13.3 WAH WAH VALLEY

13.3.1 Background and Summary of Impacts

13.3.1.1 General Information

The proposed Wah Wah Valley SEZ is located in Beaver County in southwestern Utah about 21 mi (34 km) northwest of the proposed Milford Flats South SEZ (Figure 13.3.1.1-1). The SEZ has a total area of 6,097 acres (25 km^2). In 2008, the county population was 7,265, while adjacent Iron County to the south had a population of 45,833. The largest nearby town is Cedar City, Utah, about 50 mi (80 km) southeast in Iron County. The town of Milford is located about 23 mi (37 km) east. Salt Lake City lies about 200 mi (322 km) north–northeast.

There is good access to the SEZ from State Route 21, which runs from west to east through the northern half of the SEZ. Access to the interior of the SEZ is by dirt roads. The nearest UP Railroad stop is 23 mi (37 km) away in Milford. The nearest airport is also in Milford; the Milford Municipal Airport. Transmission access to the Wah Wah Valley SEZ currently does not exist. The nearest existing transmission line is a north–south running 130-kV line about 42 mi (68 km) east of the SEZ. However, a Section 368 designated energy corridor on BLM lands runs east–west through the site along State Route 21; thus, access to the lands required to construct transmission is available.

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

The proposed Wah Wah Valley SEZ is in a rural area. There is a ranch with some land under irrigation on the northern boundary of the site. The SEZ is located in Wah Wah Valley, a narrow, north–south trending valley northwest of the Escalante Desert across the Shauntie Hills, and lying between the Wah Wah Mountains to the west and southwest, the Shauntie Hills to the south and southeast, and the San Francisco Mountains to the east. Land within the SEZ is undeveloped scrubland, characteristic of a high-elevation, semiarid basin.

The proposed Wah Wah Valley SEZ and other relevant information are shown in Figure 13.3.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar energy development included proximity to existing transmission or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (11 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Wah Wah Valley 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.

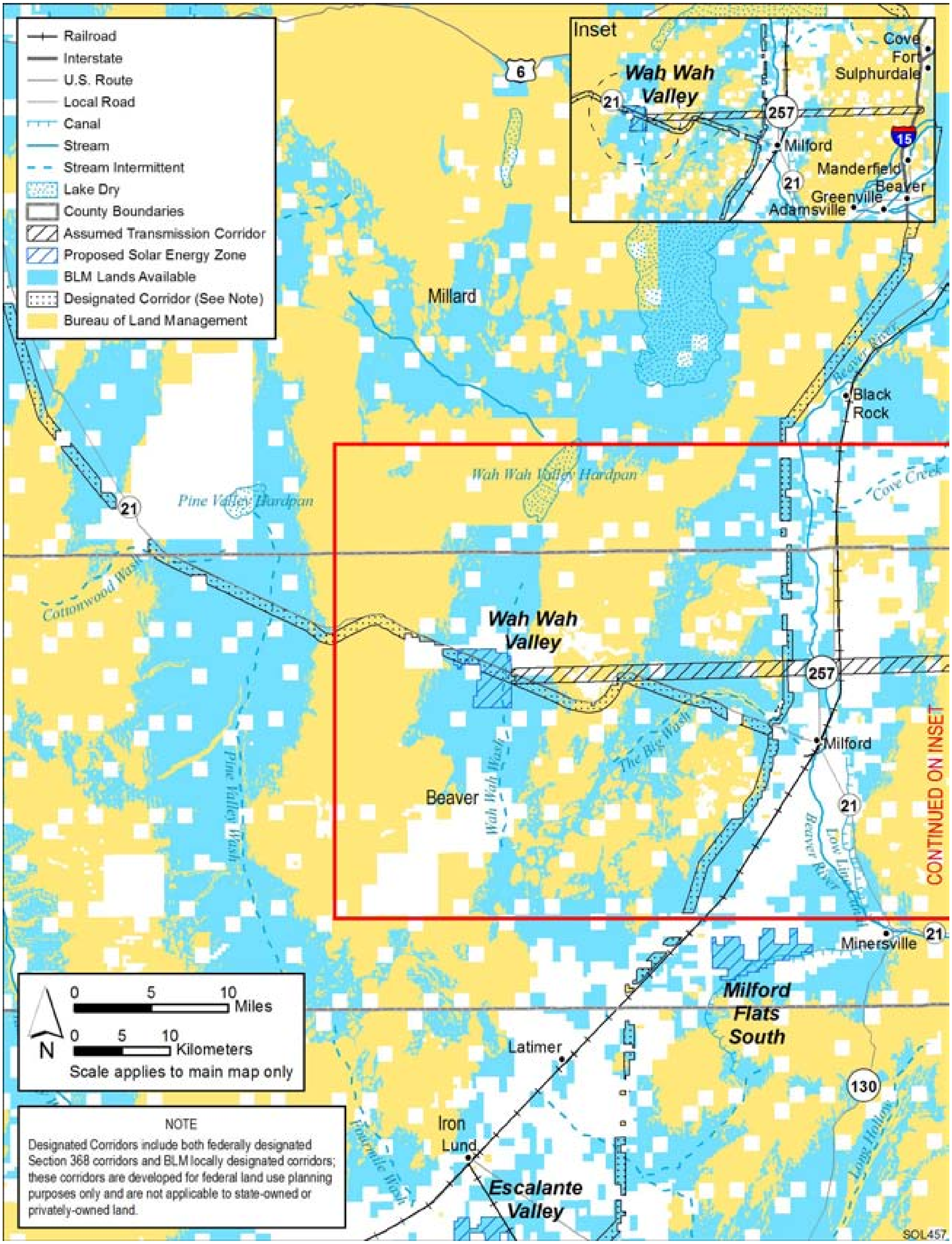

FIGURE 13.3.1.1-1 Proposed Wah Wah Valley SEZ

As initially announced in the *Federal Register* on June 30, 2009, the proposed Wah Wah Valley SEZ encompasses 3,676 acres (15 km^2). Subsequent to the study area scoping period, 2,422 acres (10 km^2) were added at the south end of the study area, on the basis of further observations at the BLM Cedar City Field Office indicating that this additional area met all criteria for solar development.

13.3.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the Wah Wah Valley SEZ is assumed to be 80% of the SEZ area over a period of 20 years; a maximum of 4,878 acres (20 km^2). These values are shown in Table 13.3.1.2-1, along with other development assumptions. Full development of the Wah Wah Valley SEZ would allow development of facilities with an estimated total of 542 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 976 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 138-kV line 42 mi (68 km) east of the SEZ. It is possible that a new transmission line could be constructed from the SEZ to that existing line, but the 138-kV capacity of that line would be inadequate for 542 to 976 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 clear that new transmission and/or upgrades of existing transmission lines (in addition to or instead of construction of a connection to the nearest existing line) would be required to bring electricity from the proposed Wah Wah Valley SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For purposes of as complete an analysis of impacts of SEZ development in the SEZ as possible, it was assumed that, at a minimum, a transmission line segment would be constructed from the proposed Wah Wah Valley SEZ to the nearest existing transmission line to connect the SEZ to the transmission grid. This assumption was made without additional information on whether the nearest existing transmission line would actually be available for connection of future solar facilities, and without assumptions about upgrades of the line. This was also a simplifying assumption for purposes of analysis; an actual new line would likely follow the route of the designated corridor where available. Establishing a connection to the line closest to the Wah Wah Valley SEZ would involve the construction of about 42 mi (68 km) of new transmission line outside of the SEZ. The ROW for this transmission line would occupy approximately 1,273 acres (5.2 km^2) of land, assuming a 250-ft (76-m) wide ROW, a typical width for such a ROW. If a connecting transmission line were constructed to a different offsite grid location in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades, if they were needed.

TABLE 13.3.1.2-1 Proposed Wah Wah Valley SEZ—Assumed Development Acreages, Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S. or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line ROW and Road ROW	Distance to Nearest Designated Corridor[f]
6,097 acres and 4,878 acres[a]	542 MW[b] and 976 MW[c]	State Route 21: adjacent	42 mi[d] and 130 kV	1,273 acres; NA[e]	Adjacent

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

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

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

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

[e] NA = no access road construction is assumed necessary for Wah Wah Valley.

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

Existing road access to the proposed Wah Wah Valley SEZ should be adequate to support construction and operation of solar facilities, because State Route 21 runs from west to east through the northern portion of the SEZ. Thus, no additional road construction outside of the SEZ is assumed to be required to support solar development.

13.3.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 13.3.2 through 13.3.21 for the proposed Wah Wah Valley SEZ are summarized in tabular form. Table 13.3.1.3-1 is a comprehensive list of impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 13.3.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Wah Wah Valley SEZ are included in Sections 13.3.2 through 13.3.21 and in the summary table. The detailed programmatic design features for each resource area to be required under the BLM 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 13.3.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Wah Wah Valley SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ (80% of the total area) could disturb up to 4,878 acres (20 km^2). Solar development would introduce a new and discordant land use into the area. Establishing transmission within the designated corridor and connecting to the regional grid would involve the construction of about 42 mi (68 km) of new transmission line and would disturb about 1,273 acres (5 km^2) of BLM-administered, state, and private lands.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	SEZ development would have varying degrees of adverse impact on the wilderness characteristics of the Wah Wah Mountains WSA and the Central and Northern Wah Wah Mountain inventory units. These impacts would not be fully mitigable.	None.
Rangeland Resources: Livestock Grazing	Up to 3,676 acres (15 km^2) of the Wah Wah Lawson grazing allotment (<3% of the allotment) could be removed from grazing with small potential impacts on one permittee.	Consideration should be given to the feasibility of replacing all or part of any lost AUMs through development of additional range improvements on public lands remaining in the allotment.
Rangeland Resources: Wild Horses and Burros	None.	None.
Recreation	Developed portions of the SEZ would become unavailable for recreational use, but the overall loss would not be significant.	None.
Military and Civilian Aviation	None.	None.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation).	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.
Water Resources	Ground-disturbance activities (affecting up to 49% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Water requirements for dust suppression and potable water supply during the peak construction year could be as high as 1,261 ac-ft (1.6 million m^3). Up to 74 ac-ft (91,300 m^3) of sanitary wastewater could be generated during the peak construction year. Assuming full development of the SEZ, the following amounts of water would be used during operations: • For parabolic trough facilities (976-MW capacity), 697 to 1,478 ac-ft/yr (859,700 million to 1.8 million m^3/yr) for dry-cooled systems; and 4,892 to 14,647 ac-ft/yr (6.0 million to 18.1 million m^3/yr) for wet-cooled systems;	Wet-cooling options would not be feasible; other technologies should incorporate water conservation measures. During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as being within a 100-year floodplain. Land disturbance and operations activities should avoid increasing drainage to the Wah Wah Wash to prevent further channel incisions and sedimentation issues. Groundwater rights must be obtained from the Utah Division of Water Rights.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	• For power tower facilities (542-MW capacity), 385 to 819 ac-ft/yr (474,900 million to 1.0 million m^3/yr) for dry-cooled systems; and 2,716 to 8,135 ac-ft/yr (3.4 million to 10.0 million m^3/yr) for wet-cooled systems; • For dish engine facilities (542-MW capacity), 277 ac-ft/yr (341,700 million m^3/yr); and • For PV facilities, (542-MW capacity), 28 ac-ft/yr (34,500 m^3/yr). Assuming full development of the SEZ, operations would generate up to 14 ac-ft/yr (17,300 m^3/yr) of sanitary wastewater and up to 277 ac-ft/yr (341,700 m^3/yr) of blowdown water. High TDS values of groundwater could produce water that is non-potable. • For PV facilities (542-MW capacity), 27 ac-ft/yr (0.03 million m^3/yr). Assuming full development of the SEZ, operations would generate up to 14 ac-ft/yr (0.02 million m^3/yr) of sanitary wastewater and up to 277 ac-ft/yr (0.34 million m^3/yr) of blowdown water. High TDS values of groundwater could produce water that is non-potable.	Groundwater monitoring and production wells should be constructed in accordance with Utah standards. Stormwater management plans and BMPs should comply with standards developed by the Utah Division of Water Quality. Water for potable uses would have to meet, or be treated to meet, Utah drinking water standards as defined by Utah Administrative Code Rule R309-200.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Vegetation[b]	Up to 80% (4,878 acres [20 km^2]) of the SEZ and additional acreage in the transmission line ROW would be cleared of vegetation. Re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult, because of the arid conditions, and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. A number of springs occur in the vicinity of the SEZ, and may support wetland or riparian communities. If these springs are hydrologically connected to the aquifer below the SEZ, groundwater depletion related to solar development projects and subsequent reductions in groundwater discharges at the springs could result in degradation of these habitats. Playa habitats, such as the large playas, including Wah Wah Valley Hardpan, associated with Wah Wah Wash north of the SEZ; greasewood flats communities; or other intermittently flooded areas downgradient from solar projects in the SEZ could be affected by ground-disturbing activities.	An Integrated Vegetation Management Plan addressing invasive species control and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and to minimize the potential for the spread of invasive species, such as those occurring in Beaver County, that could be introduced as a result of solar energy project activities. Invasive species control should focus on biological and mechanical methods, where possible, to reduce the use of herbicides. Appropriate engineering controls should be used to minimize impacts on dry wash, playa, and greasewood flat habitats, including downstream occurrences resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition on these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. All dry wash and playa habitats within the SEZ and all dry wash, wetland, and riparian habitats within the assumed transmission line corridor (e.g., Beaver Creek) should be avoided to the extent practicable, and any impacts should be minimized and mitigated. A buffer area should be maintained around wetlands, dry washes, and riparian habitats to reduce the potential for impacts.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*		Transmission line towers should be sited and constructed to minimize impacts on wetlands, dry washes, and riparian areas, such as those associated with Beaver Creek. Towers should span such areas whenever practicable. Groundwater studies should be conducted to evaluate the potential for indirect impacts on springs located in the vicinity of the SEZ or those in hydrologically connected basins.
Wildlife: Amphibians and Reptiles[b]	Direct impacts on amphibians and reptiles from development of the SEZ would be small (loss of ≤1.0% of potentially suitable habitats identified for the species in the SEZ region). With implementation of design features, indirect impacts would be expected to be negligible.	Wah Wah Wash should be avoided. Avoid instream and nearshore disturbance of the Beaver River when constructing the transmission line.
Wildlife: Birds[b]	Direct impacts on bird species would be small (loss of ≤1.0% of potentially suitable habitats identified for the species in the SEZ region). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. The steps outlined in the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin and Muck 1999) should be followed. Wah Wah Wash should be avoided.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Wildlife: Birds[b] *(Cont.)*		Avoid instream and nearshore disturbance of the Beaver River when constructing the transmission line.
Wildlife: Mammals[b]	Direct impacts on big game, small game, furbearers, and small mammals from habitat disturbance and long-term habitat reduction/ fragmentation would be small (loss of ≤1.0% of potentially suitable habitats identified for the species in the SEZ region). The pronghorn is the only big game species with crucial habitat within the SEZ; however, direct impacts could occur to only about 0.2% of crucial habitat; thus, impacts on pronghorn would be expected to be small. The assumed transmission line would directly affect less than 0.04% of preferred cougar habitat, 0.05% of crucial elk habitat, and 0.03% of crucial mule deer habitat. These impacts would be considered small.	The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. Wah Wah Wash should be avoided. Avoid instream and nearshore disturbance of the Beaver River when constructing the transmission line. The inter-mountain basins big sagebrush shrubland cover type in the southeastern portion of the SEZ, which is the only identified suitable land cover for the elk and sagebrush vole and about a third of the suitable habitat for the American black bear in the SEZ, should be avoided.
Aquatic Biota[b]	No permanent water bodies, perennial streams, or wetlands are present within the boundaries of the Wah Wah Valley SEZ, making direct impacts on aquatic habitats or aquatic biota unlikely. It is also unlikely solar energy development within the SEZ would indirectly affect aquatic habitat outside the SEZ. Direct effects could result from construction of transmission line corridor that would cross directly over Beaver River, a perennial stream approximately 19 mi (31 km) east of the SEZ.	Transmission lines should be sited and constructed to minimize impacts on aquatic habitats whenever possible and transmission lines should span Beaver River.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Special Status Species[b]	Potentially suitable habitat for 22 special status species occurs in the affected area of the Wah Wah Valley SEZ. For all of these special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects.	Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species. Disturbance of occupied habitats for these species should be avoided or impacts on occupied habitats 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 uses one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Avoiding or minimizing disturbance of woodland, rocky cliffs, and outcrops in the area of direct effects could reduce impacts on nine special status species. Consultations with the USFWS and the UDWR should be conducted to address the potential for impacts on the Utah prairie dog a species listed as threatened under the ESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Coordination with the USFWS and UDWR should be conducted to address the potential for impacts on the greater sage-grouse—a candidate species for listing under the ESA. Coordination with the USFWS and UDWR should also be conducted for the following species that are under review for listing under the ESA: Frisco buckwheat, Frisco clover, and Ostler's pepper-grass. Coordination with the USFWS and UDWR would identify an appropriate pre-disturbance survey protocol, avoidance measures, and any potential compensatory mitigation actions for each of these species. Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based on consultation with the USFWS and UDWR.
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for PM_{10} and $PM_{2.5}$ at the SEZ boundaries and the nearest residences next to the northern SEZ boundary possible during construction; higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. In addition, construction emissions from the engine exhaust from heavy equipment and vehicles could cause some impacts on AQRVs (e.g., visibility and acid deposition) at the nearest federal Class I area, Zion NP, which is not located directly downwind of prevailing winds.	None.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Air Quality and Climate *(Cont.)*	*Operations*: Positive impact due to avoided emission of air pollutants from combustion-related power generation: 2.6 to 4.6% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Utah avoided (up to 1,701 tons/yr of SO_2, 3,253 tons/yr of NO_x, 0.007 tons/yr of Hg, and 1,844,000 tons/yr of CO_2).	
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. Residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ. The SEZ and surrounding lands within the SEZ viewshed would incur large visual impacts due to major modification of the character of the existing landscape. The SEZ is located 5 mi (8 km) from the Wah Wah Mountains WSA. Because of the open views of the SEZ and elevated viewpoints, weak to moderate visual contrasts could be observed by WSA visitors. About 16 mi (26 km) of State Route 21 is within the SEZ viewshed, and about 4 mi (6 km) of State Route 21 is within the SEZ. Very strong visual contrasts could be observed within and near the SEZ by travelers on State Route 21.	None.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction*. For construction activities occurring near the nearest residences (just next to the northern SEZ boundary), estimated noise levels at the nearest residences would be about 74 dBA, which is well above both the Iron County regulation of 50 dBA for a solar facility and typical daytime mean rural background level of 40 dBA. In addition, an estimated 70 dBA L_{dn} at these residences is also well above the EPA guideline of 55 dBA L_{dn} for residential areas. *Operations*. For a facility located near the northern SEZ boundary, the predicted noise level for parabolic trough or power tower technologies would be about 51 dBA at the nearest residences, located just next to the northern SEZ boundary, which is comparable to the Iron County regulation of 50 dBA, but higher than the typical rural background level of 40 dBA. In the case of six-hour TES, the estimated nighttime noise level at the nearest residences would be 61 dBA, which is higher than both the Iron County regulation of 50 dBA and typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 63 dBA L_{dn}, which is higher than the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level of 58 dBA at the nearest residences would be higher than both the Iron County regulation of 50 dBA and typical daytime mean rural background level of 40 dBA. If assuming 12-hour daytime operation, the estimated 55 dBA L_{dn} at these residences would be equivalent to the EPA guideline for residential areas.	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearest residences adjacent to the northern SEZ boundary are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers. Dish engine facilities within the Wah Wah Valley SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residences (i.e., the facilities should be located in the lower half of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at nearby residences.
Paleontological Resources	Few, if any, impacts on significant paleontological resources are likely to occur in the proposed SEZ or along the associated transmission line ROW. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted.	None.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Cultural Resources	No adverse impacts are currently anticipated in the proposed Wah Wah Valley SEZ or along the associated transmission line ROW, but such impacts could be possible if significant cultural resources are found in the area during survey. 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. An evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties.	SEZ-specific design features would be determined during consultations with the Utah SHPO and affected Tribes and would depend on the findings of cultural surveys.
Native American Concerns	While no specific concerns regarding the proposed Wah Wah Valley SEZ have been expressed, as consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native American concerns will emerge over potential effects of solar energy development within the SEZ.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.
Socioeconomics	*Construction of solar facilities within the SEZ:* 213 to 2,817 total jobs; \$11.2 million to \$148 million income in ROI for facilities in the SEZ. *Operations of solar facilities within the SEZ:* 15 to 328 annual total jobs; \$0.4 million to \$10 million annual income in the ROI for facilities in the SEZ. *Construction of new transmission line:* 183 total jobs; \$7.4 million income.	None.
Environmental Justice	Although impacts are likely to be small, there are low-income populations, as defined by CEQ guidelines, in one census block group within the 50-mi (80-km) radius of the SEZ, meaning that any adverse impacts of solar projects could disproportionately affect low-income populations. There would be no impacts on minority populations, however, as there are no minority populations within the 50-mi (80-km) radius of the SEZ, according to CEQ guidelines.	None.

TABLE 13.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Wah Wah Valley SEZ	SEZ-Specific Design Features
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The volume of traffic on State Route 21 and other regional corridors would be more than double the current values near the Wah Wah Valley SEZ.	None.

Abbreviations: AAQS = ambient air quality standards; AQRV = air quality-related value; AUM = animal unit month; 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; NO_x = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; $PM_{2.5}$ = 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; SO_2 = sulfur dioxide; TDS = total dissolved solids; TES = thermal energy storage; UDWR = Utah Division of Wildlife Resources; USFWS = U.S. Fish and Wildlife Service; VRM = visual resource management.

[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 Wah Wah Valley SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 13.3.10 through 13.3.12.

13.3.2 Lands and Realty

13.3.2.1 Affected Environment

The overall character of the land around the proposed Wah Wah Valley SEZ is rural and undeveloped. There is a ranch/irrigated farming operation north of the SEZ, but no other development is nearby. ROWs for a state highway and a telecommunications line lie within the Wah Wah Valley SEZ. A Section 368 designated energy corridor passes through the SEZ but is currently unoccupied. Both state and private lands abut portions of the SEZ. The SEZ also encompasses a Beaver County sand and gravel free use permit and a small BLM administrative site. As of February 2010, there were no applications for solar facility ROWs on BLM-administered lands in the vicinity of the Wah Wah Valley SEZ or in the state of Utah.

13.3.2.2 Impacts

13.3.2.2.1 Construction and Operations

Full development of the proposed Wah Wah Valley SEZ could disturb up to 4,878 acres (20 km^2) (Table 13.3.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and rural, utility-scale solar energy development would be a new and discordant land use to the area. It also is possible that with landowner agreement, the state and private lands located adjacent to the SEZ would be developed in the same or a complementary manner as the public lands. Development of additional industrial or support activities also could be induced on additional state and private lands near the SEZ.

Existing ROW authorizations on the SEZ would not be affected by solar energy development because they are prior existing rights. Should the proposed SEZ be identified as a SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development. Because the area currently has so few ROWs and there is considerable opportunity for locating future ROWs outside the SEZ, it is not anticipated that approval of solar energy development would have a significant impact on ROW availability in the area. Beaver County has asserted Revised Statute 2477 Class B and D road ROWs within the Wah Wah Valley SEZ.

The Section 368 designated energy corridor along State Route 21 covers about 1,560 acres (6 km^2), which is about 25% of the SEZ and could limit future solar development within the corridor. To avoid technical or operational interference between transmission and solar energy facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. This is an administrative conflict that can be addressed by the BLM, either through amendment of the corridor or the boundary of the SEZ. There is enough

BLM-administered land in the area to allow for modification of either the corridor or the SEZ and retain the current development capacities of both.

13.3.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

Delivery of energy produced in the SEZ would require establishing connection to the regional grid, and for analysis it is assumed that connection would be made to the existing 138-kV transmission line located 42 mi (68 km) east of the SEZ, because this line might be available to transport the power produced in this SEZ (See Section 13.3.1.2 for a description of analysis assumptions). This connection would likely cross primarily BLM-administered public land and could disturb as much as 1,273 acres (5 km^2). State and privately owned lands would also be affected.

At full build-out capacity, it is clear that additional new transmission lines and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Wah Wah Valley SEZ to load centers; however, at this time, the location and size of such new transmission facilities is 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 solar projects requiring additional transmission capacity.

No need for constructing new roads for access to the SEZ is anticipated because State Route 21 passes through the SEZ, although new roads and transmission lines within the SEZ would be required to accomplish development of the site.

13.3.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features related to lands and realty for the proposed Wah Wah Valley SEZ have been identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts.

13.3.3 Specially Designated Areas and Lands with Wilderness Characteristics

13.3.3.1 Affected Environment

Figure 13.3.3.1-1 shows the locations of specially designated areas in the vicinity of the proposed Wah Wah Valley SEZ. Two WSAs, Wah Wah Mountains and King Top, are about 6 and 25 mi (10 and 40 km), respectively, from the nearest boundary of the Wah Wah Valley SEZ. The Wah Wah Mountains WSA includes about 49,000 acres (198 km^2), and King Top includes about 93,000 acres (376 km^2).

