | Terrestrial habitats, vegetation, wildlife, soil, water, visual, cultural | 38 mi (60 km) southwest of the SEZ |
| BrightSource Overton Project 1,200 MW, solar tower | Planning stage | Terrestrial habitats, vegetation, wildlife, soil, water, visual, cultural | 30 mi (48 km) southwest of the SEZ |
| Sithe Global Flat Top Mesa Solar, 50 MW, PV, 450 acres | Proposed | Terrestrial habitats, wildlife, cultural, visual | 10 mi (16 km) northeast of the SEZ |
| ***Transmission and Distribution Systems*** | | | |
| One Nevada Transmission Line Project | Draft Supplemental EIS Nov. 30, 2009 | Disturbed areas, terrestrial habitats along transmission line ROW | Corridor passes 40 mi (64 km) west of the SEZ |
| Southwest Intertie Project | FONSI issued July 30, 2008; in-service in 2010 | Disturbed areas, terrestrial habitats along transmission line ROW | Corridor passes 40 mi (64 km) west of the SEZ |
| TransWest Transmission Project | Permit Application Nov. 2009 | Disturbed areas, terrestrial habitats along transmission line ROW | Corridor passes southern boundary of SEZ |
| Zephyr and Chinook Transmission Line Project | Permit Applications in 2011/2012 | Disturbed areas, terrestrial habitats along transmission line ROW | Corridor passes about 40 mi (64 km) west of the SEZ |

[a] Projects in later stages of agency environmental review and project development.

***Sithe Global Flat Top Mesa Solar.*** Sithe Global is planning to build a 50-MW solar PV power plant. The 450-acre (1.8-km$^2$) site would be located on private land 5 mi (8 km) west of Mesquite Nevada and 10 mi (16 km) southeast of the SEZ. Approximately 200 workers would be required during the 15-month construction period (Sithe Global 2010a).

***Pending Solar and Wind ROW Applications on BLM-Administered Lands.*** Applications for ROW-way grants that have been submitted to the BLM include eight pending solar projects, three pending authorizations for wind site testing, and two authorized projects for wind testing that would be located within 50 mi (80 km) of the East Mormon Mountain SEZ (BLM 2010a). No applications for geothermal projects have been submitted. Table 11.5.22.2-2 lists these applications and Figure 11.5.22.2-1 shows their locations.

The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The projects, listed in Table 11.5.22.2-2 for completeness, are an indication of the level of interest in development of renewable energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

Wind testing would involve some relatively minor activities that could have some environmental effects, mainly, the erection of meteorological towers and monitoring of wind conditions. These towers may or may not employ guy wires and may be 200 ft (60 m) high.

**Transmission and Distribution Systems**

Table 11.5.22.2-1 identifies four major new transmission projects, which are described below.

***One Nevada Transmission Line Project.*** NV Energy proposes to construct and operate a 236-mi (382-km) 500-kV transmission line with fiber optic telecommunication and appurtenant facilities in White Pine, Nye, Lincoln, and Clark counties. It will consist of self-supporting, steel-lattice and steel-pose H-frame structures, placed 900 to 1,600 ft (274 to 488 m) apart. The width of the ROW is 200 ft (61 m). The proposed action includes new substations outside the ROI of the East Mormon Mountain SEZ. The transmission line would be within the SWIP utility corridor 40 mi (64 km) west of the SEZ. Construction could have potential impacts on the Mojave Desert Tortoise (BLM 2009a).

***Southwest Intertie Project (SWIP).*** The SWIP is a 520-mi (830-km) single-circuit, overhead, 500-kV transmission line project. The first phase, the Southern Portion, is a 264-mi (422-km) long transmission line that begins at the existing Harry Allen Substation in Dry Lake, Nevada, and runs north to a proposed substation approximately 18 mi (29 km) northwest of Ely, Nevada. The transmission line will pass 40 mi (64 km) west of the SEZ. It will consist of

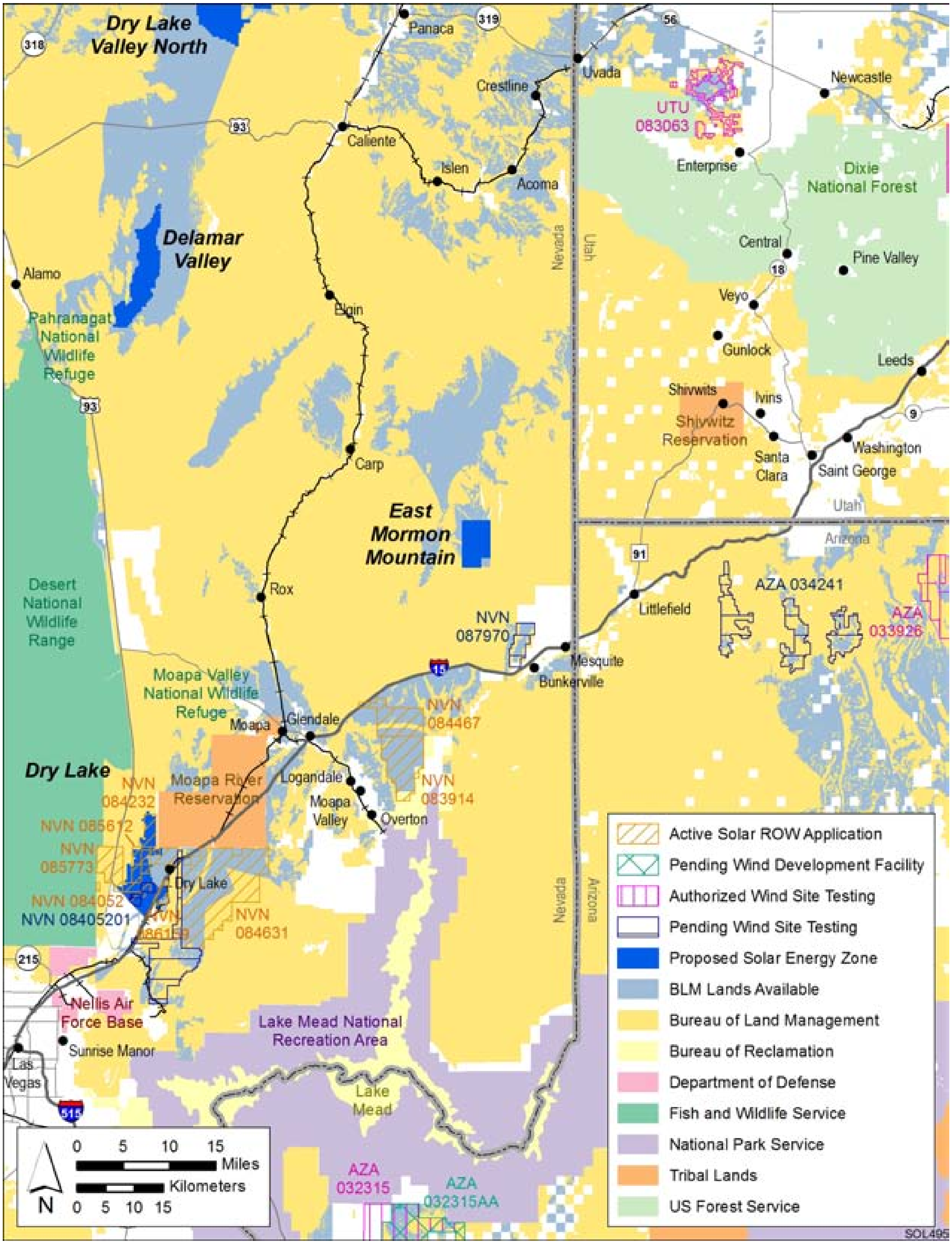


**FIGURE 11.5.22.2-1 Locations of Renewable Energy Project ROW Applications on Public Land within a 50-mi (80-km) Radius of the Proposed East Mormon Mountain SEZ**

**TABLE 11.5.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed East Mormon Mountain SEZ[a,b]**

| Serial Number | Applicant | Application Received | Size (acres)[c] | MW | Technology | Status | Field Office |
|---|---|---|---|---|---|---|---|
| ***Solar Applications*** | | | | | | | |
| NVN 83914 | BrightSource Energy Solar | Oct. 6, 2008 | 10,000 | 500 | CSP | Pending | Las Vegas |
| NVN 84232 | First Solar | Oct. 22, 2007 | 5,500 | 400 | PV | Pending | Las Vegas |
| NVN 84467 | Pacific Solar Investments Inc | Dec. 7, 2007 | 11,000 | 1,000 | CSP | Pending | Las Vegas |
| NVN 84631 | BrightSource Energy Solar | Jan. 28, 2008 | 2,000 | 1,200 | CSP | Pending | Las Vegas |
| NVN 85612 | Cogentrix Solar Services, LLC | July, 11, 2008 | 2,012 | 240 | CSP | Pending | Las Vegas |
| NVN 85773 | Cogentrix Solar Services, LLC | July, 11, 2008 | 11,584 | 1,000 | CSP | Pending | Las Vegas |
| NVN 84052 | Nevada Power | Aug. 14, 2007 | 1,775 | 120 | CSP | Pending | Las Vegas |
| NVN 86159 | Power Partners Southwest, LLC | Sept. 19, 2008 | 1,751 | 250 | CSP | Pending | Las Vegas |
| ***Wind Applications*** | | | | | | | |
| NVN 87970 | Pacific Wind Development | Sept. 29, 2009 | 5,089 | –[d] | Wind | Pending wind site testing | Las Vegas |
| NVN 8405201 | NV Power | Nov. 7, 2008 | 1,000 | – | Wind | Pending wind site testing | Las Vegas |
| AZA 34241 | Foresight Wind | – | 29,022 | – | Wind | Pending wind site testing | Arizona Strip |
| AZA 33926 | Gamesa Energy USA | Apr. 2, 2007 | 17,027 | – | Wind | Authorized wind site testing | Arizona Strip |
| UTU 83063 | Energy Unlimited Inc. | – | 10,013 | – | Wind | Authorized wind site testing | Cedar City |

[a] BLM (2010a).

[b] Information for pending solar (BLM and USFS 2010c) and pending wind (BLM and USFS 2010d) energy projects downloaded from GeoCommunicator.

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

[d] A dash indicates data not available.

self-supporting, steel-lattice and steel-pole H-frame structures, placed 1,200 to 1,500 ft (366 to 457 m) apart. The SWIP is expected to be completed in 2010. Construction could have potential impacts on the Mojave Desert Tortoise (BLM 2007b).

***TransWest Transmission Project.*** TransWest Express proposes to construct a high-voltage electric utility transmission line. The 600-kV direct current transmission line would extend from south central Wyoming to southern Nevada. A terminal/converter station would be located near Boulder, Nevada. A communication system for command and control will require a fiber optic network and periodic regenerative sites. The proposed routes have been sited to parallel existing facilities and occupy designated utility corridors to the extent practicable, and will pass the southern boundary of the SEZ (TransWest Express 2009).

***Zephyr and Chinook Transmission Line Project.*** TransCanada is proposing to construct two 500-kV, high-voltage, direct current transmission lines. The Zephyr project would originate in southeastern Wyoming. The Chinook project would originate in south central Montana. Both would travel along the same corridor from northern Nevada, passing about 40 mi (64 km) west of the SEZ, and terminate in the El Dorado Valley south of Las Vegas. Construction is expected to be complete in 2015 or 2016 (TransCanada 2010).

##### *11.5.22.2.2 Other Actions*

There are a number of energy production facilities within a 50-mi (80-km) radius from the center of the East Mormon Mountain SEZ, which includes portions of Clark and Lincoln Counties in Nevada, Washington County in Utah, and Mohave County in Arizona. Other major ongoing and foreseeable actions within 50 mi (80 km) of the proposed East Mormon Mountain SEZ are listed in Table 11.5.22.2-3 and described in the following sections.

**Other Ongoing and Foreseeable Energy Projects**

***Apex Generating Station.*** The Apex Generating Station is a 600-MW, combined-cycle, natural gas–fired power plant, consisting of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator. The plant is located within the Apex Industrial Park near the intersection of I-15 and U.S. 93. The site is about 50 mi (80 km) southwest of the SEZ (Mirant Las Vegas, LLC 2007).

***Chuck Lenzie Generating Station.*** The Chuck Lenzie Generating Station is an 1,160-MW, combined-cycle, natural gas–fired electric generation facility, located approximately 50 mi (80 km) southwest of the SEZ; it consists of four combustion turbines, four heat recovery steam generators and two steam turbines. The plant, owned by NV Energy, has been operating at full power since 2006. The station utilizes a dry-cooling system (NV Energy 2010a).

**TABLE 11.5.22.2-3 Other Major Actions near the Proposed East Mormon Mountain SEZ[a]**

| Description | Status | Resources Affected | Primary Impact Location |
|---|---|---|---|
| ***Energy Projects*** | | | |
| Apex Generating Station | Operating since 2003 | Terrestrial habitats, wildlife, water, air, cultural, visual | 50 mi (80 km) southwest of the SEZ |
| Chuck Lenzie Generating Station | Operating since 2006 | Terrestrial habitats, wildlife, water, air, cultural, visual | 50 mi (80 km) southwest of the SEZ |
| Harry Allen Generating Station | Operating since early 1980s | Terrestrial habitats, wildlife, water, air, cultural, visual | 50 mi (80 km) southwest of the SEZ |
| Harry Allen Generating Station Expansion | Under construction | Terrestrial habitats, wildlife, water, air, cultural, visual | 50 mi (80 km) southwest of the SEZ |
| Reid Gardner Generating Station | Operating since 1965 | Terrestrial habitats, wildlife, water, air, cultural, visual | 30 mi (48 km) southwest of the SEZ |
| Reid Gardner Expansion | EA and FONSI March 2008 | Terrestrial habitats, wildlife, soil, air, water | 30 mi (48 km) southwest of the SEZ |
| Silverhawk Generating Station | Operating since 2004 | Terrestrial habitats, wildlife, water, air, cultural, visual | 50 mi (80 km) southwest of the SEZ |
| Toquop Energy Project | Coal-fired plant FEIS 2009, changed to natural gas in 2010 | Terrestrial habitats, wildlife, soil, water, air, cultural, visual | Adjacent to SEZ |
| ***Distribution Systems*** | | | |
| Kern River Gas Transmission System | Operating since 1992 | Disturbed areas, terrestrial habitats along pipeline ROW | Corridor passes just south of SEZ |
| UNEV Pipeline Project | FEIS April 2010 | Disturbed areas, terrestrial habitats along pipeline ROW | Corridor passes just south of SEZ |