The latest revision to the 1999 Utah inventory for wilderness characteristics within BLM's Cedar City district office was completed in January 2005. The 2005 survey identified minor changes in an area that is less than 1 mi (1.6 km) west of the Wah Wah Valley SEZ; this is the 52,000-acre (21-km^2) Central Wah Wah Mountains wilderness inventory unit that the BLM identified as possessing wilderness characteristics in 1999. This area rises in elevation to the mountain ridges to the west and provides a commanding view of the SEZ. To the northwest of the SEZ and adjacent to the Wah Wah Mountains WSA is the North Wah Wah wilderness inventory unit, consisting of several noncontiguous areas also identified as possessing wilderness characteristics (Figure 13.3.3.1-1), which total about 17,210 acres (70 km^2). The southern portion of the unit that is closest to the SEZ is managed by the Cedar City Field Office, while the Fillmore Field Office manages the largest portion of the area that is farther north.

The lands having wilderness characteristics have been identified and refined through various BLM inventory efforts since 1980.[1] These lands do not receive the same protection as that received by designated wilderness and WSAs. The BLM has the authority through its land use planning system to manage these lands to protect their wilderness characteristics. At this time, however, no land use planning decisions have been made for the Central and North Wah Wah Mountains wilderness inventory units regarding management of these lands to protect their wilderness characteristics.

13.3.3.2 Impacts

13.3.3.2.1 Construction and Operations

The potential impact from solar development on specially designated areas possessing unique or sensitive visual resources is generally difficult to quantify and would vary by solar technology employed, the size of area developed for solar energy, the specific area affected (including the reasons for which it was designated), and the perception of individuals viewing the development. See Section 13.3.14 for a more thorough discussion of visual impacts associated with solar energy development.

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[1] For more information on the BLM-Utah wilderness inventories, see http://www.blm.gov/ut/st/en/prog/blm_special_areas/utah_wilderness.

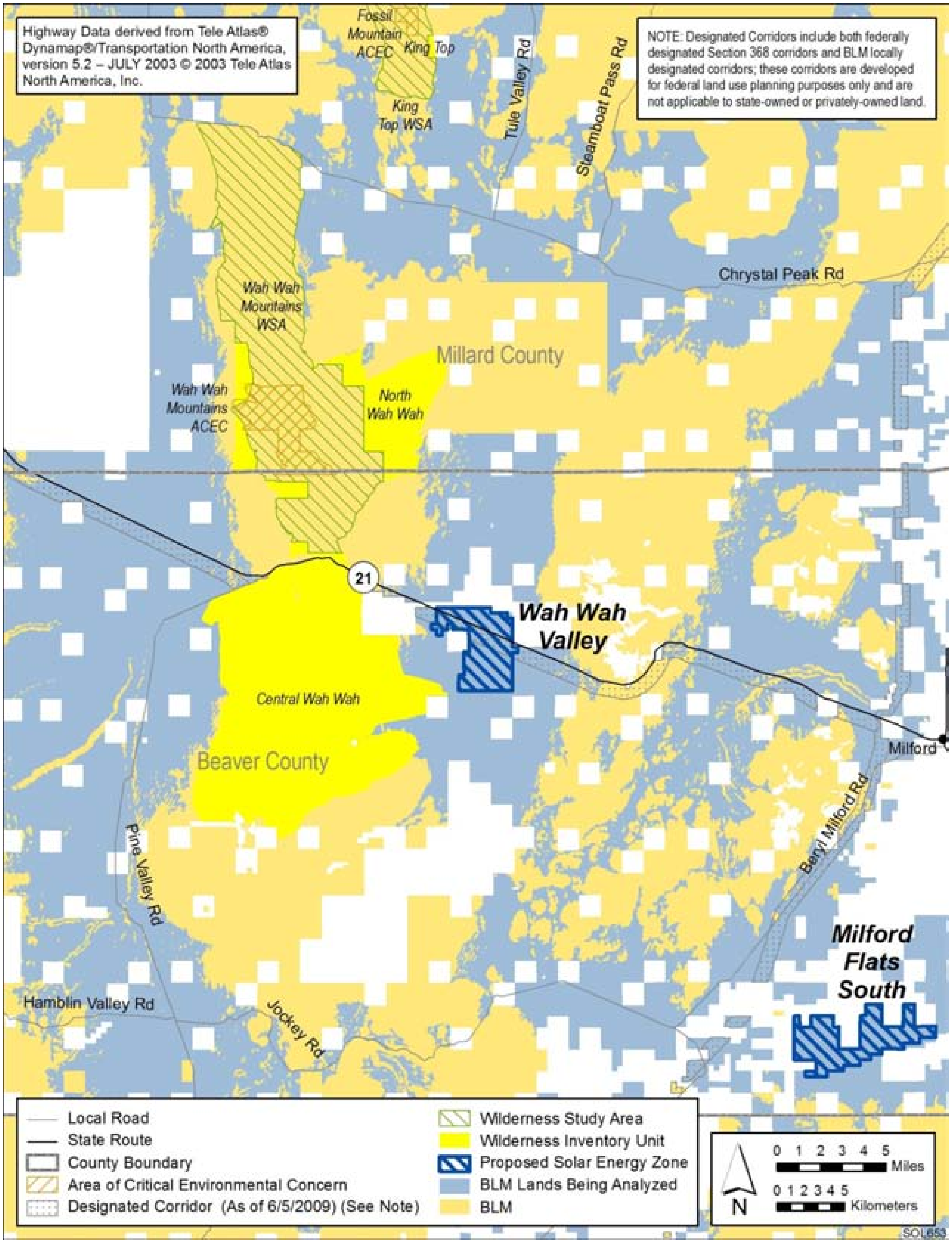

FIGURE 13.3.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Wah Wah Valley SEZ

The viewing height above a solar development area also is important to perceived impact levels, because higher elevation viewpoints show more of the facilities, make the regular, man-made geometry of the solar arrays more apparent, and can cause increased incidence of glare and other reflections from the facilities. In the case of the proposed Wah Wah Valley SEZ, the low elevation of the SEZ in relation to surrounding areas would tend to highlight the industrial development in the SEZ.

A visual analysis has been completed that identifies the amount of land within nearby sensitive resource areas that might be affected by development in the SEZ (see also Section 13.3.14).[2] The assessment of potential impacts follows.

Wilderness Study Areas

- *Wah Wah Mountains*—This WSA is located just beyond the 5-mi (8-km) distance generally considered to be the most visually sensitive zone. The viewshed between the WSA and the SEZ also contains a highway and a small amount of agricultural development, which generally reduces the visual quality of the viewshed from within the WSA. Topographic features limit the amount of area within the SEZ with a view of the SEZ to slightly less than 8% of the area, or about 3,800 acres (15 km^2). Because of the height above the SEZ, the view of solar development in the area would likely have a moderate adverse effect on wilderness characteristics in this portion of the WSA.

- *King Top*—This nearest border of this WSA is barely within 25 mi (40 km) of the SEZ, and less than 1,000 acres (4 km^2), or about 1% of the WSA has a view of the SEZ within this distance. Although larger portions of the WSA would have a view of development in the SEZ, because of the long distance, there would likely be no impact on wilderness characteristics within the WSA.

Wilderness Inventory Units

- *Central Wah Wah Mountains*—The closest boundary of this unit is within less than a mile of the boundary of the SEZ. As the area rises in elevation to the west, development in the SEZ would be a dominating portion of the viewshed. About 13,000 acres (53 km^2), or about 22% of the unit, is within 5 mi (8 km) of the SEZ. As the mountains rise to the top of the ridge, about 24,000 acres (97 km^2), or about 40% of the unit, on the east-facing portion of the ridge is in full view of the SEZ. The approximate distance from the center of the SEZ to the ridgeline ranges from about 8 to 15 mi (13 to 24 km). Because of the

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[2] The amount of land in each of the potentially sensitive areas near the SEZ has been computed by assuming the use of power tower solar energy technology. This technology likely would have the largest potential visual effect because of the height of this type of facility. The potential impacts in terms of acreage of visually sensitive areas affected would be somewhat less for smaller solar energy facilities.

proximity and the distance between the unit and the SEZ, there would be a large adverse impact on the wilderness characteristics of the area.

- *North Wah Wah Mountains*—This unit consists of several noncontiguous areas that surround the Wah Wah Mountains WSA. Less than 1% of this unit is within 5 mi (8 km) of the SEZ. At a maximum, about 3,200 acres (53 km^2), or about 22% of the unit, is within about 5 to 8 mi (8 to 13 km) of the SEZ. At this distance, because of the intervening road and small agricultural development within the viewshed, it is anticipated that there would be only a minor adverse impact on wilderness characteristics that would be limited to the southern and eastern portions of the unit.

13.3.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the distance from the areas potentially affected, construction of the 42 mi (68 km) of new transmission line, heading east from the SEZ and utilizing the existing corridor where possible, is not likely to cause additional adverse impact on specially designated areas.

13.3.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be required. SEZ development would have various degrees of adverse impact on the wilderness characteristics of the Wah Wah Mountains WSA and on the Central and Northern Wah Wah Mountains inventory units. These impacts would not be fully mitigable. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would mitigate some impacts for specially designated areas.

13.3.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros, both of which are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Wah Wah Valley SEZ are discussed in Sections 13.3.4.1 and 13.3.4.2.

13.3.4.1 Livestock Grazing

13.3.4.1.1 Affected Environment

Grazing is currently authorized on the proposed Wah Wah Valley SEZ. Table 13.3.4.1-1 summarizes the one perennial grazing allotment, along with the percentage of the allotment that lies within the SEZ.[3] The allotment is used by one permittee and supports the production of 8,490 AUMs of forage per year (BLM 2009b). These AUMs are allocated to cattle.

13.3.4.1.2 Impacts

Construction and Operations

Should utility-scale solar development occur in the SEZ, grazing would be excluded from the areas developed, as provided for in the BLM grazing regulations (43 CFR 4100).

TABLE 13.3.4.1-1 Grazing Allotments within the Proposed Wah Wah Valley SEZ

Allotment	Total Acres[a]	Percentage of the Total in the SEZ[b]	Active BLM AUMs	Number of Permittees in the Allotment
Wah-Wah Lawson	141,180 ($571 km^2$)	2.6	8,490	1

[a] Includes all federal, state, and private acreage in the allotment.

[b] Represents the percentage of public land in the allotment within the SEZ.

Source: Data were derived from BLM (2009b) and are for the 2008 grazing year since these are the most current data available.

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3 The SEZ also includes 0.2% (148 acres, 0.6 km^2) of the Willow Creek allotment. There would be no significant impact on that allotment.

This would include reimbursement of permittees for their portion of the value for any range improvements in the area removed from the grazing allotment. The impact of this change on the grazing permits would depend on several factors: (1) how much of the allotment each permittee might lose to the development, (2) how important the specific land lost is to each permittee's overall operation, and (3) the amount of actual forage production that would be lost by each permittee. On the basis of an assumed loss of AUMs comparable to the percentage of the allotment included in the SEZ, a total of 221 AUMs could be lost from the allotment. However, in reality, it is unlikely that there would be any loss of AUMs from the allotment, because the percentage of the allotment lost would be so small (2.6%) that grazing use likely would be redistributed elsewhere in the allotment to avoid the loss. Section 13.3.19 provides more information on the economic impact of the loss of grazing capacity.

Defining the impacts on individual grazing permits and permittees would require a specific analysis of each case on the basis of, at a minimum, the three factors identified above. For this PEIS, and based on an assumed loss of 221 AUMs as described above, there would be no significant impact on livestock use within the Cedar City Field Office from the designation and development of the Wah Wah Valley SEZ. This conclusion was derived from comparing the loss of 221 AUMs with the total BLM-authorized AUMs in the field office for grazing year 2008, which totaled 139,998 AUMs. The impact on the permittee in the SEZ from this loss would also be minimal.

Developers of solar facilities could pay livestock operators for the loss of the portion of the grazing permit to facilitate solar operations; however, this is not required by BLM regulations.

Transmission Facilities and Other Off-Site Infrastructure

Construction of a new transmission line would add about 1,273 acres (5.2 km^2) of surface disturbance to the impact associated with the SEZ facilities and could cross up to five additional grazing allotments. This disturbance would not have a significant impact on grazing operations in these allotments.

13.3.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide some mitigation for some identified impacts. The exception would be any adverse economic impact on the grazing permittees.

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

- Consideration should be given to the feasibility of replacing all or part of any lost AUMs through development of additional range improvements on public lands remaining in the allotment.

13.3.4.2 Wild Horses and Burros

13.3.4.2.1 Affected Environment

Section 3.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nineteen wild horse and burro herd management areas occur within Utah. Figure 13.3.4.2-1 shows the location of the HMAs within the proposed Wah Wah Valley SEZ region. The SEZ is located 3.1 mi (5.0 km) west of the Frisco HMA. The Frisco HMA contains an estimated 77 horses (17 over the appropriate management level of 60 horses) (BLM 2009c).

In addition to the BLM-managed HMAs, the USFS has 51 established wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to the proposed Wah Wah Valley SEZ is the North Hills Territory within Dixie National Forest. This territory is adjacent to the North Hills HMA, which is managed by the BLM and located southwest of the SEZ (Figure 13.3.4.2-1). The proposed Wah Wah Valley SEZ is about 58 mi (93 km) from the North Hills Territory.

13.3.4.2.2 Impacts

Since there are no managed populations of wild horses or burros present on the proposed Wah Wah Valley SEZ, there would be no direct effect on wild horses and burros from solar energy development of the SEZ. The Frisco HMA is partially located within the indirect effects area of the SEZ (area within 5 mi [8 km] from the SEZ border). Potential impacts on wild horses within this area could result from collision with vehicles, fugitive dust generated by project activities, noise, lighting, spread of invasive species, and harassment. These impacts would be negligible with implementation of programmatic design features.

13.3.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

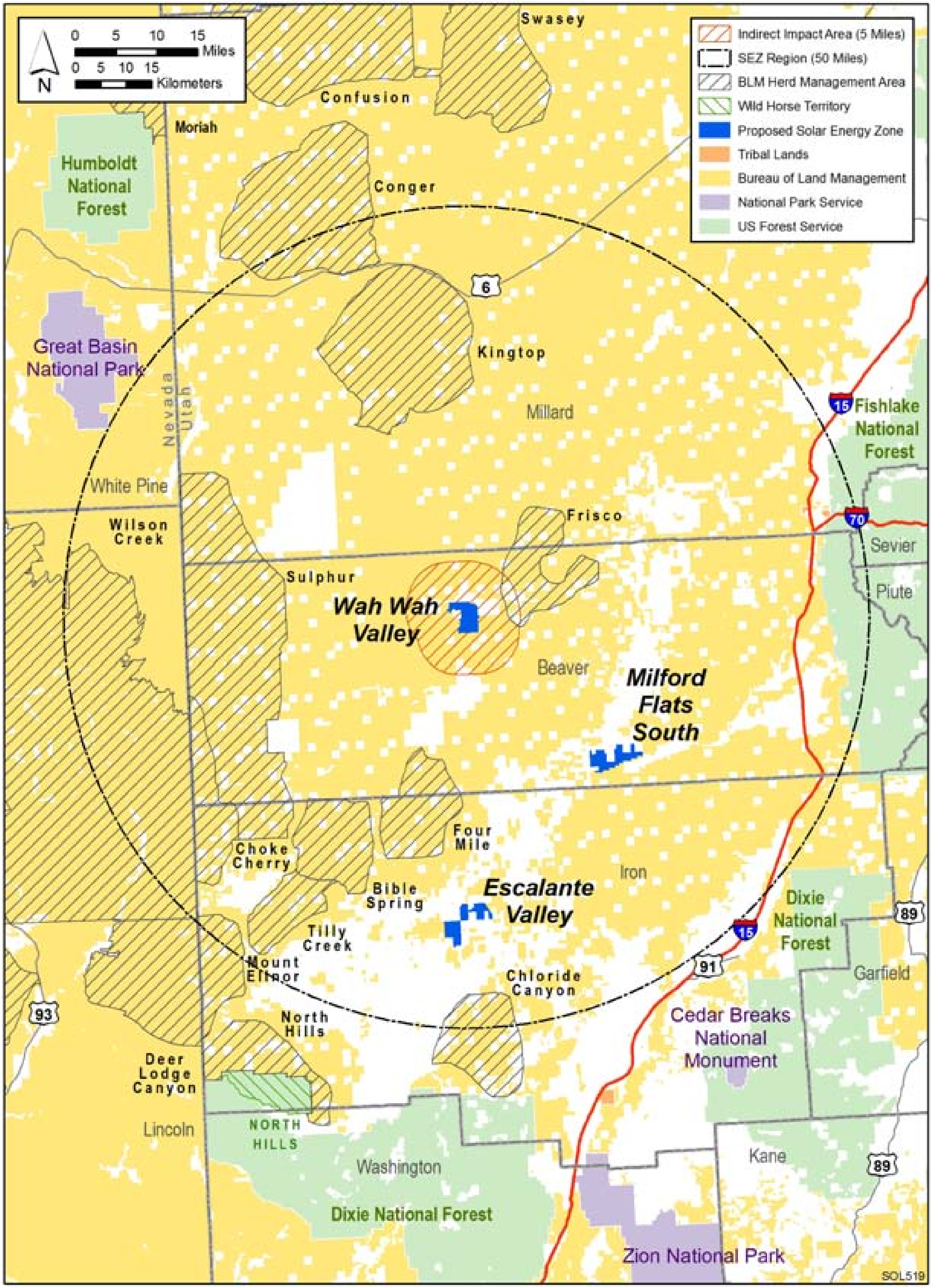

FIGURE 13.3.4.2-1 Wild Horse Herd Management Areas within the Proposed Wah Wah Valley SEZ Region

13.3.5 Recreation

13.3.5.1 Affected Environment

The proposed Wah Wah Valley SEZ is flat, and its unremarkable nature offers little potential for recreation use. The area would not be expected to attract recreational visitors from outside the area; however, it may be used by local residents for general outdoor recreation, including backcountry driving and OHV use, recreational shooting, and small and big game hunting. Site visits in September 2009 showed limited signs of recent vehicle and OHV use. The SEZ area has not been designated for vehicle travel in a BLM land use plan but will be considered in the upcoming revision of the land use plans in the Cedar City Field Office.

13.3.5.2 Impacts

Recreational users would be excluded from any portions of the SEZ developed for solar energy production. Whether recreational visitors would continue to use the remaining undeveloped portions of the SEZ is unknown. Public access through areas developed for solar power production could be lost unless access routes were identified and retained. It is not anticipated there would be a significant loss in recreational use if the SEZ were developed, but some users would be displaced.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. Data identifying open OHV routes within the proposed SEZ were not available. If such routes were identified during project-specific analyses, they would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

13.3.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary. 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.

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13.3.6 Military and Civilian Aviation

13.3.6.1 Affected Environment

The SEZ is not located under any MTRs or SUAs. The military installation closest to the Wah Wah Valley SEZ is the Deseret Test Center, about 100 mi (160 km) north of the SEZ. The Tooele Army Depot, Dugway Proving Ground, Wendover Test Range, and Camp Williams are all located in the vicinity of the Deseret Test Center, but somewhat further from the SEZ. Hill Air Force Base is located in Salt Lake City.

The closest civilian municipal airport to the Wah Wah Valley SEZ is the Milford Municipal Airport, located 23 mi (37 km) east.

13.3.6.2 Impacts

On the basis of comments received from the military, there are no concerns with respect to military aviation for the Wah Wah Valley SEZ. No comments have been received from Dugway Proving Ground or from the Utah Army National Guard.

Because the municipal airport closest to the Wah Wah Valley SEZ is more than 20 mi (32 km) from the SEZ, no impacts on civilian aviation from solar development within the area are expected.

13.3.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary to protect military or civilian aviation uses. 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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13.3.7 Geologic Setting and Soil Resources

13.3.7.1 Affected Environment

13.3.7.1.1 Geologic Setting

Regional Setting

The proposed Wah Wah Valley SEZ is located in the Wah Wah Valley, a sediment-filled basin within the Basin and Range physiographic province in southwestern Utah. The valley lies between the Sevier Lake Valley to the north and the Escalante Desert to the south and is bounded on the west by the Wah Wah Mountains and on the east by the San Francisco Mountains (Figure 13.3.7.1-1).

The Wah Wah Valley is an intermontane structural depression typical of the Basin and Range physiographic province. Normal faults occur along the base of the mountains on each side of the valley. Valley sediments fill the deepest part of a west-tilting half-graben that has moved downward relative to the Wah Wah Mountains to the west (Ertec Western, Inc. 1981).

Exposed sediments in the Wah Wah Valley are predominantly lacustrine, associated with Lake Bonneville, an ancient (Pleistocene) lake that covered most of western Utah and parts of eastern Nevada and southern Idaho from 32,000 to 14,000 years ago (UGS 2010). These fine-grained sediments—sandy silts, silts, sandy clays, and clays—are found in the valley center and are abundant within the Wah Wah Valley Hardpan, a playa or dry lake with a hardpan surface (Figure 13.3.7.1-2). The playa is an active remnant of Lake Bonneville. Alluvial fan deposits (Pleistocene to recent) are prevalent along the edges of the valley, except to the north. These deposits grade from cobbles and boulders at the mountain fronts surrounding the valley to silty or clayey sands toward the valley center. The highest shoreline of Lake Bonneville is well preserved and marks the contact between the alluvial fans along the valley margins and the lacustrine deposits within the valley center (Ertec Western, Inc. 1981).

Recent fluvial and floodplain deposits occur along the small channels that empty onto alluvial fans in the valley. The surrounding mountains are composed primarily of thick sequences of Paleozoic limestone and dolomite with lesser amounts of Precambrian and Cambrian metasediments (quartzites and phyllites). Tertiary volcanic rocks are also present (Ertec Western, Inc. 1981).

Topography

The Wah Wah Valley is a north-south trending basin with an area of about 320 mi^2 (830 km^2) (Ertec Western, Inc. 1981). Elevations along the valley axis range from about 5,250 ft (1,600 m) near the south end and along the valley sides to less than 4,640 ft (1,414 m) within the

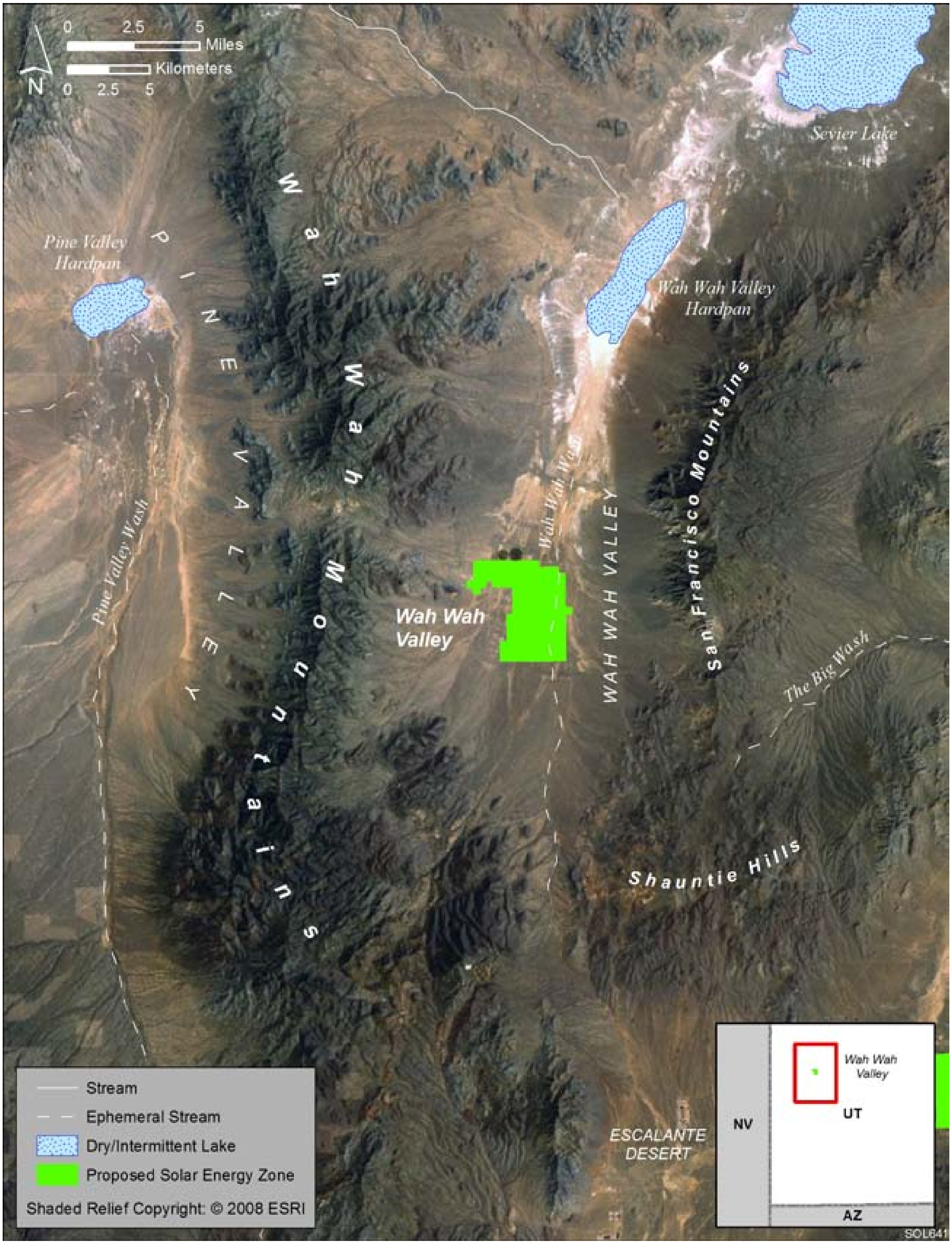

FIGURE 13.3.7.1-1 Physiographic Features of the Wah Wah Valley

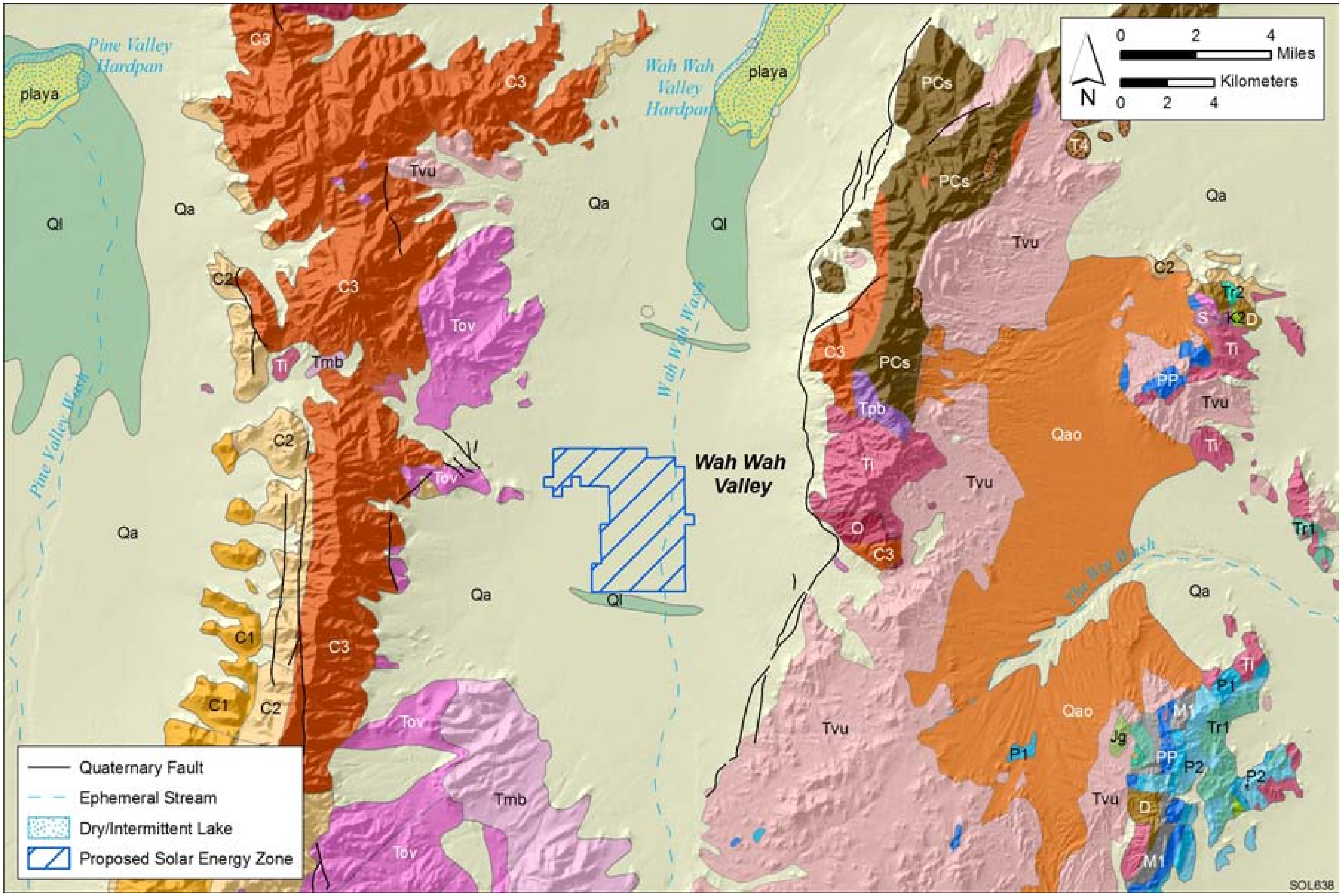

FIGURE 13.3.7.1-2 Geologic Map of the Wah Wah Valley Region (adapted from Ludington et al. 2007 and Hintze 1980)

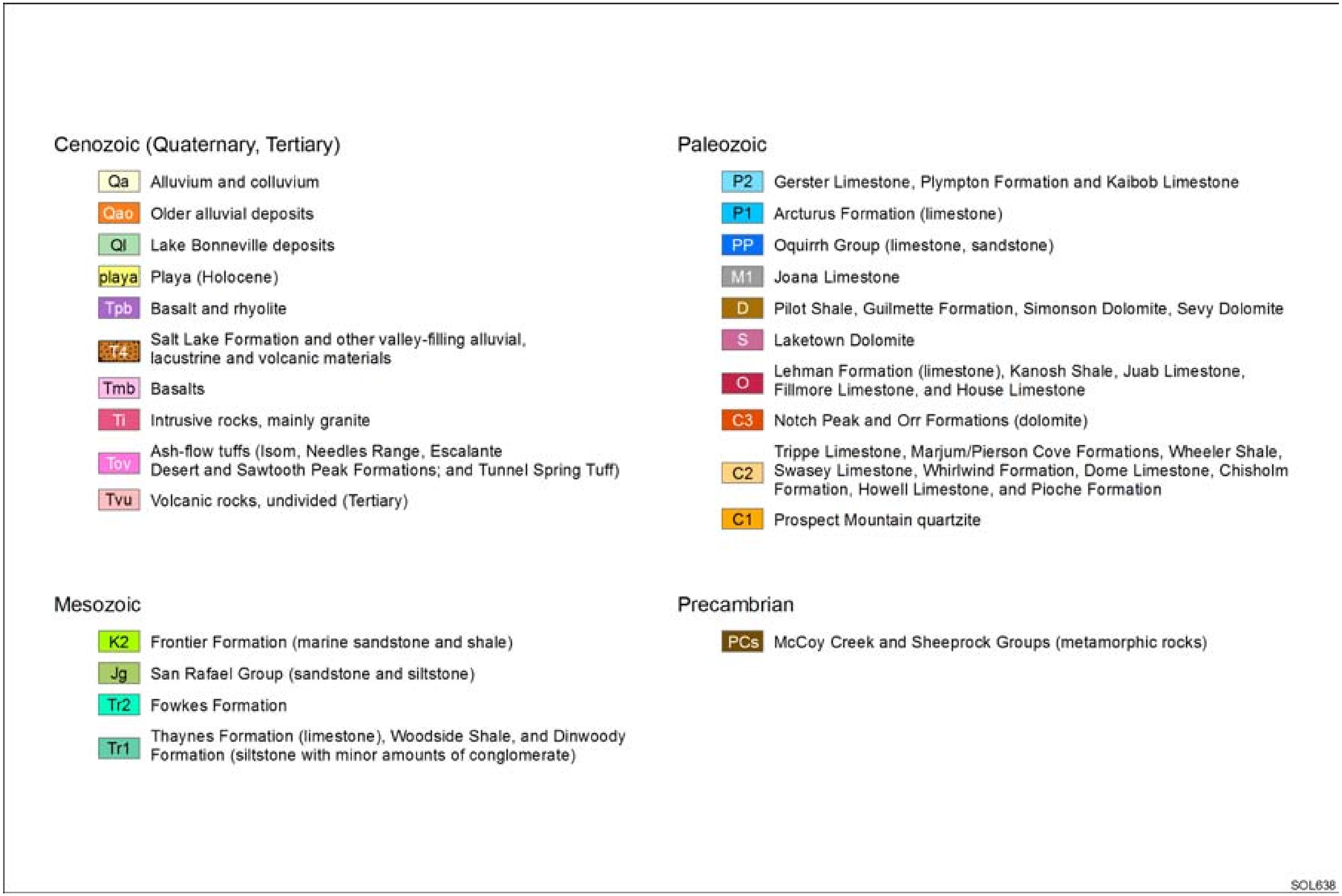

FIGURE 13.3.7.1-2 (Cont.)

Wah Wah Valley Hardpan, a playa lake with a hardpan surface, at the north end of the valley. Gently sloping alluvial fan deposits occur along the valley margins (but are steeper along the eastern margin). The valley is drained by Wah Wah Wash, an ephemeral stream that flows to the north and discharges into the Wah Wah Valley Hardpan. The Wah Wah Valley Hardpan is generally dry except for brief periods following heavy rain events (Ertec Western, Inc. 1981).

The proposed Wah Wah Valley SEZ is located in the central part of the Wah Wah Valley. The terrain is relatively flat, with a gentle dip to the north (Figure 13.3.7.1-3). Elevations range from 5,040 ft (1,536 m) near the site's southern border to 4,860 ft (1,481 m) at its northern border. The SEZ is dissected by several ephemeral streams, including the Wah Wah Wash (east side) and Quartz Creek (west side). Irrigation ditches run along the northern boundary of the SEZ.

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Wah Wah Valley SEZ. Solar project developers may need to conduct a geotechnical investigation to assess geologic hazards locally to better identify facility design criteria and site-specific mitigation measures to minimize their risk.

Seismicity. Southwestern Utah is tectonically active. The Wah Wah Valley lies within the Intermountain Seismic Belt (ISB), a north–trending zone of seismic activity that coincides with the eastern margin of the transitional zone between the Basin and Range and Colorado Plateau provinces, stretching from northwestern Montana through Wyoming, Idaho, and Utah, to southern Nevada and northern Arizona. The major active faults in southwestern Utah are located within the ISB. Earthquake activity in southwestern Utah typically occurs in dense clusters or swarms with magnitudes less than 4.0 (University of Utah 2009a; UGS 2009; Lund et al. 2007). Historically, several earthquakes with magnitudes greater than 6.0 have occurred in southwestern Utah. A 1992 earthquake in the St. George area (magnitude of 5.9), about 90 mi (145 km) south of the Wah Wah Valley SEZ, caused little damage to local buildings but triggered the largest landslide known for an earthquake of its magnitude (University of Utah 2009b; Christensen 1995).

No known Quaternary-age faults occur within the proposed Wah Wah Valley SEZ (Figure 13.3.7.1-4). The SEZ lies between two fault systems that run along the fronts of the two mountain ranges that bound the Wah Wah Valley on each side: the Wah Wah Mountains fault about 5.6 mi (9.0 km) west, and the San Francisco Mountains fault about 3.2 mi (5.1 km) east.

The Wah Wah Mountains fault system is a north–trending zone of normal faults. Movement along faults in this system is not well understood but has not likely occurred within

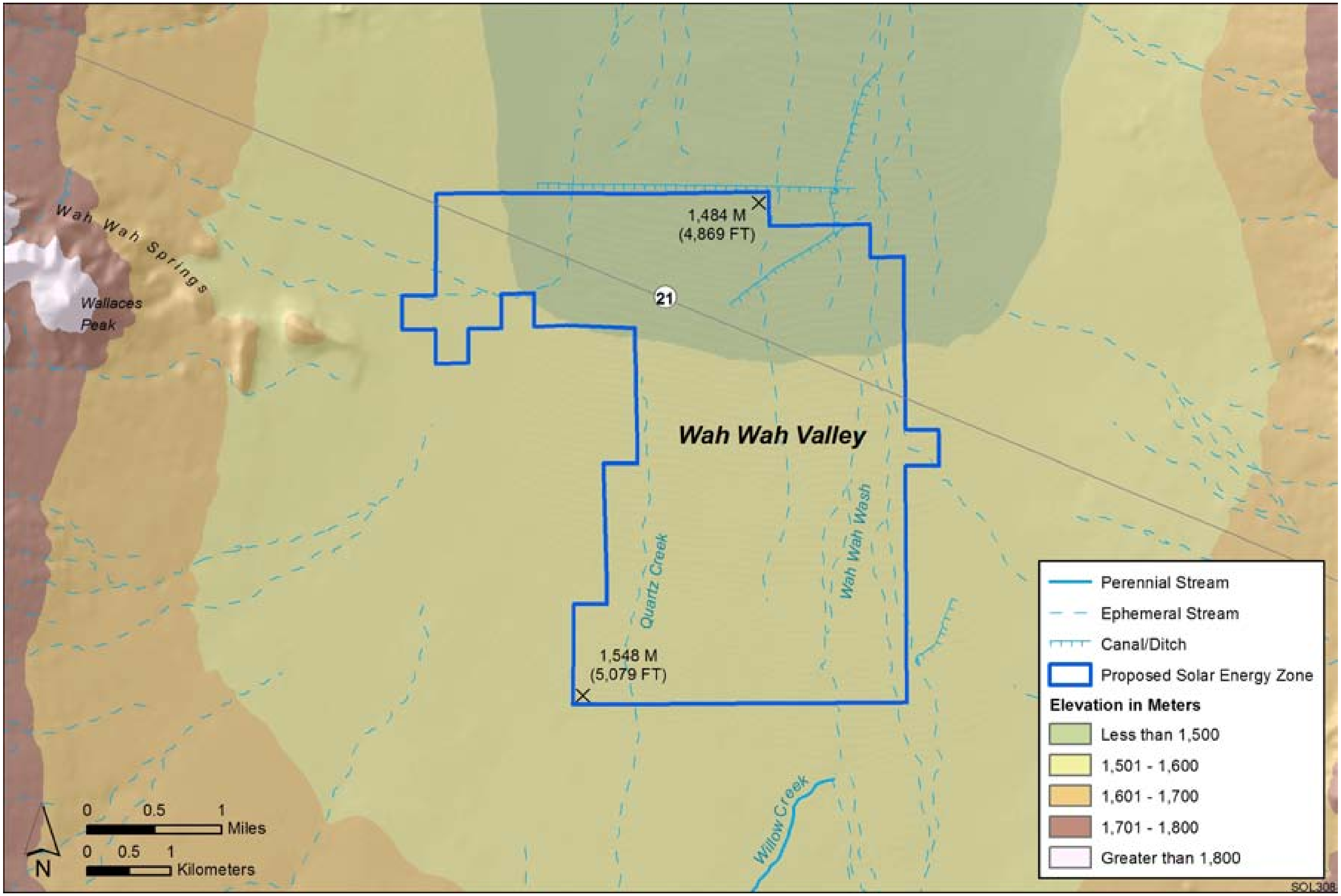

FIGURE 13.3.7.1-3 General Terrain of the Proposed Wah Wah Valley SEZ

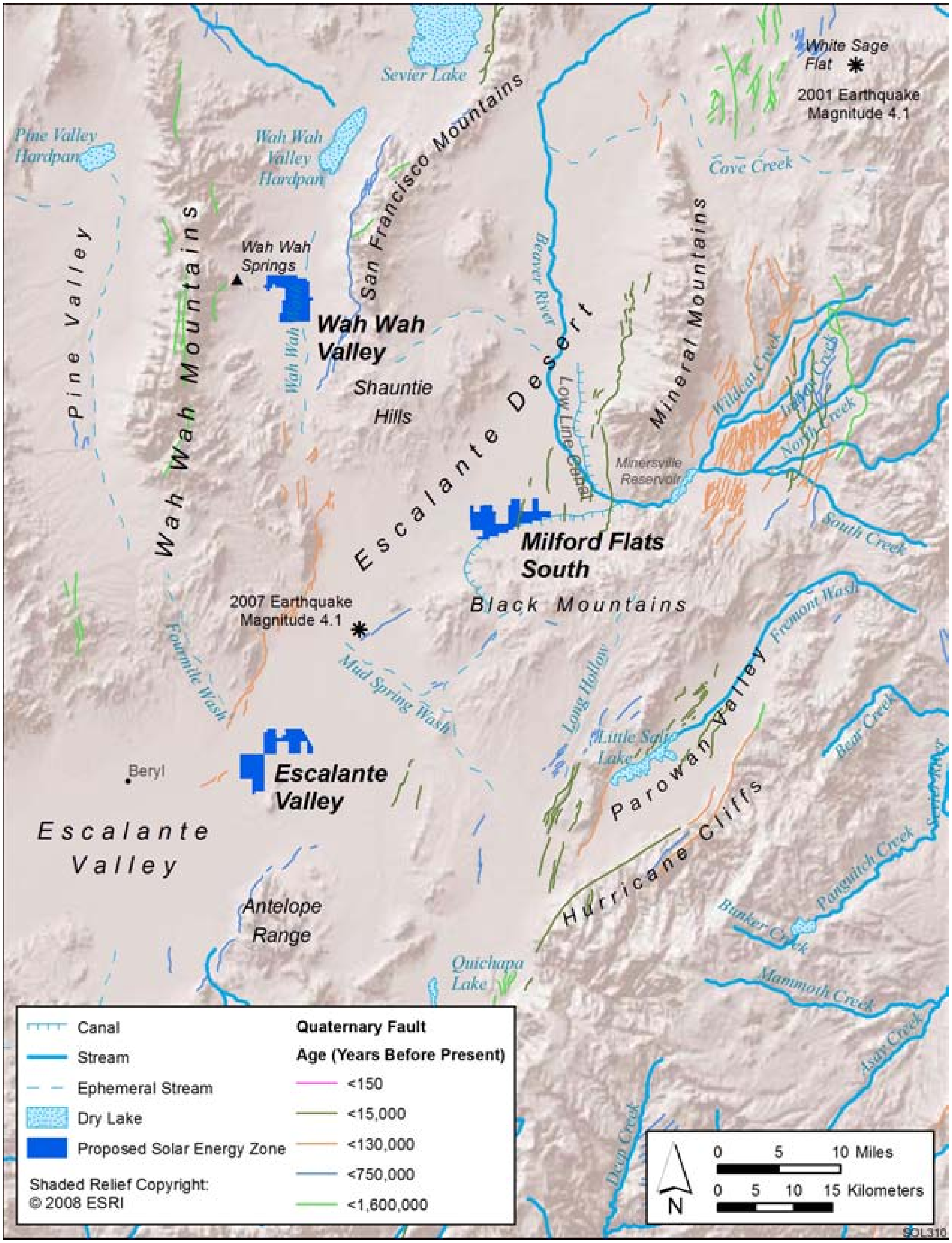

FIGURE 13.3.7.1-4 Quaternary Faults in the Wah Wah Valley Region (Sources: USGS and UGS 2009; USGS 2010b)

the past 1.6 million years (USGS 2009a). The San Francisco Mountains fault system is a north-to-northeast–trending zone of normal faults along the western side of the San Francisco Mountains. Faults in this zone have produced short, discontinuous scarps (as high as 41 ft [12.5 m] according to Ertec Western, Inc. 1981) and dissected old alluvial fan surfaces, but have not displaced Lake Bonneville shoreline sediments. This suggests that movement has not occurred in the recent past (i.e., within the past 15,000 years) (USGS 2009b; Ertec Western, Inc. 1981).

Ertec Western, Inc. (1981) identified a local zone of late Quaternary faults at Wah Wah Springs, on the west side of Wah Wah Valley near the mountain-valley contact. The fault zone consists of several short, sub-parallel, northwest-trending scarps in alluvium with displacements as high as 20 ft (6 m). Springs associated with the fault zone indicate that some of the faults may form a groundwater barrier.

From June 1, 2000 to May 31, 2010, 42 earthquakes were recorded within a 61-mi (100-km) radius of the proposed Wah Wah Valley SEZ. The largest earthquakes during that period occurred on February 23, 2001 and August 18, 2007. The 2001 earthquake was about 50 mi (80 km) northeast of the SEZ near White Sage Flat and registered a Richter scale magnitude[4] (ML) of 4.1; the 2007 earthquake was about 25 mi (40 km) south-southeast of the SEZ near Mud Spring Wash and registered a moment magnitude[5] (Mw) of 4.1 (Figure 13.1.7.1-4). During this period, 16 (36%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0; none was greater than 4.1 (USGS 2010b).

Liquefaction. The proposed Wah Wah Valley SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.06 and 0.07 g. Shaking associated with this level of acceleration is generally perceived as moderate to strong; however, the potential damage to structures is light (USGS 2008). Given the deep water table (from 200 ft [61 m] near the playa to 500 ft [152 m] at the southern end of the valley [Ertec Western, Inc. 1981; Bunch and Harrill 1984]) and the low intensity of ground shaking estimated for the Wah Wah Valley, the potential for liquefaction in Wah Wah Valley sediments is likely to be low. The Utah Geological Survey has published liquefaction susceptibility maps for several Utah counties (mainly those counties encompassing portions of the Great Salt Lake shoreline and other lakes and rivers); however, none has been prepared for Beaver County.

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4 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 2010c).

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

Volcanic Hazards. Extensive volcanic activity occurred in southwestern Utah throughout the Tertiary period, shifting in composition from calc-alkaline ash flow tuff eruptions to basalt and rhyolite lava flows about 23 million years ago, when extensional faulting in the eastern Basin and Range province began. Although there are numerous Quaternary age volcanic (basalt and lesser quantities of rhyolite) vents and flows in the region, there is little evidence of volcanic activity in the past 1,000 years (Anderson and Christenson 1989; Klauk and Gourley 1983; Hecker 1993).

The nearest active volcano is Mount St. Helens in the Cascade Range (Washington), about 695 mi (1,120 km) northwest of Wah Wah Valley, which has shown some activity as recently as 2008.

The nearest volcano that meets the criterion for an unrest episode is the Long Valley Caldera in east-central California, about 305 mi (490 km) to the west, which has experienced recurrent earthquake swarms, changes in thermal springs and gas emissions, and uplift since 1980 (Diefenbach et al. 2009). The Long Valley Caldera is part of the Mono-Inyo Craters volcanic chain that extends from Mammoth Mountain (on the caldera rim) northward about 25 mi (40 km) to Mono Lake. Small to moderate eruptions have occurred at various sites along the volcanic chain in the past 5,000 years, at intervals ranging from 250 to 700 years. Windblown ash (tephra) from some of these eruptions is known to have drifted as far east as Nebraska. While the probability of an eruption within the volcanic chain in any given year is small (less than 1%), serious hazards could result from a future eruption. Depending on the location, size, timing (season), and type of eruption, hazards could include mudflows and flooding, pyroclastic flows, small to moderate volumes of tephra, and falling ash (Hill et al. 1998, 2000; Miller 1989).

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to facilities on the relatively flat terrain of valley floors such as Wah Wah 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.

The UGS has documented earth fissures along the surface due to ground subsidence near Beryl Junction (in Escalante Valley south of the Wah Wah Valley). These fissures are thought to result from groundwater withdrawal in the area, which has caused compaction in the Escalante Valley aquifer. Lund et al. (2005) observed that between the late 1940s and 2002, water levels in monitoring wells had fallen as much as 105 ft (32 m). The earth fissures tend to occur in areas of high drawdown. Even if stabilized (by increased recharge or decreased pumping), residual compaction may still occur at a reduced rate for several decades (Galloway et al. 1999). To date, fissures related to ground subsidence have not been reported in the Wah Wah Valley.

Other Hazards. Other potential hazards at the proposed Wah Wah Valley SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Ertec Western, Inc. (1981) concluded that fine-grained materials covering the Wah Wah Valley

Hardpan exhibit low-strength characteristics to a depth of 6 ft (1.8 m) and are not suitable for use as a base for roads. Disturbance of soil crusts and desert varnish (and pavement) on soil surfaces may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those found in the Wah Wah Valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) will depend on specific morphology of the fan (National Research Council 1996). Section 13.3.9.1.1 provides further discussion of flood risks within the Wah Wah Valley SEZ.

13.3.7.1.2 Soil Resources

The dominant soil orders in southwestern Utah are Aridisols, Entisols, and Molisols (see Table 13.3.7.1-1). They are generally very deep, loamy soils that are well drained to somewhat excessively drained. Soils in the region were formed on alluvial fans and flats and on lake terraces and lake plains. Parent material consists mainly of alluvium and colluvium (with some eolian materials) derived from mixed igneous and sedimentary rocks and lake sediments (NRCS 2009). Although mechanical and microbiotic crusts are common on Utah soils (Milligan 2009), none have been reported in the soils covering the Wah Wah Valley SEZ and none were observed in the field.