**TABLE 11.5.22.2-3 (Cont.)**

| Description | Status | Resources Affected | Primary Impact Location |
|---|---|---|---|
| ***Other Projects*** | | | |
| Clark, Lincoln and White Pine Counties Groundwater Development Project | DEIS expected in 2011 | Terrestrial habitats, wildlife, groundwater | 43 mi (69 km) northwest of the SEZ |
| Coyote Springs Investment Planned Development Project | FEIS issued Sept. 2008, ROD issued Oct. 2008 | Terrestrial habitats, wildlife, water, socioeconomics | 35 mi (56 km) west of the SEZ |
| East Mormon Mountain Groundwater Testing/Monitoring Wells | EA and FONSI issued Sept. 2009 | Terrestrial habitats, wildlife cultural resources | Within the SEZ |
| Lincoln County Land Act Groundwater Development and Utility ROW | FEIS issued May 2009 ROD Jan. 2010 | Terrestrial habitats, wildlife, groundwater | Passes through the SEZ |
| Caliente Rail Realignment | FEIS June 2008 | Terrestrial habitats, wildlife cultural resources | Closest approach 44 mi (70 km) northwest of the SEZ |
| Meadow Valley Industrial Park | FEIS issued Jan. 2010 | Terrestrial habitats, wildlife, socioeconomics | 44 mi (70 km) northwest of the SEZ |
| Ash Canyon Sagebrush Restoration and Fuels Reduction Project | Preliminary EA issued May 2010 | Terrestrial habitats, wildlife | 38 mi (61 km) northwest of the SEZ |
| Meadow Valley Gypsum Project | EA and FONSI issued 2008 | Terrestrial habitats, wildlife, soils, socioeconomics | 10 mi (16 km) west of the SEZ |
| Mesquite Nevada General Aviation Replacement Airport | DEIS April 2008 | | 10 mi (16 km) southeast of SEZ |
| NV Energy Microwave and Mobile Radio Project | Preliminary EA March 2010 | Terrestrial habitats, wildlife cultural resources | Two of the sites 40 mi (64 km) west of SEZ; one site 50 mi (80 km) northwest of SEZ |

[a] Projects ongoing or in later stages of agency environmental review and project development.

***Harry Allen Generating Station.*** The Harry Allen Generating Station is a 144-MW, gas-fired power plant. The plant is located north of the intersection of I-15 and U.S. 93. The site is about 50 mi (80 km) southwest of the SEZ (NV Energy 2010b).

***Harry Allen Generating Station Expansion.*** The Harry Allen Generating Station Expansion is a 484-MW, combined-cycle, natural gas–fired power plant, consisting of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator. The heat rejection system will utilize a cooling system composed of natural-draft dry-cooling towers. The plant is located on the site of the existing 144-MW plant. The site is about 50 mi (80 km) southwest of the SEZ (NV Energy 2010b).

***Reid Gardner Generating Station.*** The Reid Gardner Generating Station is a four-unit, 557-MW coal-fired electric generating facility owned by NV Energy. The first unit went online in 1965. All four units have been operating since 1983. The 480-acre (1.9-$km^2$) site is located near the town of Moapa, about 30 mi (48 km) southwest of the SEZ. The facility includes evaporation ponds and fly ash, bottom ash, and solids landfills. Pollution control includes wet scrubbers. The heat rejection system consists of wet-cooling towers. Coal is delivered by rail (BLM 2008d).

***Reid Gardner Expansion Project.*** The Reid Gardner Expansion Project will consist of the construction of a 240-acre (0.97-$km^2$) fly ash landfill and a 315-acre (1.27-$km^2$) evaporation pond to support the existing Reid Gardner Power Plant. The proposed expansion is located adjacent to the southern boundary of the existing site near the town of Moapa, about 30 mi (48 km) southwest of the SEZ (BLM 2008d).

***Silverhawk Generating Station.*** The Silverhawk Generating Station is a 580-MW, combined-cycle, natural gas–fired power plant, consisting of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator. The plant is located within the Apex Industrial Park near the intersection of I-15 and U.S. 93. The site is about 50 mi (80 km) southwest of the SEZ. The station utilizes a dry-cooling system (NV Energy 2009b).

***Toquop Energy Project.*** The Toquop Energy Project, originally proposed as a 750-MW, coal-fired electric generation facility, is now planned as a 1,100-MW natural gas-fired combined-cycle power plant, located on a 640-acre (2.59-$km^2$) site 12 mi (19 km) northwest of the town of Mesquite, Nevada, and adjacent to the SEZ. The project will be built in phases. Phase 1 will be a nominal 550 to 600 MW combined-cycle plant. A water supply system, a gas pipeline connecting the power plant to the Kern River pipeline, connection to the existing Navajo-McCullogh transmission line, and road access to I-15 would be required. The heat rejection system will utilize a hybrid cooling system composed of natural draft dry-cooling towers with ability to apply water overspray on the heating surfaces to provide additional cooling at ambient air temperatures greater than about 80°F (27°C). The proposed project would require 600 workers during construction, scheduled to begin in 2012 with commercial operation in 2015 (BLM 2009b; Sithe Global 2010b).

### Ongoing and Foreseeable Distribution Systems

***Kern River Gas Transmission System.*** The Kern River Gas Transmission system transports 1.7 billion $ft^3$ per day (48 million $m^3$) of natural gas from Wyoming to the Las Vegas area and then southwest as far as San Bernardino, California. The 1,680-mi (2,690-km) pipeline has been in operation since 1992. A two-pipeline delivery system exists along most of the pipeline route. The pipeline passes to the south of the SEZ (Kern River Gas Transmission Company 2010).

***UNEV Pipeline Project.*** Holly Energy Partners proposes to construct and operate a 399-mi (640-km), 12-in. (30.5-cm) petroleum products pipeline that will originate at the Holly Corporation's Woods Cross, Utah, refinery near Salt Lake City and terminate near the Apex Industrial Park near the intersection of I-15 and U.S. 93. The pipeline would generally follow the Kern River ROW within Nevada and pass just south of the SEZ (BLM 2010b).

### Other Ongoing and Foreseeable Projects

***Clark, Lincoln, and White Pine Counties Groundwater Development Project.*** The Southern Nevada Water Authority (SNWA) proposes to construct a groundwater development project that would transport approximately 122,755 ac-ft/yr (151 million $m^3$/yr) of groundwater under existing water rights and applications from several hydrographic basins in eastern Nevada and western Utah. The proposed facilities include production wells, 306 mi (490 km) of buried water pipelines, five pumping stations, six regulating tanks, three pressure reducing stations, a buried storage reservoir, a water treatment facility, and about 323 mi (517 km) of 230-kV overhead power lines, as well as two primary and five secondary substations. The project would develop groundwater in the following amounts in two hydraulically connected valleys that are about 35 mi (56 km) west of the East Mormon Mountain SEZ and in a separate hydrographic basin: Dry Lake Valley (11,584 ac-ft/yr [14.3 million $m^3$/yr]) and Delamar Valley (2,493 ac-ft/yr [3.1 million $m^3$/yr]). In addition, an undetermined amount of water could be developed and transferred from Coyote Spring Valley, which is down-gradient of the other two basins (SNWA 2010).

***Coyote Springs Investment (CSI) Development Project.*** CSI intends to develop a new town in southern Lincoln County at the junction of U.S. 93 and State Route 168. The town would be a master-planned community on 21,454 acres (86.8 $km^2$), and would include residential, commercial, and industrial land uses. Plans call for more than 111,000 residential dwelling units at a density of 5 units per acre (0.004047 $km^2$). Also included in the community would be public buildings, hotels, resorts, casinos, commercial and light industrial areas, roads, bridges, and a heliport. Utilities and other infrastructure would be developed to serve the town, including power facilities, sanitary sewer and wastewater treatment facilities, stormwater facilities, solid waste disposal transfer stations, and telecommunications facilities. Water supply treatment facilities, monitoring wells, production wells, storage facilities, and transmission and distribution facilities would also be built. Approximately 70,000 ac-ft/yr (86 million $m^3$/yr) of water would be needed for the community at full build-out, which may occur over a period of about 40 years. Currently, CSI and its affiliates hold approximately 36,000 ac-ft/yr (44.0 million $m^3$/yr) in certificated groundwater rights in various basins within Lincoln County. CSI currently owns the 21,454-acre (86.82-$km^2$) development area and holds leases on an additional 7,548 acres (30.6 $km^2$) of BLM land in Lincoln County and 6,219 acres (25.2 $km^2$) of BLM land in Clark County within or next to the privately held land. These adjacent areas would be managed by BLM for the protection of federally listed threatened or endangered species; activities would be limited to non-motorized recreation or scientific research. The development is 35 mi (56 km) west of the SEZ (USFWS 2008).

***East Mormon Mountain Groundwater Testing/Monitoring Wells.*** The SNWA intends to construct two to four groundwater wells within two 2.5-acre (0.010-$km^2$) (1.0-acre [0.004-$km^2$] long term and 1.5-acre [0.006-$km^2$] short term) site locations in the East Mormon Mountain SEZ. The dimensions for the long-term ROW would be 168 ft × 260 ft (51 m × 79 m), and the dimensions for the short-term ROW would be 330 ft × 330 ft (100 m × 100 m). Two 12-in. (30.5-cm) and two 20-in. (50.8-cm) wells would be drilled to between 2,200 and 2,400 ft (670 and 730 m) in depth. Access to the well sites would be from both existing roads and a new 809-ft (247-m) long access road. Water generated during the tests would be discharged into the natural drainage network around the sites. At the completion of hydraulic testing, SNWA would continue to record data to establish baseline ranges of the groundwater levels in the area.

***Lincoln County Land Act Groundwater Development and Utility ROW.*** This project involves the construction of the infrastructure required to pump and convey groundwater resources in the Clover Valley and Tule Desert Hydrographic Areas. The construction includes 75 mi (122 km) of collection and transmission pipeline, 30 wells, 5 storage tanks, water pipeline booster stations, transmission lines and substations, and a natural gas pipeline. A total of 240 acres (0.97 $km^2$) will be permanently disturbed, and 1,878 acres (7.6 $km^2$) temporarily disturbed. The pipeline will pass through the SEZ (BLM 2009e).

***Caliente Rail Alignment.*** The DOE proposes to construct and operate a railroad for the shipment of spent nuclear fuel and high-level radioactive waste to the geologic repository at Yucca Mountain, Nevada. The rail line would begin near Caliente, Nevada, and extend north, then turn in a westerly direction, passing through the SEZ, to a location near the northwest corner of the Nevada Test and Training Range, and then continue south-southwest to Yucca Mountain. The rail line would range in length from approximately 328 mi (528 km) to 336 mi (541 km), depending upon the exact location of the alignment. The rail line would be restricted to DOE shipments. Over a 50-year period, 9500 casks containing spent nuclear fuel and high-level radioactive waste, and approximately 29,000 rail cars of other materials, including construction materials, would be shipped to the repository. An average of 17 one-way trains per week would travel along the rail line. Construction of support facilities, interchange yard, staging yard, maintenance-of-way facility, rail equipment maintenance yard, cask maintenance facility, and Nevada Rail Control Center and National Transportation Operation Center would also be required. Construction would take 4 to 10 years and cost $2.57 billion. Construction activities would occur inside a 1000 ft (300 m) wide ROW for a total footprint of 40,600 acres (164 km$^2$) (DOE 2008).

***Meadow Valley Industrial Park.*** The BLM is planning to transfer a 103-acre (0.42-km$^2$) parcel to the City of Caliente, Nevada, for the construction of the Meadow Valley Industrial Park. The site is located on a previously disturbed area used for agriculture and recreation at the intersection of U.S. 93 and State Route 317, about 20 mi (32 km) northeast of the SEZ. Improvements to the site would include construction of a rail spur, access roads, and water and sewer extensions (USFWS 2010b).

***Ash Canyon Sagebrush Restoration and Fuels Reduction Project.*** The BLM Caliente Field Office is proposing to conduct a sagebrush improvement and fuels reduction project adjacent to Ash Canyon, about 5 mi (8 km) southeast of Caliente, Nevada, and about 38 mi (61 km) northwest of the SEZ. The size of the project area is 870 acres (3.5 km$^2$). The goal is to reduce pinyon and juniper in order to achieve a desired state where sagebrush is present along with an understory of perennial species; to reduce risk of wild fires by reducing fuel loading; to restore the historic disturbance regime; and to improve the available habitat for resident wildlife (BLM 2010d).

***Meadow Valley Gypsum Project.*** Meadow Valley Gypsum was issued a Finding of No Significant Impact (BLM 2008c) following an Environmental Assessment of proposed mining, processing, and transporting of gypsum on public lands. The project would be located 50 mi (80 km) south of Caliente in Lincoln County, Nevada. The project would disturb 46.7 acres (0.2 km$^2$) and would consist of an open pit, processing plant, and a 1.5-mi (2.4-km) access road.

***Mesquite Nevada General Aviation Replacement Airport.*** The City of Mesquite, Nevada, is proposing to replace its existing airport with a new airport on Mormon Mesa, adjacent to I-15 near Riverside, Nevada, and about 10 mi (16 km) south of the SEZ. The airport would require BLM to release 2,560 acres (10.4 km$^2$) of BLM land for acquisition by the City of Mesquite. The airport would include a new runway with associated parallel taxiway and general aviation support and maintenance facilities. The existing airport would be decommissioned, and the site would be released for nonaeronautical uses (FAA 2008).

***NV Energy Microwave and Mobile Radio Project.*** NV Energy is proposing to install a new microwave and radio communications network at 13 sites. Two sites are located 40 mi (64 km) west of the SEZ, and one is located 50 mi (80 km) northwest of the SEZ. The two closest sites are small, about 0.1 acres (0.0004 $km^2$). The further site is 0.6 acres (0.0024 $km^2$) but requires 57 acres (0.23 $km^2$) of land disturbance for access and power line ROWs. Each site would include a communication shelter, two propane tanks, and a generator. Two of the sites have a 160-ft (50-m) self-supporting lattice tower and one, an 80-ft (25-m) tower (BLM 2010a).

**Grazing**

There are numerous grazing allotments within the BLM Ely District. Restrictions on Season of Use have been placed upon the desert tortoise critical habitat portions of the Gourd Springs and Summit Spring allotments in the Programmatic Biological Opinion for the Bureau of Land Management's Ely District Resource Management Plan.

**Mining**

The Meadow Valley Gypsum Project is proposing to mine gypsum on public land approximately 10 mi (16 km) west of the SEZ, as noted above. A total of 46.7 acres (0.19 $km^2$) would be disturbed during the 10-year lifetime of the project. A 1.5-mi (2.5-km) access road and a 1.8-acre (0.0073-$km^2$) railroad siding would be constructed.

### 11.5.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change for the proposed East Mormon Mountain SEZ are presented in this section. Table 11.5.22.3-1 lists the relevant impacting factors for the trends.

#### *11.5.22.3.1 Population Growth*

Over the period 2000 to 2008, the population in Lincoln County grew annually by 1.4%, in Clark County, 4.0%, and in Washington County, Utah, 5.2%, portions of which make up the ROI for the East Mormon Mountain SEZ (see Section 11.5.19.1.5). The annual growth rate for Nevada as a whole was 3.4% and for Utah, 2.5%. The population of the ROI in 2008 was 2,019,414 and is projected to increase to 2,977,752 by 2021 and to 3,079,077 by 2023.