Soils within the Wah Wah Valley SEZ are predominantly silty clay loams, fine sandy loams, and sandy clay loams of the Siltcliffe Series, the Siltcliffe-Hiko Springs-Dera complex, the Siltcliffe-Thermosprings complex, the Dera-Lynndyl complex, and the Dera Series, which together make up a 97% of the soil coverage at the site (Figure 13.3.7.1-5). These soils are very deep and well drained, with moderate runoff potential and high permeability. Dera sandy clay loams occupy relict offshore bars (shown as linear features on the map) within the southern portion of the SEZ and to the north of its northern boundary. Riverwash sediments occur along the east side of the SEZ on the steeper slopes (4 to 15%) of the Wah Wah Wash. The natural soil surface for most soils is suitable for roads, with a slight erosion hazard when used as roads or trails. The water erosion hazard is moderate for the Siltcliffe silty clay loam (covering 55% of the site), but slight for most other soils. The susceptibility to wind erosion is moderate, with as much as 86 tons (78 metric tons) of soil eroded by wind per acre (4,000 m^2) each year (NRCS 2010). Heavy clouds of windblown soil were observed in the field in September 2009. Soil map units are described in Table 13.3.7.1-1. . Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

Most of the soils within the SEZ are rated as partially hydric[6] (with riverwash soil being totally hydric). Flooding is not likely for soils at the site (occurring less than once in 500 years) (NRCS 2010).

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

TABLE 13.3.7.1-1 Summary of Soil Map Units within the Proposed Wah Wah Valley SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
182	Siltcliffe silty clay loam (0 to 3% slopes)	Moderate	Moderate (WEG 6)[d]	Nearly level soils on alluvial flats. Parent material consists of alluvium from igneous and sedimentary rocks. Soils are very deep and well drained, with moderate surface runoff potential and high permeability. Available water capacity is moderate. Partially hydric. Severe rutting hazard. Used for livestock grazing and wildlife habitat.	3,363 (55)
183	Siltcliffe-Hiko Springs-Dera complex (0 to 3% slopes)	Slight	Moderate (WEG 3)	Nearly level soils (very fine sandy loams) on alluvial flats. Parent material consists of alluvium from igneous and sedimentary rocks. Soils are very deep and well drained, with moderate surface runoff potential and high permeability. Available water capacity is moderate. Moderate rutting hazard. Used for rangeland and wildlife habitat.	1,386 (23)
180	Siltcliffe-Thermosprings complex (0 to 2% slopes)	Slight	Moderate (WEG 3)	Nearly level soils (sandy loams) on alluvial flats. Parent material consists of alluvium from igneous and sedimentary rocks. Soils are very deep and well drained, with moderate surface runoff potential and high permeability. Available water capacity is moderate. Partially hydric. Moderate rutting hazard. Used for rangeland and wildlife habitat.	443 (7)
176	Dera-Lynndyl complex (0 to 3% slopes)	Slight	Moderate (WEG 4)	Nearly level soils (sandy clay loams) on alluvial fan skirts. Parent material consists of eolian material, alluvium, and colluvium from igneous and sedimentary rocks and lacustrine deposits. Soils are very deep and well drained, with moderate surface runoff potential and high permeability. Available water capacity is low. Moderate rutting hazard. Used for rangeland and wildlife habitat.	363 (6)
177	Dera sandy clay loam (0 to 5% slopes)	Slight	Moderate (WEG 4)	Nearly level soils on alluvial fan skirts and relict longshore bars. Parent material consists of alluvium from igneous and sedimentary rocks. Soils are very deep and well drained, with moderate surface runoff potential and high permeability. Available water capacity is low. Moderate rutting hazard. Used for rangeland and wildlife habitat.	260 (4)

TABLE 13.3.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area in Acres[c] (% of SEZ)
181	Siltcliffe sandy clay loam (0 to 2% slopes)	Slight	Moderate (WEG 4)	Nearly level soils on alluvial flats. Parent material consists of alluvium from igneous and sedimentary rocks and lacustrine deposits. Soils are very deep and well drained, with moderate surface runoff potential and high permeability. Available water capacity is high. Severe rutting hazard. Used for rangeland and wildlife habitat.	143 (2)
175	Hiko Peak, dry-Lynndyl association	Slight	Moderate (WEG 5)	Nearly level soils (cobbly sandy loams) on alluvial fan skirts and relict longshore bars. Parent material consists of alluvium from igneous and sedimentary rocks. Soils are very deep and well drained, with low surface runoff potential (high infiltration rate) and high permeability. Available water capacity is low. Moderate rutting potential. Used for rangeland and wildlife habitat.	111 (2)
135	Riverwash (4 to 15% slopes)	Not rated	Not rated	Riverwash soils within streams and channels; occasional flooding. All hydric. Rutting hazard not rated.	29 (<1)

a Water erosion potential rates the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K (whole soil; doesn't account for the presence of rock fragments) and represent soil loss caused by sheet or rill erosion where 50 to 75% of the surface has been exposed by ground disturbance. A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions. A rating of "severe" indicates that erosion is expected; loss of soil productivity and damage are likely and erosion control measures may be costly or impractical.

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

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

Footnotes continued on next page.

TABLE 13.3.7.1-1 (Cont.)

[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; WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year; and WEG 6, 48 tons (44 metric tons) per acre (4,000 m^2) per year.

Source: NRCS (2010).

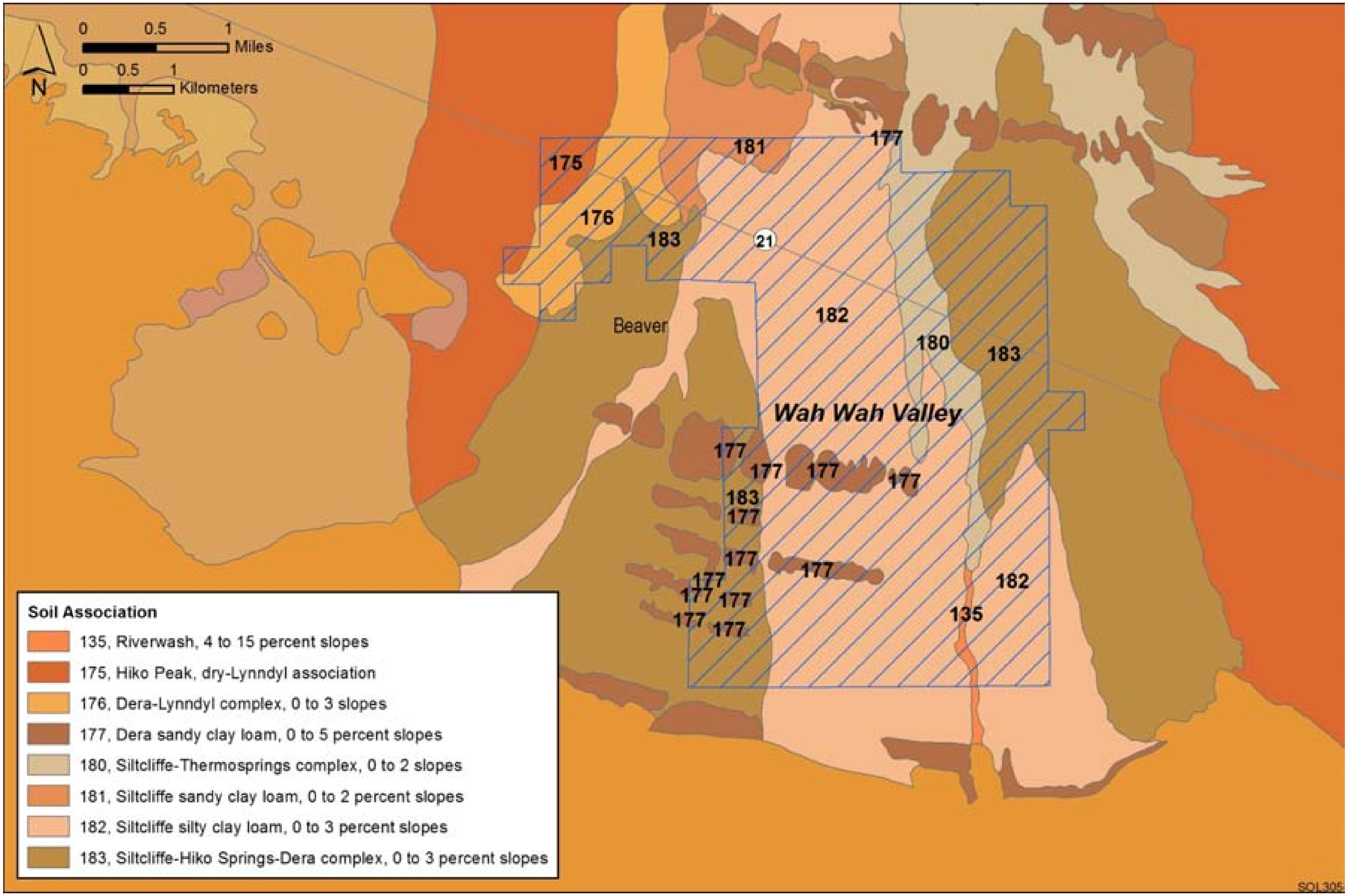

FIGURE 13.3.7.1-5 Soil Map for the Proposed Wah Wah Valley SEZ (NRCS 2008)

Soils in this region are used mainly as rangeland for grazing cattle and sheep, pastureland, and irrigated cropland. The major crops in the region are irrigated alfalfa hay, wheat, barley, potatoes, and corn (USDA 1998).

13.3.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy developments in varying degrees and are described in more detail for the four phases of development in Section 5.7.1.

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

13.3.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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13.3.8 Minerals (Fluids, Solids, and Geothermal Resources)

13.3.8.1 Affected Environment

There are no locatable mining claims within the proposed Wah Wah Valley SEZ, and the land of the SEZ was closed to locatable mineral entry in June 2009 pending the outcome of this PEIS. The SEZ and surrounding area have been leased for oil and gas development in the past, but no development occurred, and there are currently no oil or gas leases in the area. The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals and for disposal of salable minerals. There is an approximately 10,000-acre (40-km^2) area southeast of the SEZ where eight geothermal leases had been issued, but those leases are now closed. No geothermal development has occurred within or adjacent to the SEZ (BLM and USFS 2010).

13.3.8.2 Impacts

If the area is identified as a solar energy development zone, it would continue to be closed to all incompatible forms of mineral development. Since there are no oil and gas leases in the area nor has there been any development of previous leases, it is assumed there would be no significant impacts on these resources if the area were developed for solar energy production. Also, since the area does not contain existing mining claims, it is also assumed there would be no future loss of locatable mineral production. The SEZ has had no history of development of geothermal resources or leasing interest; thus, it is anticipated that solar development would not adversely affect development of geothermal resources in the region.

Should the area be identified as a solar energy development zone, some mineral uses might be allowed on all, or portions, of the SEZ. For example, oil and gas development that involves the use of directional drilling to access resources under the area (should any be found) might be allowed. It might also be possible to develop geothermal resources by using directional drilling techniques to access hot water sources. The production of common minerals, such as sand and gravel, and mineral materials used for road construction, might take place in areas that are not directly developed for solar energy production.

13.3.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary 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 locatable minerals, and oil and gas resources and geothermal resources.

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13.3.9 Water Resources

13.3.9.1 Affected Environment

The proposed Wah Wah Valley SEZ is located within the Escalante Desert–Sevier Lake subregion of the Great Basin hydrologic region (USGS 2010a) and the Basin and Range physiographic province characterized by small mountain ranges and intervening desert valleys (Robson and Banta 1995). The Wah Wah Valley is a closed basin surrounded by the Wah Wah Mountains to the west, San Francisco Mountains to the east, low-lying hills to the south, and a surface drainage divide separating Wah Wah Valley from the Sevier Lake Basin (Figure 13.3.9.1-1). The proposed SEZ has surface elevations ranging between 4,880 and 5,125 ft (1,487 and 1,562 m), with surrounding mountain elevations up to 8,500 ft (2591 m). Precipitation in the higher elevations ranges from 8 to more than 25 in./yr (20 to 64 cm/yr) with snowfalls typically greater than 100 in./yr (254 cm/yr), whereas the average precipitation in the valley is estimated to be 7 in./yr (18 cm/yr) with snowfalls of 5 in./yr (13 cm/yr) (USDA 2007; WRCC 2010a). The climate in the valley region of the proposed SEZ is arid with the average annual pan evaporation rate estimated to be 71 in./yr (180 cm/yr) (Cowherd et al. 1988; WRCC 2010b).

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

The Wah Wah Valley covers an area of 384,000 acres (1,550 km^2) and is a part of the Sevier River Basin planning area (UBWR 1999). The valley is a closed basin with a general drainage pattern from south to north toward the Wah Wah Valley Hardpan and Sevier Lake region (Figure 13.3.9.1-1). A surface drainage divide (approximately 25 ft [8 m] in height) separates the Wah Wah Valley from the Sevier Lake basin (Stephens 1974). There are no perennial surface water features in the Wah Wah Valley. Several ephemeral washes that terminate shortly after entering the valley drain the Wah Wah Mountains and the San Francisco Mountains. Willow Creek and Quartz Wash are two ephemeral washes that feed into the Wah Wah Wash, an ephemeral wash that has a significant, incised channel running south to north across the center of the valley and through the proposed SEZ (Figure 13.3.9.1-1). Several small reservoirs have been constructed throughout the Wah Wah Valley to intercept surface runoff for livestock grazing, but these are dry throughout most of the year (Stephens 1974). The Wah Wah Valley Hardpan and Sevier Lake are dry lakebeds located 10 and 20 mi (16 and 32 km) northeast of the proposed SEZ, respectively.

The proposed Wah Wah Valley SEZ is located in an area that has not been examined for flood risk (Zone D) by FEMA (2009). Flooding caused by large rainfall events would be limited to localized ponding and erosion. Channel incision and sedimentation patterns observed in the Wah Wah Wash during the September 2009 site visit indicated substantial flows occurred during past runoff events; thus, flooding could potentially occur in this limited vicinity. There is no NWI data available for the Wah Wah Valley (USFWS 2009). Riparian vegetation is evident along the Wah Wah Springs discharge area (Section 13.3.9.1.2) west of the proposed SEZ; it is also apparent in small areas surrounding several springs near the base of the surrounding

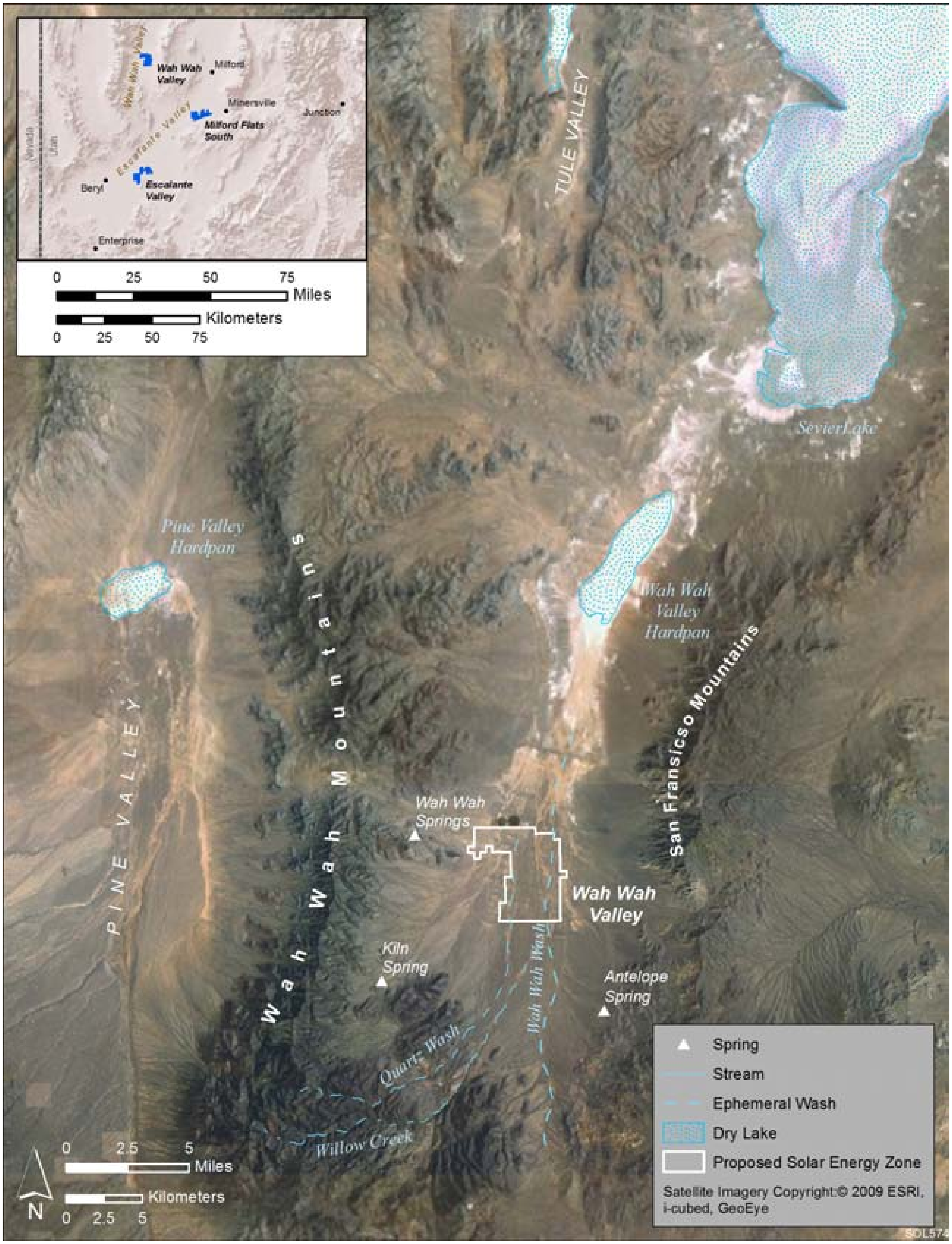

FIGURE 13.3.9.1-1 Surface Water Features near the Proposed Wah Wah Valley SEZ

mountains of the Wah Wah Valley (see Section 13.3.10.1 for further information on riparian vegetation pertaining to the proposed SEZ).

13.3.9.1.2 Groundwater

Groundwater resources in the Wah Wah Valley are not fully realized because of the lack of historical development and exploration in the area (Stephens 1974). Most of the information regarding groundwater in Wah Wah Valley is derived from large-scale analyses and models developed for regional aquifer systems of Nevada and western Utah, which include (from large- to small-scale) the Great Basin Regional Flow System (e.g., Harrill and Prudic 1998), the Basin and Range Carbonate-Rock Aquifer System (e.g., Welch et al. 2007), and the Great Salt Lake Desert System (GSLDS) (e.g., Harrill and Prudic 1998). The Wah Wah Valley is located in the southern portion of the GSLDS; which, along with Pine Valley, Snake Valley, Tule Valley, and Fish Springs Flat (all located to the north and west of Wah Wah Valley), forms a subregional groundwater flow system (Carlton 1985) that was referred to as the Fish Springs Flow System in Harrill and Prudic (1998). The conceptual models for these groundwater flow systems depict a hydrogeologic framework of basin-fill aquifers with underlying consolidated-rock aquifers. The basin-fill aquifers are thought to have limited connectivity between valleys, but the consolidated-rock aquifers join the basins, creating regional groundwater flow patterns, and are connected locally to the basin-fill aquifers (e.g., Welch et al. 2007).

The water-bearing hydrogeologic units in the region including the Wah Wah Valley consist of a basin-fill aquifer with an underlying consolidated-rock aquifer comprised of volcanic and carbonate rocks (Harrill and Prudic 1998; Welch et al. 2007). The basin-fill aquifer within Wah Wah Valley is estimated to be on the order of 1,000 ft (305 m) to 4,000 ft (1,219 m) thick at the valley center and composed of Quaternary to Tertiary age alluvium deposits, with some lacustrine and colluvium deposits as well (Stephens 1974; Carlton 1985; Harrill and Prudic 1998). The sediments range from clays to boulders that are intermixed and interbedded to form regions of unconsolidated to well-cemented layers with variable permeability (Stephens 1974). The consolidated-rock aquifer in the vicinity of the Wah Wah Valley is comprised mostly of carbonate rocks that are highly fractured and permeable (Stephens 1974; Carlton 1985; Welch et al. 2007).

Groundwater recharge in the Wah Wah Valley is primarily derived from precipitation runoff of the surrounding mountains and valley floor, and was estimated to be approximately 7,000 ac-ft/yr (8.6 million m^3/yr) (Stephens 1974). An additional source of groundwater recharge is by subsurface inflow within the carbonate-rock aquifer from Pine Valley estimated to be 3,000 ac-ft/yr (3.7 million m^3/yr). Groundwater flow in the carbonate-rock aquifers of the GSLDS is typically discharged at regional springs and low-lying areas that allow for evapotranspiration (Harrill and Prudic 1998). Several small springs are located near the base of the Wah Wah Mountains that include Antelope Spring and Kiln Spring, which have discharges of less than 40 ac-ft/yr (49,000 m^3/yr) supplied by localized runoff (Stephens 1974). Wah Wah Springs is a series of springs located 2 mi (3.2 km) west of the proposed SEZ that acts as a regional spring and groundwater discharge location for the carbonate-rock aquifer. In the study by Stephens (1974), the source water for the Wah Wah Springs was considered to be from runoff of the Wah Wah Mountains, and the discharge of the springs was estimated at 800 ac-ft/yr (987,000 m^3/yr). Current investigations are underway to assess the groundwater reserves in the basin-fill and carbonate-rock aquifers in the Wah Wah Valley, with preliminary evidence suggesting that the source water for the Wah Wah Springs is likely to be interbasin flow from Pine Valley. These studies have also estimated that the discharge of Wah Wah Springs is 1,530 ac-ft/yr (1.9 million m^3/yr) (Egerton 2009). It is estimated that approximately 600 ac-ft/yr (740,000 m^3/yr) of evaporation discharge from the Wah Wah Valley occurs that is associated with the Wah Wah Springs area (Stephens 1974).

The groundwater flow direction in the Wah Wah Valley typically follows the axis of the valley from south to north (Stephens 1974). Subsurface discharge out of the Wah Wah Valley was estimated to be 8,500 ac-ft/yr (10.5 million m^3/yr) (Gates and Kuer 1981). However, given the limited data on groundwater surface elevations in the region, it is not well understood which basins receive this subsurface discharge (Stephens 1974; Harrill et al. 1988). Groundwater modeling results indicate a region of high groundwater transmissivity from Wah Wah Valley north to Fish Springs Flat basin, the downgradient basin of the Fish Springs Flow System (Prudic et al. 1993; Harrill and Prudic 1998). In addition, the discharge to springs in the Fish Springs Flat basin far exceeds its local recharge rate, suggesting that it receives substantial interbasin flow from Pine Valley, Wah Wah Valley, Tule Valley, and Snake Valley (Harrill and Prudic 1998). This evidence suggests that the majority of the subsurface discharge out of Wah Wah Valley is into the Tule Valley and Snake Valley basins.

One active USGS monitoring well located 4 mi (6.5 km) south of the Wah Wah Valley SEZ indicates a depth to groundwater of 660 ft (201 m) (USGS 2009c; well number 382350113231901). The depth to groundwater in this well has remained fairly constant since the mid-1970s. Historical groundwater samples from approximately 15 inactive wells indicate that the water quality in the Wah Wah Valley is hard, with TDS concentrations ranging between 100 and 4,550 mg/L; a majority of the samples had a TDS concentration of greater than the 500 mg/L secondary MCL. A small portion of these wells also had sulfate concentrations greater than the 250-g/L secondary MCL (Stephens 1974).

13.3.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Beaver County were 102,350 ac-ft/yr (126 million m^3/yr), of which 52% came from surface waters and 48% from groundwater (Kenny et al. 2009). The largest water use category was for agricultural irrigation, at 89,000 ac-ft/yr (110 million m^3/yr). The remaining water use categories were for thermoelectric energy production (6%), livestock (3%), public supply and domestic uses (2%), and industrial purposes (2%) (Kenny et al. 2009). The Wah Wah Valley is a remote area of Beaver County and only contains one ranch supporting agriculture, and its water is supplied via an aqueduct from Wah Wah Springs. The rest of the Wah Wah Valley is used primarily for livestock grazing (Stephens 1974).

In Utah, the appropriation doctrine is the basis of water appropriation, which implies that water rights are allocated on a temporal basis (BLM 2001). All waters are the property of the public in the State of Utah and subject to the laws described in Utah Code, Title 73, Water and Irrigation (available at http://www.le.state.ut.us/~code/TITLE73/TITLE73.htm). A water right establishes an entity's legal ability to divert surface water or groundwater for beneficial use and contains five key elements: a definition of the beneficial use, a priority date, a defined flow or quantity of water to be diverted, a location of the diversion, and location of the beneficial use. Water rights are administered by the Office of the State Engineer, which was renamed the Utah Division of Water Rights (Utah DWR) in 1963 (Utah DWR 2005).