**TABLE 11.5.22.3-1 General Trends Relevant to the Proposed SEZs in Nevada**

| General Trend | Impacting Factors |
|---|---|
| Population growth | Urbanization<br>Increased use of roads and traffic<br>Land use modification<br>Employment<br>Education and training<br>Increased resource use (e.g., water and energy)<br>Tax revenue |
| Energy demand | Increased resource use<br>Energy development (including alternative energy sources)<br>Energy transmission and distribution |
| Water availability | Drought conditions and water loss<br>Conservation practices<br>Changes in water distribution |
| Climate change | Water cycle changes<br>Increased wildland fires<br>Habitat changes<br>Changes in farming production and costs |

#### *11.5.22.3.2 Energy Demand*

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in seven SEZ areas in Nevada between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5, 0.4, and 0.1% each year, respectively (EIA 2009).

#### *11.5.22.3.3 Water Availability*

As described in Section 11.5.9.1.2, the proposed East Mormon Mountain SEZ is located within the Lower Virgin River Valley groundwater basin. Groundwater recharge from precipitation is estimated to be between 9,500 and 55,000 ac-ft/yr (12 million and 68 million $m^3$/yr); evaporation from groundwater is estimated to be 30,000 to 70,000 ac-ft/yr (37 million to 86 million $m^3$/yr); and outflow into Lake Mead is estimated at 29,000 to

40,000 ac-ft/yr (36 million to 49 million $m^3$/yr). The estimated sustainable yield of the groundwater basin in the three-state region near the SEZ is between 12,600 and 40,000 ac-ft/yr (16 million and 49 million $m^3$/yr), but is currently set by the NDWR as 3,600 ac-ft/yr (4.4 million $m^3$/yr) in the Nevada portion of the basin.

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million $m^3$/yr), of which 11% came from surface waters and 89% from groundwater. The largest water use category was irrigation at 55,100 ac-ft/yr (68 million $m^3$/yr), while public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million $m^3$/yr). It is estimated that a total of 12,000 ac-ft/yr (15 million $m^3$/yr) are withdrawn from the Lower Virgin Valley Groundwater basin.

The Lincoln County Water District has proposed a groundwater development and utility ROW project (Lincoln County Land Act project described above) to pump and convey water that is permitted or may be permitted for use by the Nevada State Engineer from the Clover Valley and Tule Desert hydrographic areas for use by Lincoln County customers. The project could pump up to 14,480 ac-ft/yr (17.9 million $m^3$/yr) from 15 wells in Clover Valley and 9,340 ac-ft/yr (11.5 million $m^3$/yr) from Tule Desert. A pipeline ROW on public land would convey water to multiple storage tanks for use (BLM 2009e).

##### *11.5.22.3.4 Climate Change*

Governor Jim Gibbons' Nevada Climate Change Advisory committee (NCCAC) conducted a study of climate change and its effects on Utah (NCCAC 2008). The report summarized the present scientific understanding of climate change and its potential impacts on Nevada. A report on global climate change in the United States prepared by the U.S. Global Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from these reports indicate the following:

- Precipitation will decrease, and a greater percentage of that precipitation will come from rain, resulting in a greater likelihood of winter and spring flooding and decreased stream flow in the summer.

- The average temperature in the Southwest has already increased by about 1.5ºF compared to a 1960 to 1979 baseline, and by the end of the century, the average annual temperature is projected to rise 4ºF to 10ºF.

- A warming climate and the related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires.

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end.

- Much of the Southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region.

- As temperatures rise, landscape will be altered as species shift their ranges northward and upward to cooler climates.

- Temperature increases, when combined with urban heat island effects for major cities such as Las Vegas, present significant stress to health, electricity, and water supply.

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

### 11.5.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed East Mormon Mountain SEZ on the basis of the following assumptions: (1) because of the small size of the proposed SEZ (<10,000 acres [<40.5 $km^2$]), only one project could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 7,174 acres (29 $km^2$) (80% of the entire proposed SEZ). For purposes of analysis, it is also assumed that no more than 3,000 acres (12.1 $km^2$) would be disturbed per project annually and 250 acres (1.01 $km^2$) monthly on the basis of construction schedules planned in current applications. Since an existing 500-kV transmission line runs by the southeast corner of the SEZ, no analysis of impacts has been conducted for the construction of new transmission line outside of the SEZ that might be needed to connect solar facilities to the regional grid (see Section 11.5.1.2). The nearest major road is I-15, which lies 11 mi (18 km) south of the SEZ. It is assumed that a new access road disturbing an additional 80 acres (0.3 $km^2$) would be constructed to support solar development in the SEZ.

Cumulative impacts that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section in each resource area are discussed below. At this stage of development, because of the uncertain nature of the future projects in terms of size, number, location within the proposed SEZ, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

#### *11.5.22.4.1 Lands and Realty*

The proposed East Mormon Mountain SEZ is very isolated and is accessible only by dirt roads. There are no existing rights of way within the SEZ, but two designated 368b transmission corridors pass adjacent to the SEZ and contain three major transmission lines and a natural gas pipeline (Section 11.5.2.1).

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. Solar energy facilities would become a dominating visual presence in the area due to their large size.

As presented in Section 11.5.22.2, foreseeable actions within a 50-mi (80-km) radius of the proposed SEZ include the Toquop power plant, three solar facilities, four transmission lines, two groundwater development projects, a petroleum pipeline project, the proposed 21,454-acre (86.8-$km^2$) Coyote Springs Investment residential development, and a proposed new community airport. In addition, eight potential solar facilities with pending applications covering over 40,000 acres (160 $km^2$) and five pending wind applications lie within this distance. Existing facilities include several large gas-fired power plants located 30 to 50 mi (49 to 80 km) to the southwest near the proposed Dry Lake SEZ. The proposed Dry Lake SEZ, located about 40 mi (64 km) to the southwest, and the proposed Delamar Valley SEZ, located about 40 mi (64 km) to the northwest, each lie within 50 mi (80 km) of the proposed East Mormon Mountain SEZ. The number of solar applications, along with the two foreseeable solar energy projects within this distance, indicates a fairly strong interest in solar energy development in the region.

The development of utility-scale solar projects in the proposed East Mormon Mountain SEZ in combination with other ongoing, foreseeable, and potential actions within the 50-mi (80-km) geographic extent of effects could have cumulative effects on land use in the vicinity of the proposed SEZ. Cumulative impacts on accessibility of land for other purposes and on groundwater and visual resources could result, among other resource impacts, depending in part on where and how many potential solar and wind projects are actually built.

#### *11.5.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics*

There are 20 specially designated areas within 25 mi (40 km) of the proposed East Mormon Mountain SEZ in Nevada, Utah, and Arizona (Section 11.5.3.1). Potential exists for cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and other projects outside the SEZ. The exact nature of cumulative visual impacts on the users of these areas would depend on the specific solar technologies employed and the locations selected within the SEZ for solar facilities. Currently proposed projects and potential solar and wind projects within the geographic extent of effects could cumulatively affect sensitive areas through visual impacts and effects on wilderness characteristics. In addition, projects would produce fugitive dust emissions, and could strain water resources and reduce access to specially designated areas.

#### *11.5.22.4.3 Rangeland Resources*

Portions of two grazing allotments overlap the proposed SEZ; they would be reduced by less than 10% in size by solar energy development within the SEZ. One allotment has already been reduced by other factors, so SEZ impacts would result in a small cumulative impact on livestock grazing in this allotment, and the proposed adjacent Toquop power plant could further affect one or both of these allotments. However, the loss of approximately 315 AUMs within the proposed SEZ would be a negligible reduction in the over 54,199 AUMs authorized within the BLM Caliente Field Office (Section 11.5.4.1.2.1).