The Utah DWR manages both surface water and groundwater appropriations (new appropriations and transfer of existing water rights). In many regions of the state, both surface water and groundwater resources are fully appropriated, so new water diversions can only be made through the transfer of existing water rights. The application process for obtaining a water right is the same for surface water and groundwater; however, the criteria used to evaluate new surface water and groundwater diversions are different and can vary by region of the state. Groundwater diversions can also be subject to groundwater management plans that have been established to protect existing water rights and limit overuse and degradation of water quality in sensitive areas. The Utah DWR assesses a water right application based on its potential for beneficial use, as well as its potential to affect existing water rights or impair water quality (BLM 2001). For water right transfer applications in regions where water resources are limited, the seniority of a transferred water right and its ability to not affect more senior water rights in the region will determine whether it can meet project demands (Utah DWR 2005).

The Wah Wah Valley is under the jurisdiction of the southwestern regional office of the Utah DWR and is located in Policy Area 69 (Wah Wah Valley and Sevier Lake). Surface waters in this Policy Area are considered fully appropriated, with only new diversions of less than 2 ac-ft/yr (2,500 m^3/yr) considered. New groundwater diversion applications are typically granted for small farming applications (less than 1 acre [0.004 km^2] of irrigation), and all other groundwater applications are considered on a case-by-case basis (Utah DWR 2010). Groundwater is not fully appropriated in the Wah Wah Valley, but there are currently two pending water right applications that are seeking substantial groundwater amounts. The Central Iron County Water Conservancy District (CICWCD) has applied for the use of 12,000 ac-ft/yr (14.8 million m^3/yr) to be extracted from 20 wells within the Wah Wah Valley that would range from 100 to 2,000 ft (31 to 610 m) in depth (Utah DWR 2010; application number A76677). Beaver County has applied for the use of 6,650 ac-ft/yr (8.2 million m^3/yr) to be extracted from 17 wells within the Wah Wah Valley that range from 500 to 1,000 ft (152 to 305 m) in proposed depths (Utah DWR 2010; application number A78814). Both of these groundwater applications are under review by the Utah DWR, and together have the potential to withdraw groundwater quantities that exceed the estimated value of groundwater recharge for the basin.

The pending water right applications in Wah Wah Valley are seeking groundwater that is primarily within the basin-fill aquifer of the Wah Wah Valley. However, the connectivity of the local basin-fill aquifer with the regional carbonate-rock aquifer, along with several proposed groundwater extractions in the surrounding valleys of eastern Nevada and western Utah (e.g., SNWA 2010), has prompted the Department of the Interior to initiate a groundwater modeling project to assess the potential for new groundwater diversions to impact groundwater resources. (Information on this groundwater modeling effort and provisional data can be found at http://www.blm.gov/ut/st/en/prog/more/doi_groundwater_modeling.html.)

13.3.9.2 Impacts

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

13.3.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy developments, which are described in more detail for the four phases of development in Section 5.9.1; these impacts would be minimized through the implementation of programmatic design features described in Appendix A, Section.A.2.2. Land disturbance impacts in the vicinity of the proposed Wah Wah Valley SEZ could potentially affect natural drainage patterns and natural groundwater recharge and discharge properties. The Wah Wah Wash conveys substantial flows during storm events, as evident from channel incision and sedimentation patterns. Land disturbance activities near Wah Wah Wash could potentially increase flows during storms and cause further channel incision and sedimentation problems.

13.3.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

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

- On the basis of a total area less than 10,000 acres (40 km^2), it is assumed that one solar project could be constructed during the peak construction year;

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

- The maximum build-out 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 approximately 49% of the SEZ total area during peak construction year; and

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

Site Characterization

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

Construction

During construction, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Because there are no significant surface water bodies on the proposed Wah Wah Valley SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources. Water requirements for dust suppression and potable water supply during construction are shown in Table 13.3.9.2-1 and could be as high as 1,261 ac-ft (1.6 million m^3). The assumptions underlying these estimates for each solar energy technology are described in Appendix M. Groundwater wells would have to yield an estimated 781 gal/min (3,000 L/min) to meet the estimated construction water requirements. These yields are similar to average well yields of small- to medium-sized irrigated farms in Utah (USDA 2009b). The availability of groundwater and the impacts of groundwater withdrawal would need to be assessed during the site characterization phase of a solar development project. In addition, up to 74 ac-ft (91,300 m^3) of sanitary wastewater would need to be either treated on-site or sent to an off-site facility.

The Utah primary drinking water standards require that TDS concentrations be less than 2,000 mg/L (*Utah Administrative Code*, Rule R309-200, Monitoring and Water Quality: Drinking Water Standards). In the Wah Wah Valley, groundwater TDS concentrations have been reported that exceed this drinking-water threshold. If the groundwater supply used for a project does not meet drinking water quality standards, potable water would need to be brought in from off-site.

TABLE 13.3.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Wah Wah Valley SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	811	1,216	1,216	1,216
Potable supply for workforce (ac-ft)	74	45	19	9
Total water use requirements (ac-ft)	885	1,261	1,235	1,225
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 of 71 in./yr (180 cm/yr) (Cowherd et al. 1988; WRCC 2010b).

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

Operations

Water would be required for mirror/panel washing, the workforce potable water supply, and cooling during operations. Cooling water is required only for the parabolic trough and power tower technologies. Water needs for cooling are a function of the type of cooling used (dry, wet, hybrid). Further refinements to water requirements for cooling would result from the percentage of time that the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 13.3.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

The water use requirements among the solar energy technologies are a factor of the full build-out capacity, as well as assumptions on water use and technology operations discussed in Appendix M. At full build-out capacity, the estimated total water use requirements during operations range from 28 to 277 ac-ft/yr (34,500 to 341,700 m^3/yr) for the dish engine and PV technologies (no cooling required). For parabolic trough and power tower technologies, full build-out water requirements range from 385 to 1,478 ac-ft/yr (474,900 to 1.8 million m^3/yr) using dry cooling and from 2,716 to 14,647 ac-ft/yr (3.4 million to 18.1 million m^3/yr) using wet cooling. The water use estimates for wet cooling are approximately a factor of 10 times larger than the estimated water needs for dry cooled parabolic trough and power tower technologies. The amounts of water needed for mirror/panel washing, potable water supply, and cooling activities for each solar energy technology are listed in Table 13.3.9.2-1. Operations would generate up to 14 ac-ft/yr (17,300 m^3/yr) of sanitary wastewater; in addition, for wet-cooled technologies, 154 to 277 ac-ft/yr (190,000 to 341,7000 m^3/yr) of cooling system blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment

TABLE 13.3.9.2-2 Estimated Water Requirements during Operations at the Proposed Wah Wah Valley SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	976	542	542	542
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	488	271	271	27
Potable supply for workforce ac-ft/yr)	14	6	6	1
Dry cooling (ac-ft/yr)[e]	195–976	108–542	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	4,390–14,145	2,439–7,858	NA	NA
Total water use				
Non-cooled technologies (ac-ft/yr)	NA	NA	277	28
Dry-cooled (ac-ft/yr)	697–1,478	385–819	NA	NA
Wet-cooled (ac-ft/yr)	4,892–14,647	2,716–8,135	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	277	154	NA	NA
Sanitary wastewater (ac-ft/yr)	14	6	6	1

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

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

[c] Value assumes a usage rate of 0.5 ac-ft/yr/MW (617 m^3/yr/MW) for mirror washing for the parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW (62 m^3/yr/MW) for panel washing for the 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 the 250-MW Beacon Solar project with an annual discharge of 44 gal/min (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Water demands during operations would most likely be met by withdrawing groundwater from wells constructed onsite. The parabolic trough and power tower technologies would require an estimated well yield of 239 to 916 gal/min (905 to 3,467 L/min) for dry cooling and 1,683 to 9,075 gal/min (6,371 to 34,353 L/min) for wet cooling. The required well yields for dry cooling are similar to average well yields of small irrigated farms in Utah, while the required well yields for wet cooling range from similar well yields of medium-sized irrigated farms to over three times greater than the average well yields of large irrigated farms in Utah (USDA 2009b).

The estimated water requirements for wet-cooling technologies are of similar magnitude to the annual groundwater recharge for the entire valley as estimated by Stephens (1974) (see Section 13.3.9.1.2). Therefore, wet-cooling technologies would not be feasible for use at the proposed Wah Wah Valley SEZ. To the extent possible, facilities using dry cooling should implement water conservation practices to limit water needs.

The availability of water rights and the impacts associated with groundwater withdrawals would need to be assessed during the site characterization phase of a proposed solar project. Less water would be needed for any of the four solar technologies if the full build-out capacity was reduced. The analysis of water use for the various solar technologies assumed a single technology for full build-out. Water use requirements for development scenarios that assume a mixture of solar technologies can be estimated using water use factors described in Appendix M, Section M.9.

The effects of groundwater withdrawal rates on potential drawdown of groundwater elevations would need to be assessed during the site characterization phase and during the development of constructed wells.

Decommissioning/Reclamation

All surface structures associated with the solar energy development would be dismantled, and the site would be reclaimed to its preconstruction state during decommissioning. Land disturbance and water use activities would be similar to those during the construction phase (see Table 13.3.9.2-1) 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.

13.3.9.2.3 Off-Site Impacts: Roads and Transmission Lines

State Route 21 is adjacent to the proposed Wah Wah Valley SEZ and, as described in Section 13.3.1.2, the nearest transmission lines are 42 mi (68 km) to the east of the SEZ. Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. Water needed for road modification and transmission line construction activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. As a result, water use impacts would be negligible. Impacts on surface water and groundwater quality resulting from spills would be minimized by implementing the programmatic design features described in Appendix A, Section A.2.2 (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 programmatic design features to minimize impacts associated with alterations to natural drainage pathways and hydrologic processes.

13.3.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy in the proposed Wah Wah Valley SEZ are associated with land disturbance effects on natural hydrology, water use requirements for the various solar energy technologies, and water quality concerns. Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, hybrid) employed. Water requirements would be greatest for wet-cooled parabolic trough and power tower facilities. Dry cooling reduces water use requirements by approximately a factor of 10 compared with wet cooling. PV requires the least amount of water among the solar energy technologies.

Land disturbance impacts primarily affect the regions near the Wah Wah Wash that cross the eastern portion of the SEZ. Substantial flows are conveyed by this drainage during storm events, as indicated by the observed degree of channel incision and sedimentation patterns. Alterations to the natural drainage pattern could potentially cause further channel incision and sedimentation impacts on the Wah Wah Wash. Water quality impacts specific to the proposed Wah Wah Valley SEZ relate to TDS concentrations exceeding drinking water standards. The Utah primary drinking water standards require that TDS concentrations be less than 2,000 mg/L (*Utah Administrative Code*, Rule R309-200, Monitoring and Water Quality: Drinking Water Standards). In the Wah Wah Valley, groundwater TDS concentrations have been reported that exceed this drinking water threshold, so treatment of the potable water supply may be necessary.

Water use requirements for technologies using wet cooling are on the same order of magnitude as the natural groundwater recharge for the Wah Wah Valley. Given that groundwater surface elevations are typically greater than 600 ft (183 m) below the surface, it is highly likely that groundwater extractions for wet cooling would cause drawdown in the basin-fill aquifer and potentially impact the regional carbonate-rock aquifer. Therefore, wet cooling would not be feasible for the full build-out scenario at the proposed Wah Wah Valley SEZ. In addition, the pending water rights applications for the CICWCD and Beaver County (discussed in Section 13.3.9.1.3) could potentially withdraw groundwater at quantities that exceed the estimated value of groundwater recharge for the Wah Wah Valley (Section 13.3.9.1.2). Given the high demand for groundwater and the limited information on the available supply within the Wah Wah Valley, solar energy projects will need to implement water conservation measures and choose technologies with low water demands in order to reduce water requirements.

13.3.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program will mitigate some impacts on water resources. Programmatic design features would focus on coordination with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and on 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 Wah Wah Valley SEZ include the following:

- Wet-cooling options would not be feasible, and other technologies should incorporate water conservation measures;

- During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting, and siting of solar facilities and construction activities should avoid areas identified as being within a 100-year floodplain;

- Land disturbance and operations activities should avoid increasing drainage to the Wah Wah Wash to prevent further channel incisions and sedimentation issues;

- Groundwater rights must be obtained from the Utah Division of Water Rights (Utah DWR 2005);

- Groundwater monitoring and production wells should be constructed in accordance with Utah standards (Utah DWR 2008);

- Stormwater management plans and BMPs should comply with standards developed by the Utah Division of Water Quality (UDWQ 2008); and

- Water for potable uses would have to meet, or be treated to meet, Utah drinking water standards as defined by Utah Administrative Code Rule R309-200.

13.3.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Wah Wah Valley SEZ. The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects is defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 250-ft (76-m) wide portion of an assumed transmission line corridor. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed transmission line corridor, where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the area of direct effect. No area of direct or indirect effects was assumed for new access roads because they are not expected to be needed for developments on the proposed Wah Wah Valley SEZ due to the proximity of an existing state highway.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the 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.

13.3.10.1 Affected Environment

The proposed Wah Wah Valley SEZ is located within the Shadscale-dominated Saline Basins Level IV ecoregion, which primarily supports a sparse saltbush-greasewood shrub community (Woods et al. 2001). This ecoregion includes nearly flat to gently sloping valley bottoms and lower hill slopes. Soils have a high salt and alkali content, and plants are salt- and drought-tolerant. The dominant shrub species in this ecoregion are shadscale (*Atriplex confertifolia*), winterfat (*Krascheninnikovia lanata*), greasewood (*Sarcobatus vermiculatus*), and bud sagebrush (*Picrothamnus desertorum*). Perennial grasses are also typically present and include bottlebrush squirreltail (*Elymus elymoides*), indian ricegrass (*Achnatherum hymenoides*), and galleta (*Pleuraphis jamesii*). Annual precipitation in the vicinity of the SEZ is low, averaging 6.77 in. (17.2 cm) at Wah Wah Ranch (see Section 13.3.13).

The region surrounding the SEZ consists of a mosaic of this ecoregion, the Sagebrush Basins and Slopes Level IV ecoregion, and Woodland- and Shrub-covered Low Mountains Level IV ecoregion. The Sagebrush Basins and Slopes ecoregion supports a Great Basin sagebrush community dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and includes perennial bunchgrasses. This ecoregion includes valleys, alluvial fans, bajadas, mountain flanks, and stream terraces. The Woodland- and Shrub-covered Low Mountains ecoregion includes pinyon-juniper woodlands and sagebrush communities, along with mountain brush communities at higher elevations. Small areas of the Salt Deserts Level IV ecoregion also occur in the region. This ecoregion is mostly barren and contains playas, salt flats, mud flats, low terraces, and saline lakes. Playas and salt flats are ponded during wet periods and subject to wind erosion when they are dry. Soils are poorly drained, have a high salt and alkali content, and are often salt-crusted. Plants in this ecoregion are generally sparse and widely scattered, if present at all, and include extremely salt-tolerant species such as salicornia (*Salicornia* sp.), saltgrass (*Distichlis spicata*), alkali sacaton (*Sporobolus airoides*), iodine bush (*Allenrolfea occidentalis*), and greasewood. These ecoregions are all located within the Central Basin and Range Level III ecoregion, which is described in Appendix I.

Land cover types described and mapped under SWReGAP (USGS 2005c) were used to evaluate plant communities in and near the SEZ. Each cover type includes a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Wah Wah Valley SEZ and within the assumed transmission line corridor are shown in Figures 13.3.10.1-1 and 13.3.10.1-2, respectively. Table 13.3.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the proposed Wah Wah Valley SEZ are classified primarily as Inter-Mountain Basins Semi-Desert Shrub Steppe and Inter-Mountain Basins Mixed Salt Desert Scrub. Additional cover types within the SEZ are given in Table 13.3.10.1-1. Dominant species observed in September 2009 in the low scrub and shrub steppe communities present over much of the SEZ included winterfat, rabbitbrush, halogeton, galleta, indian ricegrass, sagebrush, and saltbush. Vegetation cover in the eastern portion of the SEZ was extremely sparse with a large proportion of barren ground. Sensitive habitats on the SEZ include ephemeral dry wash and playa habitats.

A wide variety of forest and woodland cover types occur within the transmission line corridor, including Great Basin Pinyon-Juniper Woodland, Colorado Plateau Pinyon-Juniper Woodland, Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland, Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland, Rocky Mountain Lower Montane Riparian Woodland and Shrubland, Rocky Mountain Aspen Forest and Woodland, Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland, and Southern Rocky Mountain Ponderosa Pine Woodland.

The indirect impact area, including the area surrounding the SEZ within 5 mi (8 km) and the transmission line corridor, includes 29 cover types, which are listed in Table 13.3.10.1-1. The predominant cover type is Inter-Mountain Basins Semi-Desert Shrub Steppe.

There are no NWI data for the region that includes the proposed Wah Wah Valley SEZ (USFWS 2009). Small ponds occur inside and outside the SEZ and are generally developed for livestock or other uses. Numerous dry washes, including Wah Wah Wash, occur within the SEZ. These drainages typically do not support wetland or riparian habitats and generally convey surface runoff to playas such as the Wah Wah Valley Hardpan north of the SEZ, which is associated with Wah Wah Wash, or to ponds or drainages outside the SEZ. Greasewood flat and playa habitats also occur in the SEZ. These playas, flats, and dry washes typically contain water for short periods during or following precipitation events. A number of springs that support riparian plant communities, such as Wah Wah Springs west of the SEZ, occur in the vicinity of the SEZ. See Section 13.3.9 for further discussion of springs.

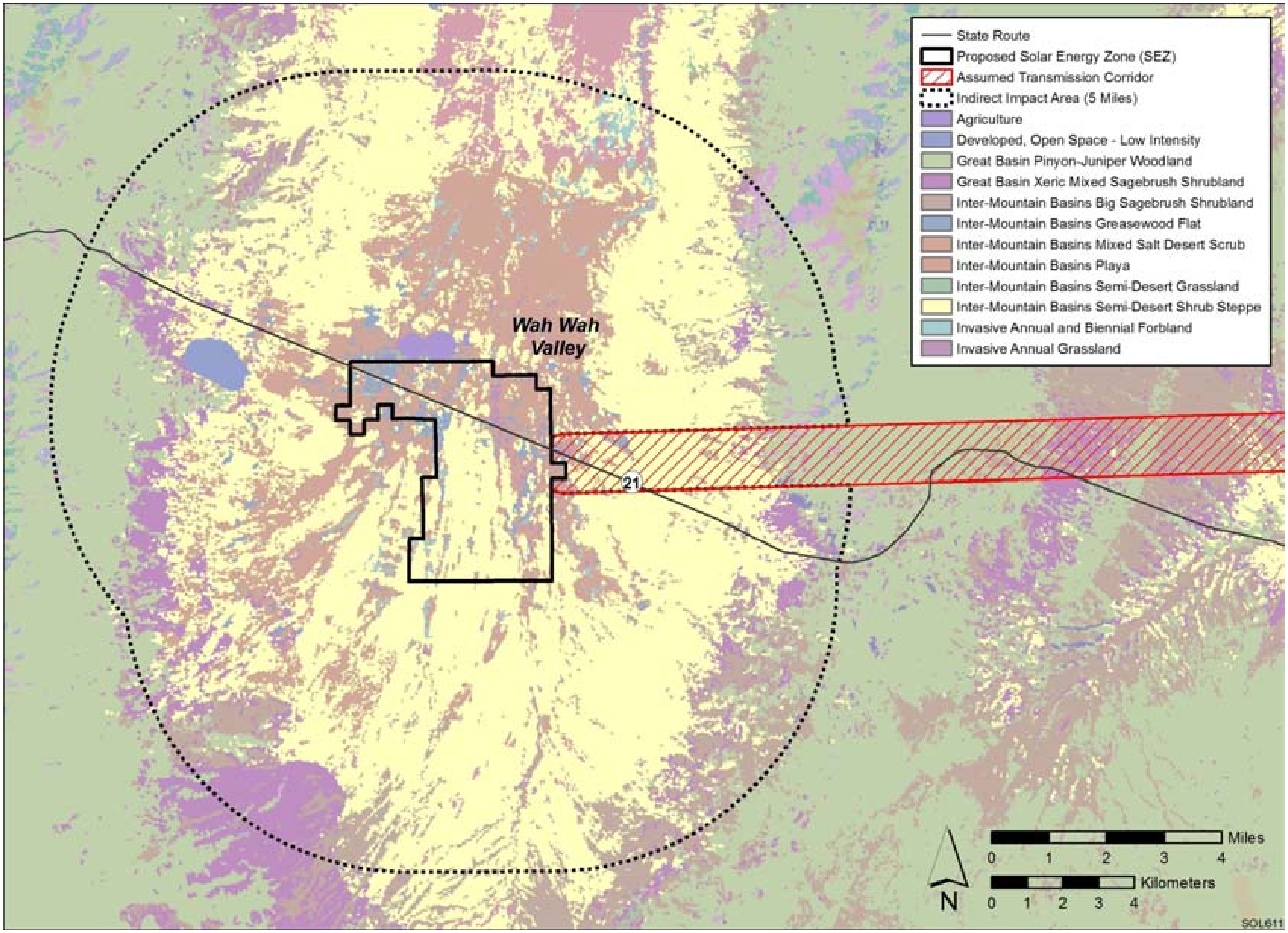

FIGURE 13.3.10.1-1 Land Cover Types within the Proposed Wah Wah Valley SEZ (Source: USGS 2004)

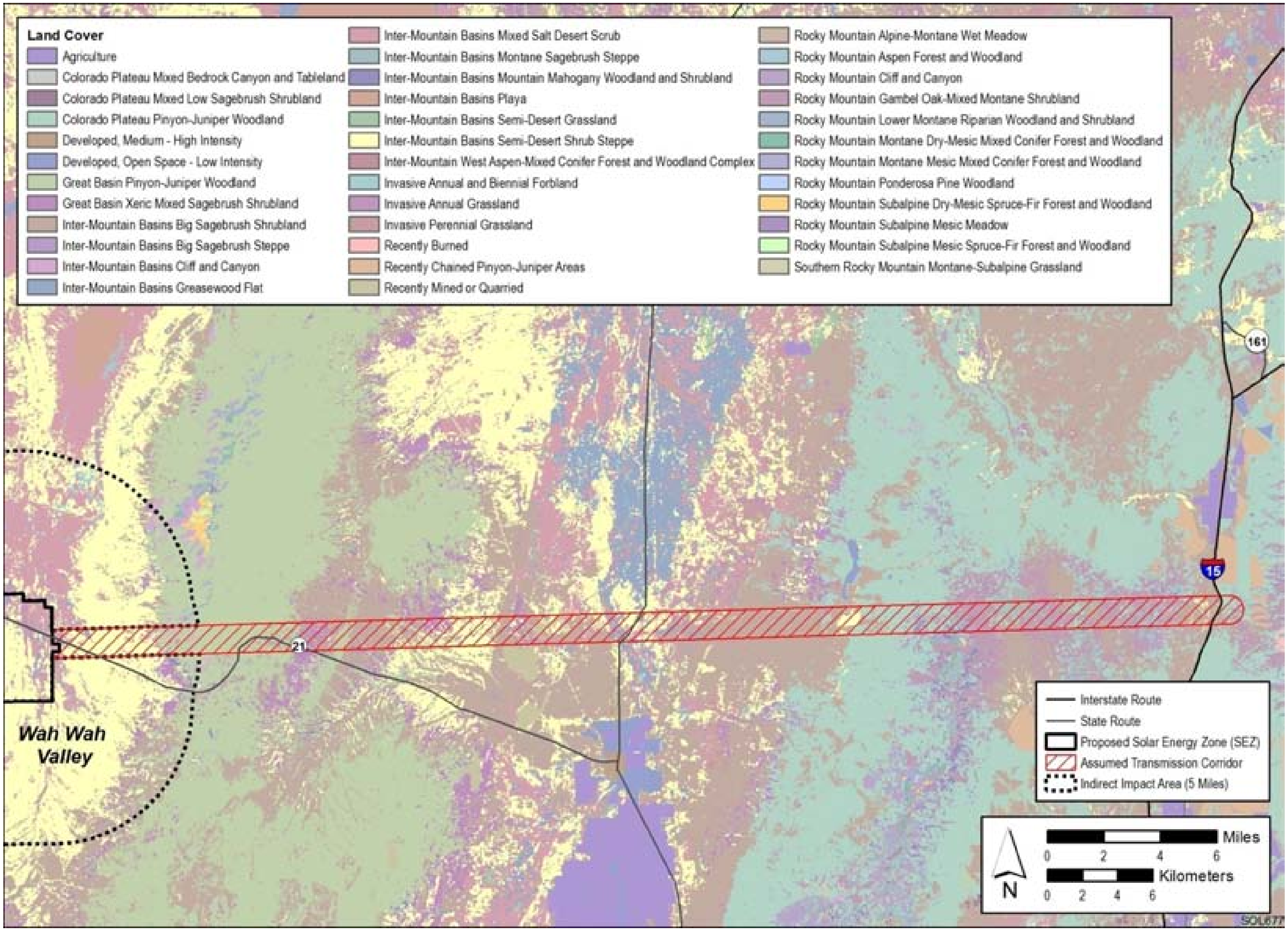

FIGURE 13.3.10.1-2 Land Cover Types within the Proposed Wah Wah Valley SEZ Assumed Transmission Line Corridor (Source: USGS 2004)