Because the East Mormon Mountain SEZ is 32 mi (51.5 km) or more from any wild horse and burro HMA managed by the BLM and more than 50 mi (80 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly or indirectly affect wild horses and burros that are managed by these agencies and would not contribute to cumulative impacts on these species (Section 11.5.4.2.2).

#### *11.5.22.4.4 Recreation*

Limited outdoor recreation (e.g., backcountry driving, OHV use, and some camping and hunting) occurs on or in the immediate vicinity of the SEZ. Construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. Road closures and access restrictions within the proposed SEZ would affect OHV use and access to undeveloped areas. Foreseeable and potential future actions would similarly affect areas of low recreational use and would have minimal effects on recreation. Thus, cumulative impacts on recreation within the geographic extent of effects are not expected.

#### *11.5.22.4.5 Military and Civilian Aviation*

The proposed East Mormon Mountain SEZ is located under two MTRs and 5 mi (8 km) east of a large MOA that extends across southern Nevada just north of Las Vegas. The area is also located within a mandatory DoD Consultation Area. The military has indicated that solar facility structures higher than 200 ft (61 m) would intrude into military airspace and would present safety concerns for military aircraft (Section 11.5.6.2). Foreseeable and potential solar facilities, communication towers, and transmission lines, and the proposed Toquop power plant adjacent to the SEZ, could present additional concerns for military aviation and could result in cumulative impacts on military aviation. The Mesquite and St. George Airports are located far enough away from the facility that there would be no effect on their operations.

#### *11.5.22.4.6 Soil Resources*

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from construction of the proposed Toquop power plant and nearby transmission lines and pipelines, and from recreational uses. Overall, small cumulative impacts on soil resources near the proposed SEZ could result with mitigations in place.

In addition to soil loss from erosion, landscaping of solar energy facilities and other future projects within and outside the SEZ could alter drainage patterns and lead to increased siltation of surface water streambeds. However, programmatic design features would be in place to minimize impacts from erosion.

#### *11.5.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)*

As discussed in Section 11.5.8, there are currently no active oil and gas leases within the proposed East Mormon Mountain SEZ, and there are no pending mining claims or proposals for geothermal energy development in the SEZ. Because of the generally low level of mineral production in the area and the expected low impact of other foreseeable actions on mineral accessibility within the geographic extent of effects, no cumulative impacts on mineral resources are expected.

#### *11.5.22.4.8 Water Resources*

Section 11.5.9.2 describes the water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities. The amount of water needed during the peak construction year for all evaluated solar technologies would be 1,039 to 1,492 ac-ft (1.3 million to 1.8 million $m^3$). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for all evaluated solar technologies would range from 41 to 21,543 ac-ft/yr (51 thousand to 27 million $m^3$). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. As discussed in Section 11.5.22.2.3, water withdrawals in 2005 in Lincoln County were 57,100 ac-ft/yr (70 million $m^3$/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use categories were irrigation at 55,100 ac-ft/yr (68 million $m^3$/yr) and public supply/domestic supply at 1,300 ac-ft/yr (1.6 million $m^3$/yr). Cumulatively, the additional water resources needed for solar facilities in the SEZ during operations would constitute from a very small (0.07%) to a large (38%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Lincoln County) depending on the solar technology used (PV technology at the low end and wet-cooled parabolic trough technology at the high end).

Near the SEZ, the Lower Virgin River Valley groundwater basin has an estimated sustainable yield of between 12,600 and 40,000 ac-ft/yr (16 and 49 million $m^3$/yr) in the three-state region near the SEZ (Section 11.5.9.1.2). Thus, solar developments on the SEZ would have the capacity to use about half of the sustainable groundwater yield in the local basin using wet cooling. Full development with dry-cooled solar trough technologies would require up to 2,172 ac-ft/yr (2.7 million $m^3$/yr), or about 5% of this level (Section 11.5.9.2.2).

While solar development of the proposed SEZ with water-intensive technologies would likely be infeasible due to impacts on groundwater supplies and existing demands on water rights, excessive groundwater withdrawals could disrupt the existing groundwater supplies in the Lower Virgin River Valley and in hydraulically connected basins. In addition, land disturbance for solar facility construction could cause localized soil erosion and sedimentation of ephemeral washes, degrade associated habitats, and alter groundwater recharge and discharge processes. Thus, a significant increase in withdrawals from solar development within the proposed SEZ could result in a major impact on groundwater, and further cumulative impacts could occur when combined with other current and future uses in the region. These could include the foreseeable Toquop power plant, which would be adjacent to the SEZ and tap the same groundwater resources of the Tule Desert basin, which is adjacent to the Virgin River Valley basin to the northwest and hydraulically connected. This plant was originally configured to produce 750 MW from coal and use hybrid cooling as analyzed in the 2009 Final EIS (BLM 2009e), requiring an estimated 2,500 ac-ft/yr (3.1 million $m^3$/yr) of water. The Nevada State Engineer has already permitted 2,100 ac-ft/yr for a power plant at this location; the remaining 400 ac-ft/yr (494,000 $m^3$/yr) is pending approval. In March 2010, however, project proponents announced revised plans for a 1,100-MW gas-fired plant (Phase 1, 550 to 600 MW) supplemented by 50 to 100 MW of PV solar, which would use 60% less water than the coal-fired version (Sithe Global 2010b). In addition, the proposed Lincoln County Land Act Groundwater Development and Utility ROW project would pump and store groundwater from the Clover Valley and Tule Desert hydrographic areas for use in Lincoln County, including potentially for Toquop power plant. Other foreseeable and potential solar projects are more than 15 mi (24 km) from the SEZ and would not likely affect the same groundwater resources (Section 11.5.22.2).

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 9 to 74 ac-ft (11,000 to 91,000 $m^3$) during the peak construction year and would range from less than 1 up to 20 ac-ft/yr (up to 25,000 $m^3$/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to put undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet-cooling systems, there would also be from 226 to 408 ac-ft/yr (0.28 to 0.50 million $m^3$) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

#### *11.5.22.4.9 Vegetation*

The proposed East Mormon Mountain SEZ is located within the Creosotebush–Dominated Basins ecoregion, which is characterized by sparse creosotebush, white bursage, and big galleta grass, with cacti, yucca, ephedra, and Indian ricegrass also common. Sonora–Mojave Creosote–White Bursage Desert Scrub is the predominant cover type within the proposed SEZ. Sensitive habitats on the SEZ include desert dry wash, riparian, and playa habitats. Areas surrounding the SEZ include the Creosotebush–Dominated Basins and Arid Footslopes ecoregions. The dominant cover type in the 5-mi (8-km) area of indirect effects is Sonora–Mojave Creosote–White Bursage Desert Scrub. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the SEZ over 80% of its area would result in small impacts on all cover types in the affected area (Section 11.5.10.2.1). Playa habitats, riparian habitats, or other intermittently flooded areas within or downgradient from solar projects, including riparian plant communities along Toquop Wash and the Virgin River, could be affected by ground-disturbing activities, and increased runoff from facilities could affect the hydrology of these areas. In addition, groundwater drawdown by solar facilities could affect wetland communities associated with springs, including Tule Spring, Abe Spring, Gourd Spring, and Peach Spring. A further concern in disturbed areas is the establishment and spread of noxious weeds and invasive species. An increase in invasive species such as red brome could increase fire frequency within native plant communities.