TABLE 13.3.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Wah Wah Valley SEZ and Potential Impacts

Land Cover Type[a]	Area of Cover Type Affected (acres)[b]			
	Within SEZ (Direct Effects)[c]	Assumed Transmission Line (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
S079 Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	2,862 acres[g] (0.4%, 0.5%)	217 acres (<0.1%)	49,315 acres (7.1%)	Small
S065 Inter-Mountain Basins Mixed Salt Desert Scrub: Generally consists of open shrublands that include at least one species of *Atriplex*, along with other shrubs. Perennial grasses dominate a sparse to moderately dense herbaceous layer.	2,271 acres (0.3%, 0.4%)	51 acres (<0.1)	16,284 acres (2.3%)	Small
S096 Inter-Mountain Basins Greasewood Flat: Dominated or co-dominated by greasewood (*Sarcobatus vermiculatus*) and generally occurring in areas with saline soils, a shallow water table, and intermittent flooding, although remaining dry for most growing seasons. This community type generally occurs near drainages or around playas. These areas may include, or may be co-dominated by, other shrubs, and may include a graminoid herbaceous layer.	616 acres (0.4%, 0.6%)	22 acres (<0.1%)	1,106 acres (0.7%)	Small
D08 Invasive Annual Grassland: Dominated by non-native annual grass species.	219 acres (0.4%, 0.6%)	7 acres (<0.1%)	462 acres (0.9%)	Small
D09 Invasive Annual and Biennial Forbland: Areas dominated by annual and biennial non-native forb species.	109 acres (0.3%, 0.5%)	1 acre (<0.1%)	875 acres (2.5%)	Small
S090 Inter-Mountain Basins Semi-Desert Grassland: Consists of perennial bunchgrasses as dominants or co-dominants. Scattered shrubs or dwarf shrubs may also be present.	10 acres (<0.1%, <0.1%)	1 acre (<0.1%)	96 acres (0.2%)	Small

TABLE 13.3.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Assumed Transmission Line (Direct Effects)[d]	Corridors and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
S054 Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	5 acres (<0.1%, <0.1%)	419 acres (<0.1%)	15,994 acres (1.6%)	Small
S015 Inter-Mountain Basins Playa: Playa habitats are intermittently flooded and generally barren or sparsely vegetated. Depressions may contain small patches of grass and sparse shrubs may occur around playa margins.	1 acre (<0.1%, <0.1%)	0 acres	120 acres (0.1%)	Small
S040 Great Basin Pinyon-Juniper Woodland: Occurs on low-elevation slopes and ridges. Singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), or both are the dominant species, generally associating with curl-leaf mountain mahogany (*Cercocarpus ledifolius*). Understory species include shrubs and grasses.	0 acres	153 acres (<0.1%)	14,326 acres (1.3%)	Small
S046 Rocky Mountain Gambel Oak-Mixed Montane Shrubland: Occurs on dry foothills and lower mountain slopes. Gambel oak (*Quercus gambelii*) may be the only dominant species or share dominance with other shrubs.	0 acres	138 acres (0.4%)	2,779 acres (8.2%)	Small
S039 Colorado Plateau Pinyon-Juniper Woodland: Occurs on foothills, ridges, and low-elevation mountain slopes. Twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), or both are the dominant species. Understory layers, if present, may be shrub- or grass-dominated.	0 acres	126 acres (<0.1%)	2,529 acres (0.2%)	Small

TABLE 13.3.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Assumed Transmission Line (Direct Effects)[d]	Corridors and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
S055 Great Basin Xeric Mixed Sagebrush Shrubland: Generally occurs on level plains, slopes, and ridges. The dominant shrub species are black sagebrush (*Artemisia nova*) or, at higher elevations, little sagebrush (*Artemisia arbuscula*), and co-dominants may be Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) or yellow rabbitbrush (*Chrysothamnus viscidiflorus*). Other shrub species may also be present as well as sparse perennial bunchgrasses.	0 acres	60 acres (<0.1%)	7,477 acres (2.2%)	Small
S071 Inter-Mountain Basins Montane Sagebrush Steppe: Occurs on flats, ridges, level ridgetops, and mountain slopes. Mountain big sagebrush (*Artemisia tridentata vaseyana*) and related taxa such as big sagebrush (*Artemisia tridentata spiciformis*) are typically the dominant species. Perennial herbaceous species, especially grasses, are usually abundant, although shrublands are also present.	0 acres	45 acres (0.1%)	919 acres (1.8 %)	Small
D03 Recently Mined or Quarried: Includes open pit mines and quarries.	0 acres	11 acres (0.3%)	277 acres (6.2%)	Small
S050 Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland: Occurs in hills and mountain ranges on rocky outcrops or escarpments and small to large stands in forested areas. Mostly occurs as shrubland on ridges and steep slopes, but may be a small tree in steppe habitat. The dominant species is mountain mahogany (*Cercocarpus ledifolius*). A number of shrub species are often present, and scattered conifers may also occur.	0 acres	10 acres (<0.1%)	393 acres (1.2%)	Small

TABLE 13.3.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Assumed Transmission Line (Direct Effects)[d]	Corridors and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
S006 Rocky Mountain Cliff and Canyon and Massive Bedrock: Occurs on steep cliffs, narrow canyons, rock outcrops, and scree and talus slopes. This cover type includes barren and sparsely vegetated areas (less than 10% cover) with scattered trees and/or shrubs, or with small dense patches. Herbaceous plant cover is limited.	0 acres	7 acres (0.1%)	146 acres (2.3%)	Small
S009 Inter-Mountain Basins Cliff and Canyon: Includes barren and sparsely vegetated (generally <10% plant cover) steep cliff faces, narrow canyons, small rock outcrops, and scree and talus slopes. Composed of widely scattered coniferous trees and a variety of shrubs.	0 acres	3 acres (<0.1%)	427 acres (1.4%)	Small
S085 Southern Rocky Mountain Montane-Subalpine Grassland: Typically occurs as a mosaic of two or three plant associations on well-drained soils. The dominant species is usually a bunchgrass.	0 acres	3 acres (<0.1%)	137 acres (2.1%)	Small
S102 Rocky Mountain Alpine-Montane Wet Meadow: Occurs on wet soils in very low-velocity areas along ponds, lakes, streams, and toeslope seeps. This cover type is dominated by herbaceous species, and often occurs as a mosaic of several plant associations. The dominant species are often grass or grass-like plants.	0 acres	2 acres (0.6%)	49 acres (12.4%)	Small
N22 Developed, Medium–High Intensity: Includes housing and commercial/industrial development. Impervious surfaces comprise 50 to 100% of the total land cover.	0 acres	2 acres (<0.1%)	38 acres (0.9%)	Small
D06 Invasive Perennial Grassland: Dominated by non-native perennial grasses.	0 acres	2 acres (<0.1%)	62 acres (0.4%)	Small

TABLE 13.3.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Assumed Transmission Line (Direct Effects)[d]	Corridors and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
S034 Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland: Occurs in lower and middle ravine slopes, along stream terraces, and on north- and east-facing slopes. Shrubs and herbaceous species are generally present.	0 acres	1 acre (<0.1%)	82 acres (1.0%)	Small
S093 Rocky Mountain Lower Montane Riparian Woodland and Shrubland: Occurs on streambanks, islands, and bars, in areas of annual or episodic flooding, and often occurs as a mosaic of tree-dominated communities with diverse shrubs.	0 acres	1 acre (<0.1%)	12 acres (0.5%)	Small
S023 Rocky Mountain Aspen Forest and Woodland: Dominated by quaking aspen (*Populus tremuloides*), with or without a significant presence of conifers. The understory may consist of only herbaceous species or multiple shrub and herbaceous layers.	0 acres	<1 acre (<0.1%)	7 acres (0.2%)	Small
S032 Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland: Occurs on mountain slopes, canyon sideslopes, and ridgetops. Shrub and graminoid species are generally present.	0 acres	<1 acre (<0.1%)	29 acres (0.3%)	Small
S036 Southern Rocky Mountain Ponderosa Pine Woodland: Occurs on dry slopes. Ponderosa pine (*Pinus ponderosa*, primarily var. *scopulorum*, and var. *brachyptera*) is the dominant species. Other tree species may be present. The understory is usually shrubby and grasses may be present.	0 acres	<1 acre (<0.1%)	6 acres (0.3%)	Small

TABLE 13.3.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b]: Within SEZ (Direct Effects)[c]	Assumed Transmission Line (Direct Effects)[d]	Corridors and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
S083 Rocky Mountain Subalpine Mesic Meadow: Occurs on gentle to moderate slopes on soils that are seasonally moist to saturated in spring. Forbs typically have more cover than graminoides.	0 acres	<1 acre (0.3%)	2 acres (6.4%)	Small
N21 Developed, Open Space—Low Intensity: Includes housing, parks, golf courses, and other areas planted in developed settings. Impervious surfaces comprise up to 49% of the total land cover.	0 acres	0 acres	463 acres (3.2%)	Small
N80 Agriculture: Areas where pasture/hay or cultivated crops account for more than 20% of total vegetation cover.	0 acres	0 acres	258 acres (0.4%)	Small

[a] Land cover descriptions are from USGS (2005c). 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 transmission development, direct effects were estimated within a 42-mi (67-km) long, 250-ft (76-m) wide assumed transmission ROW from the SEZ to the nearest existing line. Direct impacts within this area were determined from the proportion of the cover type within the 1-mi (1.6-km) wide transmission corridor. Impacts are for the area of the cover type within the assumed ROW, and the percentage that area represents of all occurrences of that cover type within the SEZ region.

Footnotes continued on next page.

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TABLE 13.3.10.1-1 (Cont.)

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

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

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

Numerous dry washes occur within the transmission line corridor. The Beaver River, a perennial stream, would be crossed by the transmission line corridor about 20 mi (32 km) east of the SEZ. Although riparian habitat occurs along upstream portions of the Beaver River, the portion of the river within the transmission line corridor is typically dry because of irrigation withdrawals; therefore, wetland or riparian habitats are not likely to occur along that portion of the river channel. Cover types within the corridor that may include wetland or riparian communities include Rocky Mountain Alpine-Montane Wet Meadow, Rocky Mountain Lower Montane Riparian Woodland and Shrubland, and Rocky Mountain Subalpine Mesic Meadow.

Table 13.3.10.1-2 lists the designated noxious weeds of Utah that are recorded as occurring in Beaver County (UDA 2008; USDA 2010), which includes the proposed Wah Wah Valley SEZ, and additional noxious weed species declared by Beaver County (UDA 2009). UDA (2008) provides a list of all Utah State designated noxious weeds. Halogeton (*Halogeton glomeratus*), an invasive species known to occur within the SEZ, is not included in this table.

13.3.10.2 Impacts

The construction of solar energy facilities within the proposed Wah Wah Valley SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (4,878 acres [19.7 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations, and could include any of the communities occurring on the SEZ. Therefore, for the purposes of this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

TABLE 13.3.10.1-2 Utah State Designated Noxious Weeds Known to Occur in Beaver County

Common Name	Scientific Name
Black henbane	*Hyoscyamus niger*
Bull thistle	*Cirsium vulgare*
Canada thistle	*Cirsium arvense*
Dalmatian toadflax	*Linaria dalmatica*
Field bindweed	*Convolvulus arvensis*
Hoary cress	*Cardaria* spp.
Houndstongue	*Cynoglossum officinale*
Poison hemlock	*Conium maculatum*
Quackgrass	*Agropyron repens*
Scotch thistle	*Onopordium acanthum*
Spotted knapweed	*Centaurea maculosa*
Yellow toadflax	*Linaria vulgaris*

Sources: UDA (2008, 2009); USDA (2010).

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

Possible impacts from solar energy facilities on vegetation that are encountered within the SEZ are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2 and from any additional mitigation applied. Section 13.3.10.2.3, below identifies design features of particular relevance to the proposed Wah Wah Valley SEZ.

13.3.10.2.1 Impacts on Native Species

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

Solar facility construction and operation in the proposed Wah Wah Valley SEZ would primarily affect communities of the Inter-Mountain Basins Semi-Desert Shrub Steppe and Inter-Mountain Basins Mixed Salt Desert Scrub cover types. Additional cover types that would be affected within the SEZ include Inter-Mountain Basins Greasewood Flat, Invasive Annual Grassland, Invasive Annual and Biennial Forbland, Inter-Mountain Basins Semi-Desert Grassland, Inter-Mountain Basins Big Sagebrush Shrubland, and Inter-Mountain Basins Playa. The Invasive Annual Grassland and Invasive Annual and Biennial Forbland likely support few native plant communities. Table 13.3.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed Wah Wah Valley SEZ. Many of these cover types are relatively common in the SEZ region; however, several are relatively uncommon, representing less than 1% of the land area within the SEZ region: Inter-Mountain Basins Semi-Desert Grassland (0.9%) and Invasive Annual and Biennial Forbland (0.7%). Uncommon cover types that would potentially be affected by the transmission line ROW are Rocky Mountain Cliff and Canyon (0.1%), Inter-Mountain Basins Cliff and Canyon (0.6%), Rocky Mountain Aspen Forest and Woodland (0.1%), Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (0.2%), Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (0.2%), Southern Rocky Mountain Ponderosa Pine Woodland (<0.1%), Rocky Mountain Gambel Oak-Mixed Montane Shrubland (0.7%), Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland (0.7%), Rocky Mountain Subalpine Mesic Meadow (<0.1%), Southern Rocky Mountain Montane-Subalpine Grassland (0.1%), Rocky Mountain Lower Montane Riparian Woodland and Shrubland (<0.1%), Rocky Mountain Alpine-Montane Wet Meadow (<0.1%), Developed, Medium-High Density (0.1%), Recently Mined or Quarried (0.1%), and Invasive

Perennial Grassland (0.3%). Playa and dry wash communities are important sensitive habitats in the region.

The construction, operation, and decommissioning of solar projects within the proposed Wah Wah Valley SEZ would result in small impacts on all cover types in the affected area.

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

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect impact area identified in Table 13.3.10.1-1.

Communities associated with playa habitats, such as the large playas (including Wah Wah Valley Hardpan) associated with Wah Wah Wash north of the SEZ, greasewood flats communities, or other intermittently flooded areas downgradient from solar projects in the SEZ could be affected by ground-disturbing activities. Site clearing and grading could disrupt surface water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter playa or greasewood flats plant communities and affect community function. Increases in surface runoff from a solar energy project site could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect dry washes within the SEZ and transmission line corridor. 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.

The use of groundwater within the proposed Wah Wah Valley SEZ for technologies with high water requirements, such as wet-cooling systems, could contribute to the depletion of the regional groundwater system (see Section 13.3.9). A number of springs occur in the vicinity of the SEZ that support riparian communities. If these springs are hydrologically connected to the aquifer below the SEZ, groundwater depletion and subsequent reductions in groundwater discharges at the springs could result in degradation of these habitats. Studies of the Wah Wah Valley groundwater recharge and discharge processes would be necessary to determine potential effects of groundwater withdrawals within the proposed Wah Wah Valley SEZ on these springs or those in hydrologically connected basins.

Cover types within the 42-mi (67-km) transmission line corridor that may include wetland or riparian communities include Rocky Mountain Alpine-Montane Wet Meadow, Rocky Mountain Lower Montane Riparian Woodland and Shrubland, and Rocky Mountain Subalpine Mesic Meadow. The construction of transmission lines in a ROW outside of the SEZ could potentially result in direct impacts on wetlands that may occur in or near the ROW if fill material is placed within wetland areas, or in indirect impacts such as sedimentation or alterations of hydrologic characteristics, which could result in degradation of wetland plant communities.

The construction of transmission lines could also result in impacts on forest and woodland communities. A large number of forest and woodland cover types occur within the transmission line corridor. Forest and woodland habitat within the ROW would likely be converted to shrub- or grass-dominated habitat. Clearing of forest and woodland along the ROW during construction would contribute to fragmentation of these habitats and changes in characteristics in adjacent areas, such as light and soil moisture conditions. As a result, forest and woodland communities along the ROW could be degraded. ROW management would maintain altered habitat conditions within and adjacent to the ROW.

13.3.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

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

Noxious weeds, including halogeton, occur on the SEZ. Additional species designated as noxious weeds in Utah, and those known to occur in Beaver County, are given in Table 13.3.10.1-2. Past or present land uses, such as grazing or OHV use, may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Approximately 219 acres (0.9 km^2) of Invasive Annual Grassland occur within the SEZ, about 462 acres (1.9 km^2) occur within 5 mi (8 km) of the SEZ and in the transmission line corridor, and 7 acres (0.03 km^2) occur within the ROW; approximately 109 acres (0.4 km^2) of Invasive Annual and Biennial Forbland occur within the SEZ, approximately 875 acres (3.5 km^2) occur within 5 mi (8 km) of the SEZ and in the transmission line corridor, and 1 acre (0.004 km^2) occurs within the ROW. About 62 acres (0.3 km^2) of Invasive Perennial Grassland occur within 5 mi (8 km) of the SEZ and in the transmission line corridor, and 2 acres (0.008 km^2) occur within the ROW; about 38 acres (0.2 km^2) of Developed, Medium-High Intensity occur within 5 mi (8 km) of the SEZ and in the transmission line corridor, and 2 acres (0.008 km^2) occur within the ROW; about 463 acres (1.9 km^2) of Developed, Open Space–Low Intensity occur within 5 mi (8 km) of the SEZ. Because disturbance may promote the establishment and spread of invasive species, developed areas may provide sources of such species. Disturbance associated with existing roads, transmission lines, and rail lines within the SEZ area of potential impacts also likely contributes to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

13.3.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- An Integrated Vegetation Management Plan addressing invasive species control and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as those occurring in Beaver County, that could be introduced as a result of solar energy project activities (see Section 13.3.10.2.2). Invasive species control should focus on biological and mechanical methods, where possible, to reduce the use of herbicides.

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

- All dry wash and playa habitats within the SEZ and all dry wash, wetland, and riparian habitats within the assumed transmission line corridor (e.g., Beaver Creek) should be avoided to the extent practicable, and any impacts should be minimized and mitigated. A buffer area should be maintained around wetlands, dry washes, and riparian habitats to reduce the potential for impacts.

- Transmission line towers should be sited and constructed to minimize impacts on wetlands, dry washes, and riparian areas, such as those associated with Beaver Creek. Towers should span such areas whenever practicable.

- Groundwater studies should be conducted to evaluate the potential for indirect impacts on springs located in the vicinity of the SEZ or those in hydrologically connected basins.

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

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13.3.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Wah Wah Valley SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from the Utah Conservation Data Center (UDWR 2009a). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing waterbody features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ by using available GIS surface water data sets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 250-ft (76-m) wide portion of an assumed 42-mi (67.6-km) long transmission line corridor. No area of direct effects was assumed for a new access road, because State Route 21 traverses the SEZ.

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1.0-mi (1.6-km) wide assumed transmission 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 in the transmission line construction area). An additional area of indirect effects was considered for 37 mi (60 km) of the transmission corridor that would extend beyond the 5 mi (8 km) area of indirect effects for the SEZ. The potential degree of indirect effects would decrease with increasing distance from the SEZ and transmission line. The area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. These areas of direct and indirect effects are defined and the impact assessment approach is described in Appendix M.

Dominant land cover habitat in the affected area is intermountain scrub-shrub, and the primary vegetation community types within the affected area are mixed salt desert scrub and sagebrush (*Artemisia* spp.) (see Section 13.3.10). The only aquatic or riparian habitats in the affected area occur within and along the Wah Wah Wash, which runs south to north through the eastern portion of the SEZ, and the Beaver River, which intersects the assumed transmission corridor approximately 20 mi (32 km) east of the SEZ (Figure 13.3.12.1-1).

13.3.11.1 Amphibians and Reptiles

13.3.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Wah Wah Valley SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from range maps and habitat information available from the Utah

Conservation Data Center (UDWR 2009a). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Seven amphibian species occur in Beaver County, within which the proposed Wah Wah Valley SEZ is located (UDWR 2009a). Based on species distributions within this area and habitat preferences of the amphibian species, only the Great Basin spadefoot (*Spea intermontana*) and the Great Plains toad (*Bufo cognatus*) would be expected to occur within the SEZ (Stebbins 2003; UDWR 2009a).

Twenty-five reptile species are known to occur within Beaver County (UDWR 2009a). About half of these species could occur within the proposed Wah Wah Valley SEZ (Stebbins 2003; UDWR 2009a). Species expected to be fairly common to abundant within the SEZ area include the common sagebrush lizard (*Sceloporus graciosus*), desert horned lizard (*Phrynosoma platyrhinos*), eastern fence lizard (*S. undulatus*), gophersnake (*Pituophis catenifer*), greater short-horned lizard (*Phrynosoma hernandesi*), long-nosed leopard lizard (*Gambelia wislizenii*), nightsnake (*Hypsiglena torquata*), tiger whiptail (*Aspidoscelis tigris*), and wandering gartersnake (*Thamnophis elegans vagrans*, a subspecies of terrestrial gartersnake).

Table 13.3.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Wah Wah Valley SEZ.

13.3.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 13.3.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed Wah Wah Valley SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area, as presented in Section 13.3.11.1.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional actions required to avoid or mitigate impacts on amphibians and reptiles (see Section 13.3.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on amphibians and reptiles summarized in Table 13.3.11.1-1, direct impacts on amphibian and reptile species would be small, because 0.4% or less of potentially suitable habitats identified for the species in

TABLE 13.3.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Wah Wah Valley SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Amphibians					
Great Basin spadefoot (*Spea intermontana*)	Sagebrush flats, semidesert shrublands, pinyon-juniper woodlands, and spruce-fir forests. Breeds in temporary and permanent waters including rain pools, pools in intermittent streams, and flooded areas along streams. About 3,659,600 acres[h] of potentially suitable habitat occurs within the SEZ region.	2,276 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	63,280 acres of potentially suitable habitat (1.7% of available potentially suitable habitat)	1,067 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 21,465 acres in area of indirect effects	Small overall impact. Avoid development in Wah Wah Wash.
Great Plains toad (*Bufo cognatus*)	Prefers desert, grassland, and agricultural habitats. Breeds in shallow temporary pools, quiet areas of streams, marshes, irrigation ditches, and flooded fields. In cold winter months, burrows underground and becomes inactive. About 915,931 acres of potentially suitable habitat occurs within the SEZ region.	3,488 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	54,265 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	331 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 6,653 acres in area of indirect effects	Small overall impact. Avoid development in Wah Wah Wash.

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TABLE 13.3.11.1-1 (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 Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards					
Common sagebrush lizard (*Sceloporus graciosus*)	Open ground with scattered low bushes. Usually found in sagebrush habitat, but also occurs in many other types of habitat including pinyon-juniper areas and open forests. Sometimes abundant in prairie dog colonies. Becomes inactive during cold winter months, often using stone piles, shrubs, or rodent burrows for cover. About 4,506,900 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	116,334 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	1,361 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 27,379 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosote bush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. About 3,074,500 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	94,876 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	880 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 17,699 acres in area of indirect effects	Small overall impact. Other than avoiding development in Wah Wah Wash, no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Eastern fence lizard (*Sceloporus undulatus*)	Sunny, rocky habitats of cliffs, talus, old lava flows and cones, canyons, and outcrops. Various vegetation adjacent to or among rocks includes montane forests, woodlands, semidesert shrubland, and various forbs and grasses. About 2,614,700 acres of potentially suitable habitat occurs in the SEZ region.	3,489 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	73,577 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	663 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 13,332 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Greater short-horned lizard (*Phrynosoma hernandesi*)	Short-grass prairies, sagebrush, semidesert shrublands, shale barrens, pinyon-juniper and pine-oak woodlands, oak-grass associations, and open conifer forests in mountainous areas. About 2,651,600 acres of potentially suitable habitat occurs in the SEZ region.	1,966 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	38,771 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	904 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 18,188 acres in area of indirect effects	Small overall impact.

TABLE 13.3.11.1-1 (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 Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 2,060,300 acres of potentially suitable habitat occurs in the SEZ region.	2,276 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	40,591 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	550 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 11,059 acres in area of indirect effects	Small overall impact.
Tiger whiptail (*Aspidoscelis tigris*)	Primarily occurs in sparsely vegetated desert and shrubland habitats. During cold winter months, it often occupies underground burrows created by rodents or other lizards. About 3,436,600 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	97,087 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	773 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,554 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.1-1 (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 Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes					
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 3,180,200 acres of potentially suitable habitat occurs in the SEZ region.	1,970 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	46,686 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	965 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 19,424 acres in area of indirect effects	Small overall impact.
Nightsnake (*Hypsiglena torquata*)	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, seeks refuge underground, in crevices, or under rocks. About 3,123,300 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	88,920 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	691 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 13,910 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Wandering gartersnake (*Thamnophis elegans vagrans*)	Most terrestrial or wetland habitats in the vicinity of any lotic or lentic body of water. However, also occurs many miles from surface waters. About 1,898,100 acres of potentially suitable habitat occurs within the SEZ region.	2,868 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	69,571 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	741 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 14,907 acres in area of indirect effects	Small overall impact.