The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other construction, agriculture, recreation, and transportation. The cumulative dust loading could result in reduced productivity or changes in plant community composition. Similarly, surface runoff from project areas after heavy rains could increase sedimentation and siltation in areas downstream. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

Solar facilities within the SEZ in combination with other ongoing and reasonably foreseeable future actions would have a cumulative effect on both common and uncommon cover types within the 50-mi (80-km) geographic extent of effects. Sensitive habitats, including wetlands, would be of particular concern. The proposed Toquop power plant would draw on groundwater from the Tule Desert region, which would also serve facilities within the SEZ. Many other large-acreage developments exist or are proposed within this distance, including several large power plants, transmission line and pipeline projects, the 21,454-acre (86.8-km$^2$) Coyote Springs Investment residential development, and a community airport (Section 11.5.22.2). However, many of these projects lie 30 to 50 mi (48 to 80 km) southwest of the proposed East Mormon Mountain SEZ, near the proposed Dry Lake SEZ, although some proposed transmission line and pipeline projects pass near the SEZ. Taken together, current and future projects could have small to moderate cumulative effects on vegetation in the region. The degree of such impacts would depend to some extent on the level of actual solar and wind development in the region. Eight pending solar and five pending wind project applications lie on public land within 50 mi (80 km) of the SEZ; most solar applications lie on or near the East

Mormon Mountain SEZ. The East Mormon Mountain SEZ would make a relatively small contribution to cumulative effects, however, given its modest size in comparison to other developments.

#### *11.5.22.4.10 Wildlife and Aquatic Biota*

Wildlife species that could potentially be affected by the development of utility-scale solar energy facilities in the proposed SEZ include amphibians, reptiles, birds, and mammals. The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, and wildlife injury or mortality. In general, impacted species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These design features may include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats.

As noted in Section 11.5.22.2, other ongoing, reasonably foreseeable, and potential future actions within 50 mi (80 km) of the proposed SEZ include three foreseeable large solar facilities on private land, four foreseeable transmission line projects, eight potential solar facilities with pending applications covering over 40,000 acres (160 $km^2$) on public land, five pending wind applications, several existing large power plants, two pipeline projects, the proposed 21,454-acre (86.8-$km^2$) Coyote Springs Investment residential development, and a proposed new community airport (Section 11.5.22.2). While impacts from full build-out over 80% of the proposed SEZ would result in small impacts on amphibian, reptile, bird, and mammal species (Section 11.5.11), impacts from foreseeable development within the 50-mi (80-km) geographic extent of effects could be moderate. However, many of the wildlife species present within the proposed SEZ that could be affected by other actions would still have extensive available habitat within the region, while contributions to cumulative impacts from solar facilities within the proposed SEZ would be relatively small due to its modest size.

There are no permanent streams or water bodies within the proposed East Mormon SEZ or within the 5-mi (8-km) area of indirect effects. Toquop Wash is an intermittent stream located within the SEZ, along with several large, unnamed ephemeral washes. Streams and washes typically contain water only after substantial rainfall and carry water to the southeast and eventually drain into the Virgin River. Ephemeral streams and washes in the SEZ may contain a diverse seasonal community of invertebrates adapted to dry conditions, but are not expected to contain permanent aquatic habitat or communities. No NWI-mapped wetlands are present within the SEZ or within area of indirect effects (Section 11.5.11.4.1). Within the 50-mi (80-km) geographic extent of effects, there are 7,372 acres (30 $km^2$) of dry lakes, 19,963 acres (81 $km^2$) of perennial lakes, 319 mi (513 km) of perennial streams, and 402 mi (647 km) of intermittent streams. The Virgin River is the nearest perennial surface stream and is located approximately 10 mi (16 km) south of the SEZ (Section 11.5.11.2). Soil disturbance from construction of solar facilities in the SEZ could result in soil transport to surface streams via water and airborne routes, but is expected to be low with mitigations in place. Groundwater drawdown by operating solar facilities within the SEZ could affect aquatic habitats in springs supported by groundwater. Cumulative impacts on aquatic biota from all ongoing and foreseeable development within the 50-mi (80-km) geographic extent of effects could be accrued, given the level of foreseen development. However, most such impacts would occur away from the proposed East Mormon Mountain SEZ, while any contributions to cumulative impacts on aquatic biota from solar development within the proposed SEZ would be small. The proposed Toquop power plant would combine with impacts from the SEZ.

#### *11.5.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)*

On the basis of recorded occurrences or suitable habitat, as many as 32 special status species could occur within the East Mormon Mountain SEZ. The following three special status species are known to occur within the affected area of the SEZ: Las Vegas buckwheat, desert tortoise, and Nelson's bighorn sheep. No groundwater-dependent special status species have been identified in the affected area. Occurrences of the desert tortoise have been recorded near the SEZ, while critical habitat for the desert tortoise lies with the 5-mi (8-km) area of indirect affects outside the SEZ, adjacent to the eastern and southern boundaries. Numerous species that occur on or in the vicinity of the SEZ are listed as threatened or endangered by the State of Nevada or listed as a sensitive species by the BLM (Section 11.5.12.1). Avoidance of habitat and minimization of erosion, sedimentation, and dust deposition are some of the programmatic design features to be used to reduce or eliminate the potential for effects on these species from the construction and operation of utility-scale solar energy projects in the SEZs and related developments (e.g., access roads and transmission line connections) outside the SEZ. Special-status species are also affected by ongoing actions within the 50-mi (80-km) geographic extent of effects, including from residential areas, roads, transmission lines, and power plants within this distance. Future developments, including the proposed Toquop power plant, two foreseeable large solar facilities on private land, four foreseeable transmission line projects, eight potential solar facilities with pending applications covering over 40,000 acres (160 km$^2$) on public land, five pending wind applications, the proposed 21,454-acre (86.8-km$^2$) Coyote Springs Investment residential development, and a proposed new community airport (Section 11.5.22.2), will add further effects. Potential developments cover large areas and long linear distances and are likely to affect special status species. Moderate total cumulative impacts on some species, such as the desert tortoise, within the geographic extent of effects could result. However, contributions to cumulative impacts from solar development with the proposed SEZ would be small. Future projects would employ mitigation measures to limit effects.

#### *11.5.22.4.12 Air Quality and Climate*

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other nearby projects outside the proposed SEZ, or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, the maximum 24-hour $PM_{10}$ concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. Dust generation from construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency, or road paving or treatment.

Because operation of solar facilities within the SEZ would produce minimal contributions of air emissions to those from operation of existing and future industrial sources in the area, mainly gas-fired power plants, the only type of air pollutant of concern is dust generated during construction of new facilities in addition to that produced by winds. Because there are relatively few other foreseeable and potential actions that could produce fugitive dust emissions near the SEZ, it is unlikely but possible that construction of two or more projects could overlap in both time and affected area and produce small cumulative air quality effects due to dust emissions.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as methods using coal, oil, and natural gas. As discussed in Section 11.5.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the East Mormon Mountain SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 6.6% of all emissions from the current electric power systems in Nevada.

#### *11.5.22.4.13 Visual Resources*

The proposed East Mormon Mountain SEZ is located in a valley east of the East Mormon Mountains and south of the Tule Hills. The area is rural with little cultural disturbance, mainly roads and a 500-kV transmission line (Section 11.5.14.1). Construction of utility-scale solar facilities in the SEZ would substantially alter the natural scenic quality of the area. Other foreseeable actions near the proposed SEZ would cumulatively affect the visual resources in the area. Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area. There are currently two potential solar projects and one wind project with pending applications on public land lie within the 25-mi (40 km) geographic extent for visual impacts, all near I-15 (Figure 11.5.22.2-1). In addition, the proposed Toquop power plant would lie adjacent to the SEZ, while at least one proposed transmission project and several pipeline projects would pass through or near the proposed SEZ (Section 11.5.22.2). While the contribution to cumulative visual impacts of these foreseeable and potential projects would depend on the location of facilities that are actually built, it may be concluded that the general visual character of the landscape within this distance would be significantly altered by the presence of these developments. Because of the topography of the region, such developments, located in basin flats, would be visible at great distances from surrounding mountains, which include sensitive viewsheds, such as the Mormon Mountains WA. Given the proximity of some current proposals, it is possible that two or more facilities would be viewable from a single location. In addition, some facilities would be located near major roads and thus would be viewable by motorists, who would also be viewing transmission lines, towns, and other infrastructure, as well as the road system itself.

As additional facilities are added, several projects might become visible from one location, or in succession, as viewers move through the landscape, as by driving on local roads. In general, the new developments would not be expected to be consistent in terms of their appearance and, depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Considering the above, small to moderate cumulative visual impacts could occur within the geographic extent of effects from future solar, wind, and other existing and future developments.

#### *11.5.22.4.14 Acoustic Environment*

The areas around the proposed East Mormon Mountain SEZ are relatively quiet. The existing noise sources around the SEZ include infrequent road traffic, aircraft flyover, and cattle grazing, and possibly hunting. The construction of solar energy facilities could increase the noise levels periodically for up to 3 years per facility, and there would be increased noise during operation of solar facilities, notably from solar dish engine facilities and from parabolic trough or power tower facilities using TES. However, these noises would minimally affect nearby residences due to considerable separation distance.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZs are described in Section 11.5.22.2. Because the nearest residents are relatively far from the SEZ and from other foreseeable projects with respect to noise impacts, cumulative noise effects during the construction or operation of solar facilities are unlikely.

#### *11.5.22.4.15 Paleontological Resources*

The proposed East Mormon Mountain SEZ has low potential for the occurrence of significant fossil material in nearly 100% of its area, which contains mainly alluvial deposits (Section 11.5.16.1). While impacts on significant paleontological resources are unlikely to occur in the SEZ, a review of the geological deposits in the specific sites selected for future projects would be needed to determine whether a paleontological survey was warranted. Any paleontological resources encountered would be mitigated to the extent possible. No significant contributions to cumulative impacts on paleontological resources are expected.

#### *11.5.22.4.16 Cultural Resources*

The area around East Mormon Mountain is rich in cultural history, with settlements dating as far back as 12,000 years. The area covered by the proposed East Mormon Mountain SEZ has the potential to contain significant cultural resources. Seven surveys have been conducted within the SEZ boundaries, covering 0.9% of the SEZ, while 41 surveys have been conducted within the 5-mi (8-km) area of indirect effects, recording four sites and 45 sites, respectively (Section 11.5.17.1). Areas with high potential for containing archaeological sites include the South Fork and Toquop Wash areas. It is possible that the development of utility-scale solar energy projects in the SEZ would contribute to cumulative impacts on cultural resources in the region. Such contributions would be small and overall cumulative effects within the 25-mi (40-km) geographic extent of effects would also be small, given relatively little ongoing and foreseeable development within this distance, except for the proposed adjacent Toquop power plant (Section 11.5.22.2). While any future solar projects would disturb large areas, the specific sites selected for future projects would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Nevada SHPO and appropriate Native American governments, it is likely that most adverse effects on significant resources in the region could be mitigated to some degree. It is unlikely that any sites recorded in the SEZ would be of such individual significance that, if properly mitigated, development would cumulatively cause an irretrievable loss of information about a significant resource type, but this would depend on the results of the future surveys and evaluations.

#### *11.5.22.4.17 Native American Concerns*

To date, no specific concerns have been raised to the BLM regarding the proposed East Mormon Mountain SEZ. However, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments (Section 11.5.18.2). It is possible that the development of utility-scale solar energy projects in the proposed SEZ would contribute to cumulative impacts on resources important to Native Americans. Significant drawdown of groundwater supporting Tule Springs by solar facilities in the SEZ and by the proposed Toquop power plant could affect culturally important traditional resources. In addition, the Moapa River Valley 25 mi (40 km) to the southeast is a core area of Southern Paiute population and culture and is the location of several proposed solar projects within the geographic extent of visual impacts of the SEZ (Figure 11.5.22.2-1). Continued discussions with the area Tribes through government-to-government consultation are necessary to effectively consider and address the Tribes’ concerns about solar energy development in the proposed East Mormon Mountain SEZ.

#### *11.5.22.4.18 Socioeconomics*

Solar energy development projects in the proposed East Mormon Mountain SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction, in combination with temporary workers involved in other new developments in the area, including other renewable energy development, would temporarily increase the number of workers in the area needing housing and services. The number of workers involved in the construction of solar projects in the peak construction year (including the transmission lines) could range from about 240 to 1,700 depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 440 (solar PV) to as high as 4,400 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-year or more solar development period.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-year duration, and could combine with those from other new developments in the area, including several foreseeable and potential solar and wind energy projects, several proposed transmission line and pipeline projects, and the proposed Toquop power plant project (Section 11.5.22.2). The number of workers needed at the SEZ solar facilities would be in the range of 16 to 310, with approximately 20 to 500 total jobs created in the region, assuming full build-out of the SEZ (Section 11.5.19.2.2). Population increases would contribute to general upward trends in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

##### *11.5.22.4.19 Environmental Justice*

Any impacts from solar development could have cumulative impacts on minority and low-income populations within 50 mi (80 km) of the proposed SEZ in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual impacts, noise, and exposure to fugitive dust. Actual impacts would depend on the geographic range of effects and on the location of low-income populations relative to solar and other proposed facilities. Overall, effects from facilities within the SEZ are expected to be small, while other foreseeable and potential actions could contribute additional small effects on minority and low-income populations. However, except for the proposed Toquop project, most foreseeable actions are more than 30 mi (48 km) from the proposed SEZ, and no minority or low-income populations are currently present within the 50-mi (80-km) ROI (Section 11.5.20.1). While future minority and low-income populations, if present, could experience small cumulative effects of some types, such as effects on visual resources or from fugitive dust from all actions within the geographic extent of effects, contributions from solar development in the proposed East Mormon Mountain SEZ would be small. If needed, mitigation measures could be employed to reduce the impacts on these populations in the vicinity of the SEZ.

##### *11.5.22.4.20 Transportation*

I-15 is the nearest major road and lies about 11 mi (18 km) southeast of the proposed East Mormon Mountain SEZ. The Las Vegas metropolitan area lies approximately 62 mi (100 km) to the southwest of the SEZ along I-15. The nearest airport with scheduled passenger service is the St. George Municipal Airport, 43 mi (69 km) to the northeast in St. George, Utah. The closest railroad access is in Moapa, about 25 mi (40 km) southwest of the SEZ. During construction of utility-scale solar energy facilities, there could be up to 1,000 workers commuting to the construction site at the SEZ, which could increase the AADT on these roads by 2,000 vehicle trips for each facility under construction. With a single solar facility assumed to be under construction at a given time, traffic on I-15 could experience minor slowdowns in the area near access to the SEZ (Section 11.5.21.2). This increase in highway traffic from construction workers could likewise have minor cumulative impacts on traffic flow in combination with existing traffic levels and increases from additional future developments in the area, including construction of the proposed Toquop power plant and facilities for the proposed Lincoln County Land Act Groundwater Development and Utility ROW project in the vicinity of the proposed SEZ, should project schedules overlap. Local road improvements may be necessary on portions of I-15 near access to the SEZ. Any impacts during construction activities would be temporary. The impacts can also be mitigated to some degree by staggered work schedules and ride-sharing programs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate the solar facilities and would have little contribution to cumulative impacts.

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### 11.5.23 References

*Note to Reader:* This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.


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