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

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

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 4,878 acres of direct effect within the SEZ was assumed.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide transmission line corridor (less the assumed area of direct effects) that extends beyond the 5-mi (8-km) area adjacent to the SEZ boundary. 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.

Footnotes continued on next page.

TABLE 13.3.11.1-1 (Cont.)

[e] For transmission development, direct effects were estimated within a 42-mi (67.6-km) long, 250-ft (76-m) wide ROW for an assumed new transmission line connecting the SEZ to the nearest existing line. Indirect effects were estimated within a 1-mi (1.6-km) wide transmission corridor to the existing transmission line, less the assumed area of direct effects.

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

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

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

Sources: NatureServe (2010); UDWR (2009a); USGS (2004, 2005a, 2007).

the SEZ region would be lost. Larger areas of potentially suitable habitats for most amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 5.9% of available habitat for the Great Plains toad). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts would be negligible with implementation of programmatic design features.

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

13.3.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that depend on habitat types that can be avoided (e.g., Wah Wah Wash). 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 specific project details are considered, the following design features can be identified at this time:

- Wah Wah Wash, which could provide potential breeding sites for the Great Basin spadefoot and Great Plains toad, should be avoided.

- Instream and nearshore disturbance of the Beaver River should be avoided when constructing the transmission line.

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

13.3.11.2 Birds

13.3.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Wah Wah Valley SEZ. The list of bird species potentially present in the SEZ area was determined from range maps and habitat information available from the Utah Conservation Data Center (UDWR 2009a). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

More than 235 species of birds are reported from Beaver County (Utah Ornithological Society 2007). However, based on habitat preferences for these species, only about 10% of the species would be expected to occur regularly within the proposed Wah Wah Valley SEZ.

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. About 80 waterfowl, wading bird, and shorebird species have been reported from Beaver County (Utah Ornithological Society 2007). However, within the proposed Wah Wah Valley SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. The Wah Wah Wash within the SEZ may attract a shorebird species, but the perennial stream, canal, lake, and reservoir habitats within 50 mi (80 km) of the SEZ would provide more viable habitats for this group of birds.

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 that are common or abundant within Beaver County, and that would be expected to occur within the proposed Wah Wah Valley SEZ, include Bewick's wren (*Thryomanes bewickii*), Brewer's sparrow (*Spizella breweri*), common raven (*Corvus corax*), gray flycatcher (*Empidonax wrightii*), greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), Le Conte's thrasher (*Toxostoma leconteii*), loggerhead shrike (*Lanius ludovicianus*), rock wren (*Salpinctes obsoletus*), sage sparrow (*Amphispiza belli*), sage thrasher (*Oreoscoptes montanus*), vesper sparrow (*Pooecetes gramineus*), and western kingbird (*Tyrannus verticalis*) (UDWR 2009a).

Birds of Prey

Section 4.10.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state solar study area. Twenty-three birds-of-prey species have been reported from Beaver County (Utah Ornithological Society 2007). Raptor species that could occur within the proposed Wah Wah Valley SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Buteo lagopus*, only during winter), Swainson's hawk (*Buteo swainsoni*), and turkey vulture (*Cathartes aura*) (UDWR 2009a).

Upland Game Birds

Section 4.10.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed Wah Wah Valley SEZ include the chukar (*Alectoris chukar*), mourning dove (*Zenaida macroura*), and wild turkey (*Meleagris gallopavo*) (UDWR 2009a).

The chukar is an introduced upland game bird. A management plan for the chukar in Utah has been developed (UDWR 2003a). Preferred habitat for the chukar is steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods; during the brooding period most birds are found within 0.25 mi (0.4 km) of water (UDWR 2003a, 2009a). Grasses and seeds of forbs are the main foods; insects are important to young chicks (UDWR 2003a). Urbanization and elimination of sagebrush are among the major factors that adversely affect chukar habitat. Population declines periodically occur due to severe winters or droughts (UDWR 2003a). The chukar is distributed throughout Utah; nearly 20,400,000 acres (82,556 km^2) of potential high and substantial value habitats[7] occur in the state (UDWR 2003a). Figure 13.3.11.2-1 shows the location of the proposed Wah Wah Valley SEZ relative to substantial chukar habitat. No areas of substantial chukar habitat occur within the SEZ. However, the closest distance of the SEZ to substantial chukar habitat is only about 0.5 mi (0.8 km) away. Nearly 344,200 acres (1,393 km^2) of substantial chukar habitat occurs within the SEZ region.

Two subspecies of wild turkey occur in Utah, the Rio Grande wild turkey (*Meleagris gallopavo intermedia*) and Merriam's wild turkey (*M. g. merriami*). Both subspecies have established populations within Beaver County (UDWR 2009a). The Rio Grande wild turkey prefers cottonwood riparian areas of rivers associated with oak-pine and pinyon-juniper forests, while the Merriam's wild turkey inhabits open stands of ponderosa pine interspersed with aspen, grass meadows, and oaks grading into pinyon pine and juniper (UDWR 2009a). Areas of brushy cover are used for nesting. Food items include pine nuts, acorn, grasses, weed seeds,

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[7] High value habitat is an area that provides for intensive use by a wildlife species. Substantial value habitat is an area used by a wildlife species but is not crucial for population survival. Degradation or unavailability of substantial value habitat will not lead to significant declines in carrying capacity and/or numbers of the wildlife species in question.

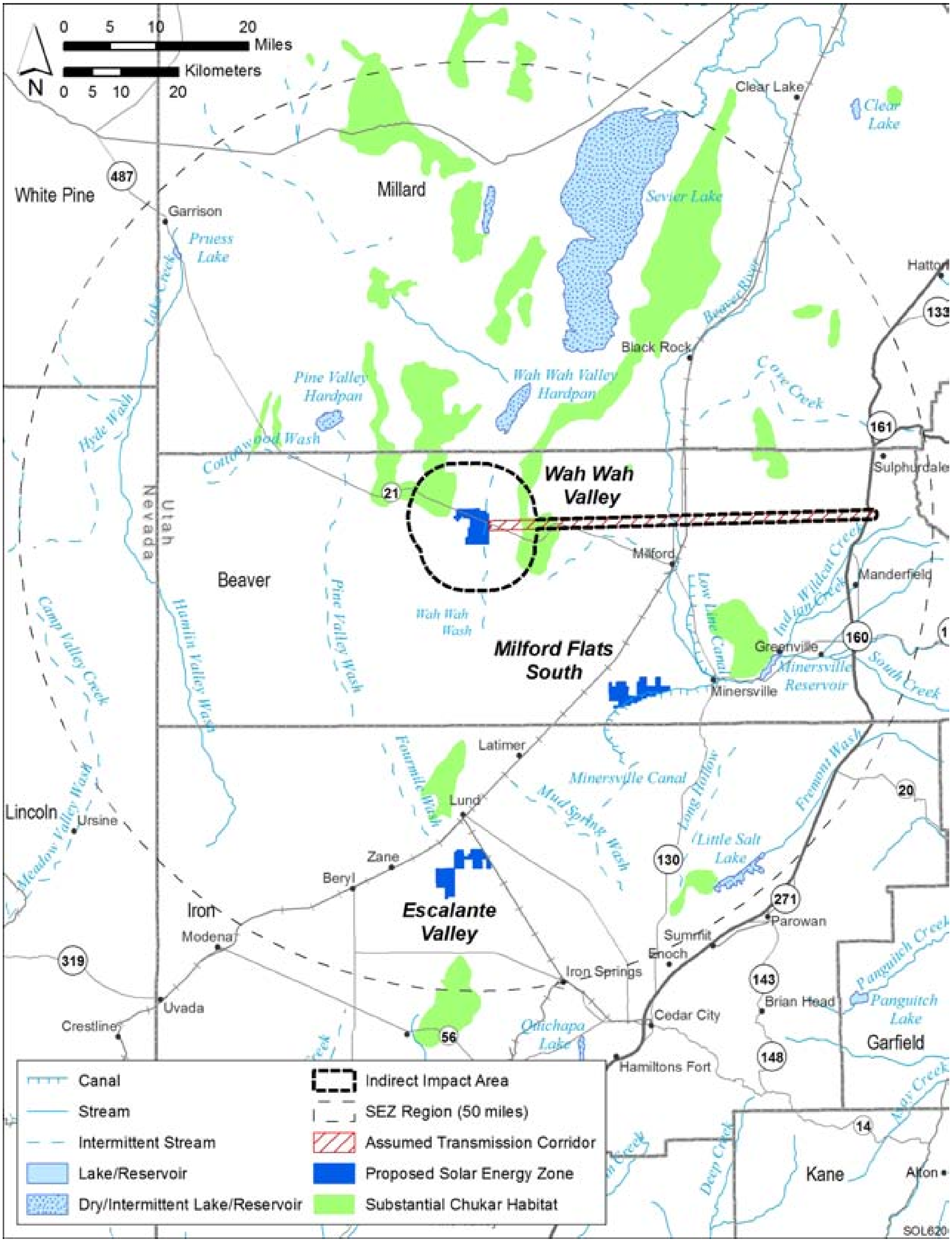

FIGURE 13.3.11.2-1 Location of the Proposed Wah Wah Valley SEZ Relative to Substantial Chukar Habitat (Source: UDWR 2006)

and green vegetation. Insects are also important in the diet of young poults (UDWR 2009a). Figure 13.3.11.2-2 shows the location of the proposed Wah Wah Valley SEZ relative to crucial wild turkey habitat.[8] The closest distance of the SEZ to crucial wild turkey habitat is about 9 mi (15 km). About 227,650 acres (921 km^2) of crucial wild turkey habitat occurs within the SEZ region.

Table 13.3.11.2-1 provides habitat information for representative bird species that could occur within the proposed Wah Wah Valley SEZ. Special status bird species are discussed in Section 13.3.12.

13.3.11.2.2 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 13.3.11.2.3, below, identifies design features of particular relevance to the proposed Wah Wah Valley SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area, as presented in Section 13.3.11.2.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 13.3.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual birds. Table 13.3.11.2-1 summarizes the potential magnitude of impacts on representative bird species resulting from solar energy development in the proposed Wah Wah Valley SEZ. Direct impacts on bird species would be small for all species, because only 0.3% or less of potentially suitable habitats for the bird species would be lost (Table 13.3.11.2-1). The transmission line route associated with the SEZ could result in the direct impact on 121 acres (0.5 km^2) of substantial chukar habitat and 8 acres (0.03 km^2) of crucial wild turkey habitat, which represent only 0.03% of the substantial chukar habitat and <0.004% of the crucial wild turkey habitat within the SEZ region. Larger areas of potentially suitable habitat for bird species occur within the area of potential indirect effects (e.g., up to 3.7% of potentially suitable habitat for the rough-legged hawk). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation,

[8] Crucial value habitat is essential to the life history requirements of the wildlife species. Degradation or unavailability of crucial habitat will lead to significant declines in carrying capacity and/or numbers of the wildlife species in question.

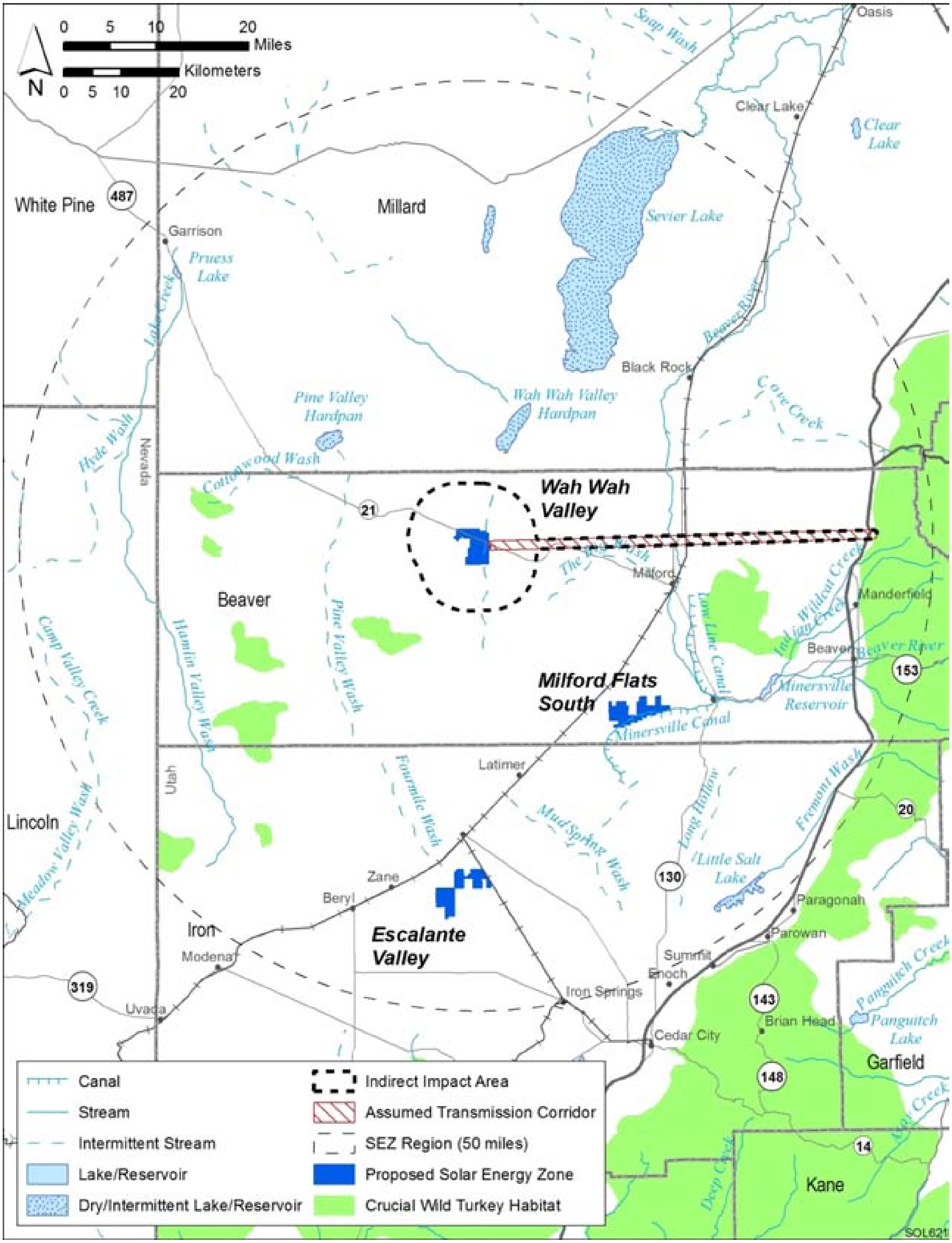

FIGURE 13.3.11.2-2 Location of the Proposed Wah Wah Valley SEZ Relative to Crucial Wild Turkey Habitat (Source: UDWR 2006)

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TABLE 13.3.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Wah Wah Valley SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants					
Bewick's wren *(Thryomanes bewickii)*	Generally associated with dense, brushy habitats. A permanent resident of lowland deserts and pinyon-juniper forests of southern Utah. Breeding occurs in brushy areas of open woodlands and other open habitats. A cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 4,031,300 acres[h] of potentially suitable habitat occurs within the SEZ region.	3,484 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	100,447 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,291 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 25,983 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Brewer's sparrow *(Spizella breweri)*	Considered a shrubsteppe obligate. Occupies open desert scrub and cropland habitats. However, may also occur in high desert scrub (greasewood) habitats, particularly where adjacent to shrubsteppe habitats. Nests are usually located in patches of sagebrush that are taller and denser, with more bare ground and less herbaceous cover, than the surrounding habitat. Also breeds in large sagebrush openings in pinyon-juniper or coniferous forest habitats. About 2,195,200 acres of potentially suitable habitat occurs in the SEZ region.	2,286 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	44,401 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	734 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 14,763 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Common raven *(Corvus corax)*	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 4,894,500 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	120,203 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,427 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 28,700 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Gray flycatcher *(Empidonax wrightii)*	Inhabits woodlands and shrublands occurring predominately in pinyon-juniper, sagebrush, and desert shrublands. Nests are located low in shrubs or small trees, usually 2 to 5 ft above ground. About 3,580,900 acres of potentially suitable habitat occurs within the SEZ region.	2,867 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,399 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	1,257 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 25,293 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Greater roadrunner *(Geococcyx californianus)*	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 3,685,000 acres of potentially suitable habitat occurs in the SEZ region.	2,276 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	63,069 acres of potentially suitable habitat (1.7% of available potentially suitable habitat)	1,010 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 20,326 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Le Conte's thrasher *(Toxostoma leconteii)*	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 creosote bush and salt bush. About 722,100 acres of potentially suitable habitat occurs in the SEZ region.	2,271 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	16,792 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	63 acres of potentially suitable habitat lost (0.009% of available potentially suitable habitat) and 1,273 acres in area of indirect effects	Small overall impact. Avoid development in Wah Wah Wash. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
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 4,651,100 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	118,401 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,390 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 27,962 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Rock wren *(Salpinctes obsoletus)*	Arid and semiarid habitats. Breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices, and the nest entrance is paved with small rocks and stones. About 4,747,600 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	118,403 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,397 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 28,098 acres in area of indirect effects	Small overall impact. Avoid development in Wah Wah Wash. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Sage sparrow *(Amphispiza belli)*	Prefers shrubland, grassland, and desert habitats. The nest, constructed of twigs and grasses, is located either low in a shrub or on the ground. About 4,607,600 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	117,968 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	1,397 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 28,113 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.3.11.2-1 (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 Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Sage thrasher *(Oreoscoptes montanus)*	Breeds in sagebrush shrublands, other shrublands, and cholla grasslands in the western United States and winters in the southwestern United States and northern Mexico. In Utah, nests in greasewood and sagebrush habitats in low-elevation deserts where it constructs a bulky nest in a concealed location, usually in sagebrush or on the ground, using twigs and grasses. About 3,411,600 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	17,968 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	1,397 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 28,113 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.3.11.2-1 (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 Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Vesper sparrow *(Pooecetes gramineus)*	Breeds in grasslands, open shrublands mixed with grasslands, and open pinyon-juniper woodlands. Occurs in open riparian and agricultural areas during migration. About 2,344,100 acres of potentially suitable habitat occurs in the SEZ region.	3,205 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	82,468 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	991 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 19,932 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Western kingbird *(Tyrannus verticalis)*	Occurs in a variety of habitats including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. Migrates to Central America or the southeastern United States for the winter. About 3,253,100 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	100,819 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	1,172 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 23,575 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey					
American kestrel *(Falco sparverius)*	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 4,705,700 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	117,879 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,360 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 27,363 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Golden eagle *(Aquila chrysaetos)*	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,677,100 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	118,264 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,402 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 28,211 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.

TABLE 13.3.11.2-1 (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 Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Red-tailed hawk *(Buteo jamaicensis)*	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 2,617,600 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	87,560 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	808 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 16,261 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Rough-legged hawk *(Buteo lagopus)*	A winter resident in Utah where it is usually found in grasslands, fields, marshes, sagebrush flats, and other open habitats. About 2,193,700 acres of potentially suitable habitat occurs within the SEZ region.	2,877 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	80,369 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	931 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 18,738 acres in area of indirect effects	Small overall impact.

TABLE 13.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Swainson's hawk *(Buteo swainsoni)*	Grasslands, agricultural areas, shrublands, and riparian forests. Nests in trees in or near open areas. Migrants often occur in treeless areas. Large flocks often occur in agricultural areas near locust infestations. About 2,286,700 acres of potentially suitable habitat occurs in the SEZ region.	2,872 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	71,855 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	629 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 12,654 acres in area of indirect effects	Small overall impact.
Turkey vulture *(Cathartes aura)*	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Roosts communally in trees, exposed boulders, and occasionally transmission line support towers. About 2,308,400 acres of potentially suitable habitat occurs in the SEZ region.	2,271 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	37,185 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	394 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 8,926 acres in area of indirect effects	Small overall impact.

TABLE 13.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Upland Game Birds					
Chukar *(Alectoris chukar)*	Steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds during the brooding period found within 0.25 mi (0.4 km) of water. About 4,436,400 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	116,755 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	1,375 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 27,664 acres in area of indirect effects	Small overall impact. Avoid development in Wah Wah Wash.
Mourning dove *(Zenaida macrroura)*	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,484,700 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	110,851acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,330 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 26,754 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Upland Game Birds (Cont.)					
Wild turkey *(Meleagris gallopavo)*	The Rio Grande wild turkey prefers cottonwood riparian areas of rivers associated with oak-pine and pinyon-juniper forests; while the Merriam's wild turkey inhabits open stands of ponderosa pine interspersed with aspen, grass meadows, and oaks grading into pinyon pine and juniper. Areas of brushy cover are used for nesting. About 3,832,500 acres of potentially suitable habitat occurs within the SEZ region.	2,878 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	99,982 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	1,312 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 26,386 acres in area of indirect effects	Small overall impact.

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

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

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and maintenance of an altered environment associated with operations. A maximum of 4,878 acres of direct effects within the SEZ was assumed.

Footnotes continued on next page.

TABLE 13.3.11.1-1 (Cont.)

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide transmission line corridor (less the assumed area of direct effects) that extends beyond the 5-mi (8-km) area adjacent to the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

[e] For transmission development, direct effects were estimated within a 42-mi (67.6-km) long, 250-ft (76-m) wide ROW for an assumed new transmission line connecting the SEZ to the nearest existing line. Indirect effects were estimated within a 1-mi (1.6-km) wide transmission corridor to the existing transmission line, less the assumed area of direct effects.

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

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

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

Sources: NatureServe (2010); UDWR (2009a); USGS (2004, 2005a, 2007).

erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

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

13.3.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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

- Take[9] of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the UDWR. A permit may be required under the Bald and Golden Eagle Protection Act.

- The steps outlined in the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin and Muck 1999) should be followed.

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9 Take under the Bald and Golden Eagle Protection Act means to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb. *Disturb* means "to agitate or bother a Bald Eagle or a Golden Eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. If compatible with the preservation of bald and golden eagles, the Secretary of the Interior may issue regulations authorizing the taking, possession and transportation of these eagles for scientific or exhibition purposes, for religious purposes of Indian tribes or for the protection of wildlife, agricultural or other interests." Requests by Native Americans to take eagles from the wild, where the take is necessary to meet the religious purposes of the Tribe, will be given first priority over all other take except, as necessary, to alleviate safety emergencies.

- Wah Wah Wash, which could provide an occasional watering and feeding site for some bird species, should be avoided.

- Instream and nearshore disturbance of the Beaver River should be avoided when constructing the transmission line.

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

13.3.11.3 Mammals

13.3.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Wah Wah Valley SEZ. The list of mammal species potentially present in the SEZ area was determined from range maps and habitat information available from the Utah Conservation Data Center (UDWR 2009a). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used. Nearly 80 species of mammals are known to occur within Beaver County (UDWR 2009a). Based on species distributions and habitat preferences, less than 30 mammal species could occur within the proposed Wah Wah Valley SEZ (UDWR 2009a). Similar to the overview of mammals provided for the six-state solar energy study area (Section 4.10.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share important habitats.

Big Game

The big game species that could occur within the area of the proposed Wah Wah Valley SEZ include American black bear (*Ursus americanus*, fairly common in Utah), cougar (*Puma concolor*, fairly common in Utah), elk (*Cervis canadensis*, common in the mountainous regions of Utah), mule deer (*Odocoileus hemionus*, common in Utah), and pronghorn (*Antilocapra americana*, common in Utah) (UDWR 2009a).

American Black Bear. The American black bear occurs throughout much of Utah, where it primarily inhabits forested areas (UDWR 2009a). However, no areas of substantial or crucial American black bear habitat occur near the SEZ. The closest distance of the SEZ to substantial and crucial American black bear habitat is 26 mi (42 km).

Cougar. The cougar is fairly common in Utah (UDWR 2009a). A management plan for the cougar in Utah has been developed (UDWR 2009b). Cougar habitat encompasses about 59,325,200 acres (240,080 km^2) in Utah; the statewide cougar population is estimated at 2,500 to 4,000 (UDWR 2009b). Cougars occur mostly in rough, broken foothills and canyon country, often in association with pinyon-juniper and pine-oak brush areas (CDOW 2009; Pederson undated), avoiding areas of sagebrush and low-growing shrubs or other areas without tall cover (Pederson undated). The proposed Wah Wah Valley SEZ overlaps the cougar's overall range, but the SEZ does not occur within high-value cougar habitat (UDWR 2009a). Figure 13.3.11.3-1 shows the location of the SEZ relative to areas of the woodland and shrub-covered low mountain Level IV ecoregion. These ecoregion areas would potentially provide suitable cougar habitat. The closest distance of these areas to the proposed Wah Wah Valley SEZ is 2 mi (3 km). About 1,473,600 acres (5,963 km^2) of the woodland and shrub-covered low mountain Level IV ecoregion occurs within the SEZ region.

Elk. Elk are common in most mountainous regions of Utah. They inhabit mountain meadows and forests during the summer and foothills and valley grasslands during the winter (UDWR 2009a). Elk require an available water source on all seasonal ranges and prefer to be within 0.5 mi (0.8 km) of water. Elk also require cover for escape and protection (UDWR 2010b). Crucial elk habitat is continuously being lost and fragmented within Utah. The statewide management plan for elk has been updated (UDWR 2010b). The management objective is a statewide population of 80,0000 elk. The statewide population estimate in 2009 was nearly 68,000. Within the Southwest Desert, Indian Peaks Big Game Management Unit, which encompasses the area that includes the proposed Wah Wah Valley SEZ, the population estimate was 1,150 (UDWR 2010b). Figure 13.3.11.3-2 shows the location of the SEZ relative to areas of crucial elk habitat. The closest distance from the SEZ to these areas is 2 mi (3 km). About 881,500 acres (3,567 km^2) of crucial elk habitat occurs within the SEZ region.

Mule Deer. The mule deer is the most important game species in Utah. It is common throughout the state, being least abundant in desert areas (UDWR 2008). A statewide management plan for mule deer has been developed (UDWR 2008). Crucial mule deer habitat is continuously being lost and fragmented within Utah. The statewide population has been declining for more than 30 years. The 2003 post-season statewide population estimate was 302,000, much lower than the long-term management objective of 426,000 (UDWR 2008). Figure 13.3.11.3-3 shows the location of the proposed Wah Wah Valley SEZ relative to areas of crucial mule deer habitat. The closest distance of the SEZ to these areas is 3 mi (5 km). About 1,610,600 acres (6,518 km^2) of crucial mule deer habitat occurs within the SEZ region.

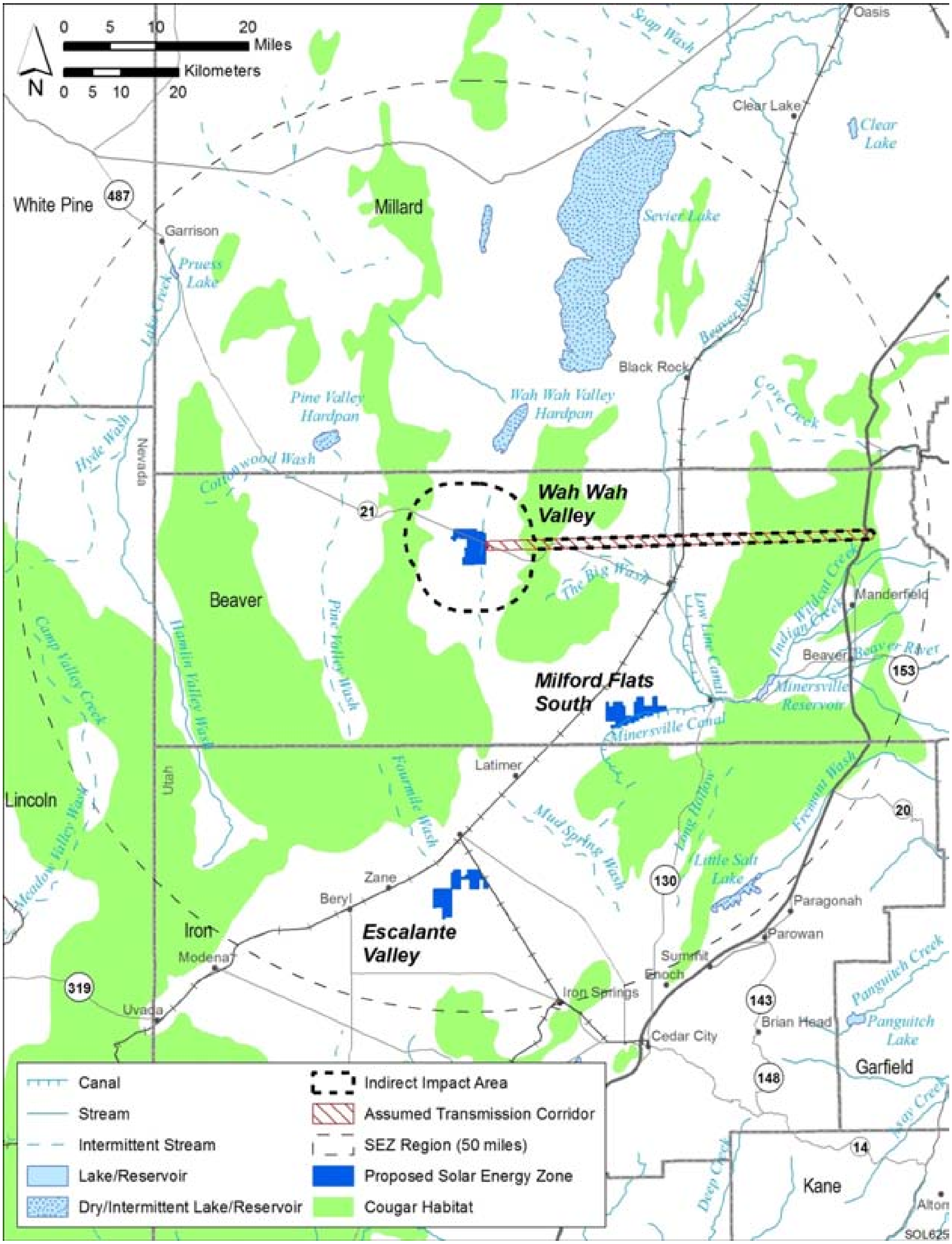

FIGURE 13.3.11.3-1 Location of the Proposed Wah Wah Valley SEZ Relative to Woodland and Shrub-Covered Low Mountain Level IV Ecoregion Areas (Cougar Habitat) (Source: Woods et al. 2001)

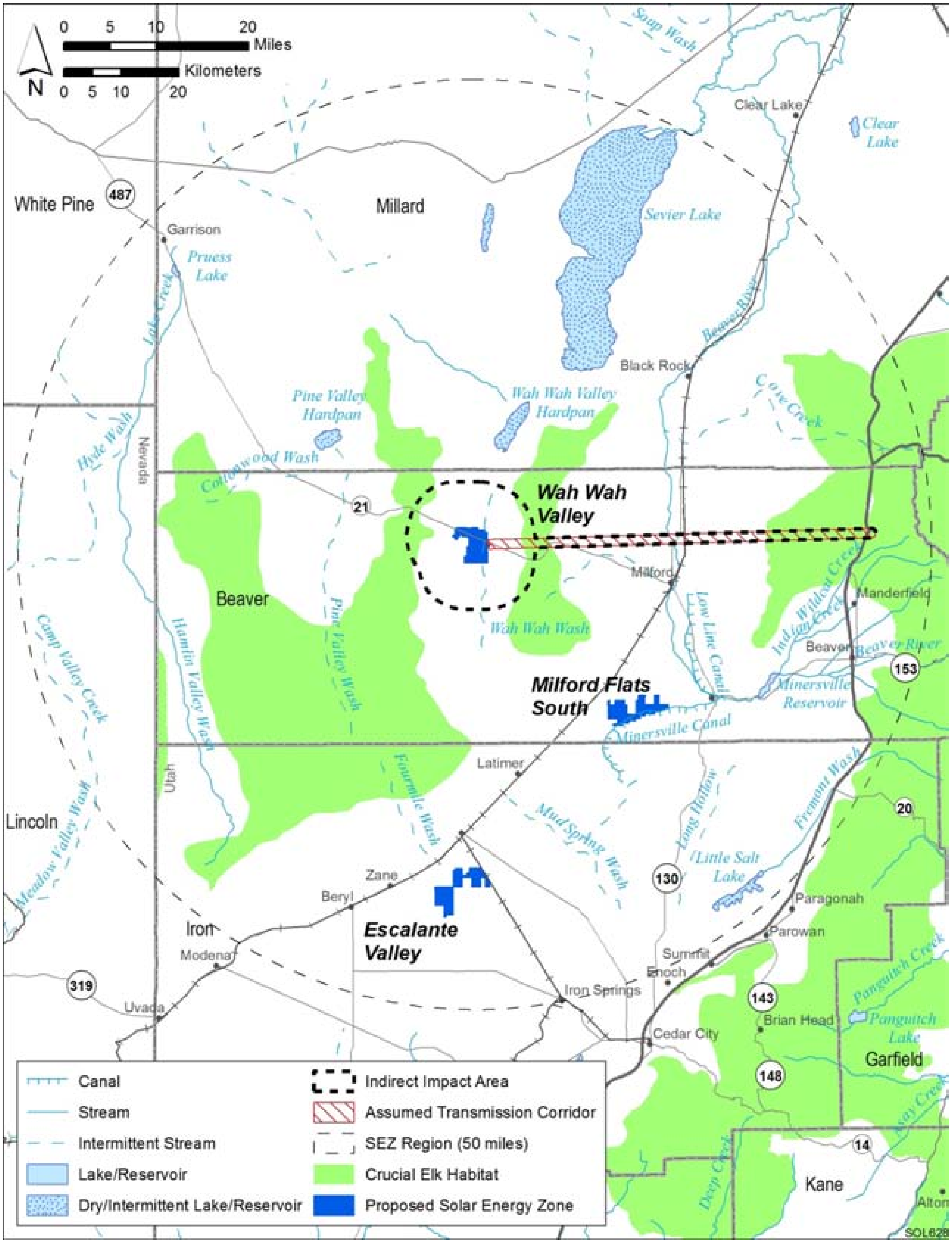

FIGURE 13.3.11.3-2 Location of the Proposed Wah Wah Valley SEZ Relative to Elk Crucial Habitat Areas (Source: UDWR 2006)

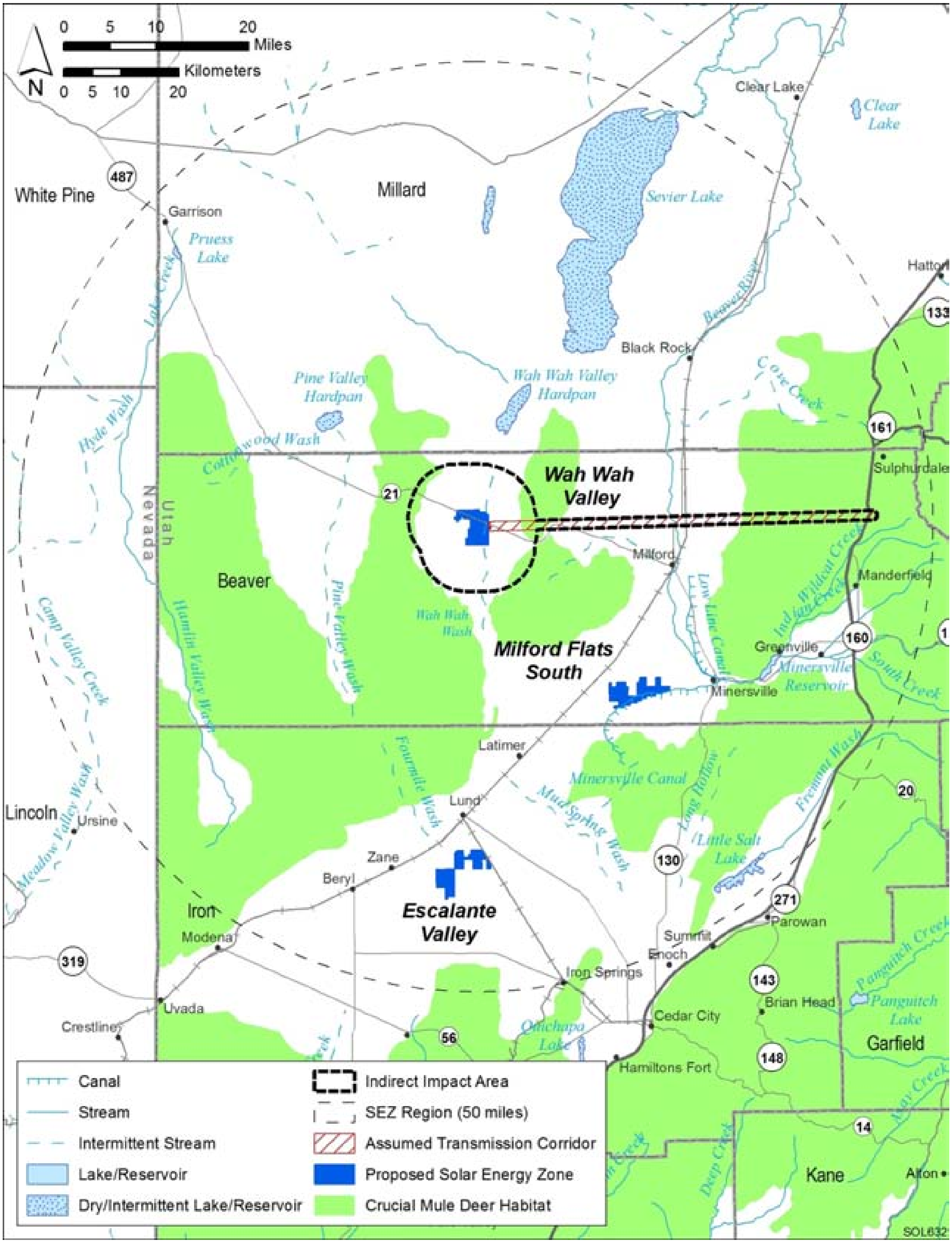

FIGURE 13.3.11.3-3 Location of the Proposed Wah Wah Valley SEZ Relative to Mule Deer Crucial Habitat Areas (Source: UDWR 2006)

Pronghorn. The pronghorn is common in Utah, occurring primarily in shrubsteppe habitat in large expanses of open, low-rolling, or flat terrain (UDWR 2009a,c). A statewide management planfor pronghorn has been developed (UDWR 2009c). The statewide population of pronghorn is estimated at 12,000 to 14,000 (UDWR 2009c). Within the Southwest Desert Big Game Management Unit, which encompasses the proposed Wah Wah Valley SEZ, the population estimate is 1,675 (UDWR 2009c). Figure 13.3.11.3-4 shows that the SEZ is contained within areas of crucial pronghorn habitat. Over 2,680,900 acres (10,849 km^2) of crucial pronghorn habitat occurs within the SEZ region.

Other Mammals

A number of small game and furbearer species occur within the area of Beaver County. Species that could occur within the area of the proposed Wah Wah Valley SEZ include the American badger (*Taxidea taxus*, common in deserts and grasslands), black-tailed jackrabbit (*Lepus californicus*, most abundant rabbit species in Utah), coyote (*Canis latrans*, common), and desert cottontail (*Sylvilagus audubonii*, widely distributed from desert areas to lower slopes of mountains) (UDWR 2009a).

Nongame (small) mammal species include bats, mice, voles, moles, and shrews. Species that could occur within the area of the proposed Wah Wah Valley SEZ include the desert woodrat (*Neotoma lepida*, common in western Utah), Great Basin pocket mouse (*Perognathus parvus*, common), least chipmunk (*Neotamias minimus*, wide-ranging in many types of habitats), northern grasshopper mouse (*Onychomys leucogaster*, common), sagebrush vole (*Lemmiscus curtatus*, moderately common), and white-tailed antelope squirrel (*Ammospermophilus leucurus*, common) (UDWR 2009a). Bat species that may occur within the area of the SEZ include the Brazilian free-tailed bat (*Tadarida brasiliensis*), little brown myotis (*Myotis lucifugus*), long-legged myotis (*M. volans*), and western pipistrelle (*Parastrellus hesperus*) (UDWR 2009a). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ.

Table 13.3.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Wah Wah Valley SEZ. Special status mammal species are discussed in Section 13.3.12.

13.3.11.3.2 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

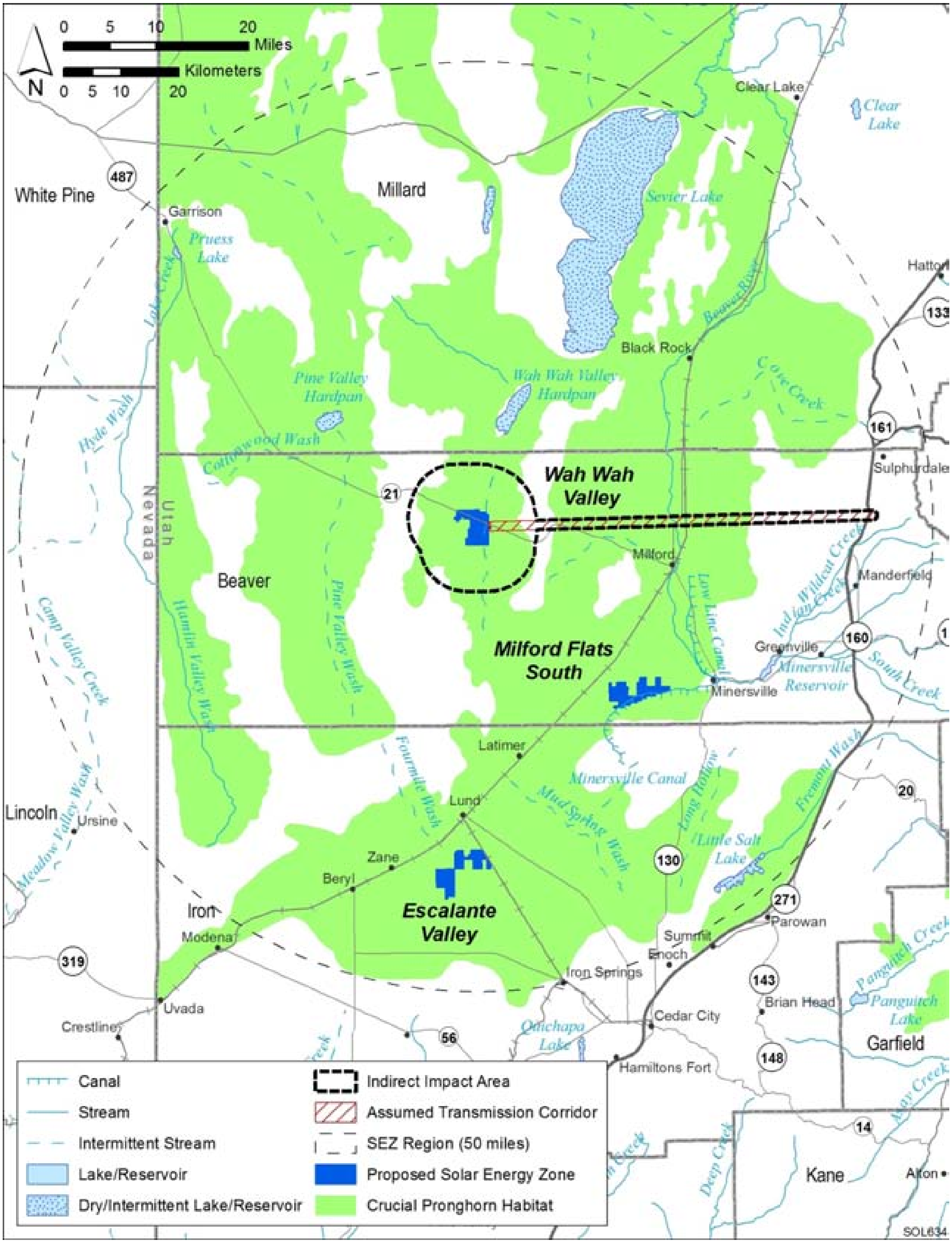

FIGURE 13.3.11.3-4 Location of the Proposed Wah Wah Valley SEZ Relative to Pronghorn Crucial Habitat Areas (Source: UDWR 2006)

TABLE 13.3.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Wah Wah Valley SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Big Game					
American black bear *(Ursus americanus)*	Montane shrublands and forests, and subalpine forests at moderate elevations. About 3,161,500 acres[h] of potentially suitable habitat occurs in the SEZ region.	16 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) during construction and operations	47,169 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	1,009 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 20,298 acres in area of indirect effects	Small overall impact. Avoid the intermontane basin big sagebrush shrubland land cover type in the southeastern portion of the SEZ.
Cougar *(Puma concolor)*	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,472,400 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost 0.1% of available potentially suitable habitat) during construction and operations	117,149 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	1,385 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 27,867 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.3-1 (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 Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Big Game (Cont.)					
Elk *(Cervis canadensis)*	Semi-open forest, mountain meadows, foothills, plains, valleys, and alpine tundra. Uses open spaces such as alpine pastures, marshy meadows, river flats, brushy clean cuts, forest edges, and semidesert areas. About 1,820,000 acres of potentially suitable habitat occurs in the SEZ region.	5 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) during construction and operations	30,353 acres of potentially suitable habitat (1.7% of available potentially suitable habitat)	807 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 16,244 acres in area of indirect effect	Small overall impact. Avoid the intermontane basin big sagebrush shrubland land cover type in the southeastern portion of the SEZ.
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 3,562,700 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	102,230 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	1,203 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 24,196 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Big Game (Cont.)					
Pronghorn *(Antilocarpa americana)*	Grasslands and semidesert shrublands on rolling topography that affords good visibility. Most abundant in shortgrass or midgrass prairies and least common in xeric habitats. About 1,917,800 acres of potentially suitable habitat occurs in the SEZ region.	1,513 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	78,460 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	820 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 16,504 acres in area of indirect effects	Small overall impact.
Small Game and Furbearers					
American badger *(Taxidea taxus)*	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 4,737,300 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	117,979 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,395 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 28,064 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
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 4,796,800 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	117,700 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,349 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 27,141 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Coyote *(Canis latrans)*	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 5,013,800 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	120,854 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	1,428 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 28,724 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Small Game and Furbearers (Cont.)					
Desert cottontail *(Sylvilagus audubonii)*	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 4,612,500 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	117,713 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	1,380 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 27,775 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Nongame (small) Mammals					
Brazilian free-tailed bat *(Tadarida brasiliensis)*	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 4,500,200 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	110,308 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,304 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 26,238 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Desert woodrat *(Neotoma lepida)*	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosote bush 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 4,612,500 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	105,651 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	785 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,804 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Great Basin pocket mouse *(Perognathus parvus)*	Prefers arid grassland, sagebrush, and pinyon-juniper habitats with sandy soil. About 4,443,200 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	63,280 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	1,067 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 21,465 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Least chipmunk *(Neotamias minimus)*	Low-elevation semidesert shrublands, montane shrublands and woodlands, forest edges, and alpine tundra. About 4,737,400 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	117,807 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	1,401 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 28,183 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Little brown myotis *(Myotis lucifugus)*	Various habitats including pinyon-juniper woodlands, montane shrublands, and riparian woodlands. It uses man-made structures for summer roosting, although caves and hollow trees are also utilized. Winter hibernation often occurs in caves or mines, Most foraging activity occurs in woodlands over or near water. About 4,113,400 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	107,866 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	1,222 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 24,582 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
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 3,425,700 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	94,741 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	913 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 18,376 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Northern grasshopper mouse *(Onychomys leucogaster)*	Occurs in grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 3,644,300 acres of potentially suitable habitat occurs within the SEZ region.	2,877 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	98,959 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	1,292 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 25,984 acres in area of indirect effects	Small overall impact.

TABLE 13.3.11.3-1 (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 Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
Sagebrush vole *(Lemmiscus curtatus)*	Typically associated with semiarid sagebrush and grassland areas. Burrows are often constructed near sagebrush. About 1,050,800 acres of potentially suitable habitat occurs within the SEZ region.	5 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) during construction and operations	17,108 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	469 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 9,432 acres in area of indirect effects	Small overall impact. Avoid the intermontane basin big sagebrush shrubland land cover type in the southeastern portion of the SEZ.
Western pipistrelle *(Parastrellus esperus)*	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 3,237,200 acres of potentially suitable habitat occurs in the SEZ region.	4,878 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	91,722 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	1,003 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 20,182 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 13.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Transmission Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (small) Mammals (Cont.)					
White-tailed antelope squirrel *(Ammospermophilus leucurus)*	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends nights and other periods of inactivity in underground burrows. About 2,468,100 acres of potentially suitable habitat occurs within the SEZ region.	4,878 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	81,453 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	586 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 11,781 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

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

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

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 4,878 acres of direct effect within the SEZ was assumed.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide transmission line corridor (less the assumed area of direct effects) that extends beyond the 5-mi (8-km) area adjacent to the SEZ boundary. 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.

Footnotes continued on next page.

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TABLE 13.3.11.1-1 (Cont.)

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[e] For transmission development, direct effects were estimated within a 42-mi (67.6-km) long, 250-ft (76-m) wide ROW for an assumed new transmission line connecting the SEZ to the nearest existing line. Indirect effects were estimated within a 1-mi (1.6-km) wide transmission corridor to the existing transmission line, less the assumed area of direct effects.

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

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

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

Sources: NatureServe (2010); UDWR (2009a); USGS (2004, 2005a, 2007).

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 13.3.11.3.3, below, identifies design features of particular relevance to mammals for the proposed Wah Wah Valley SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area, as presented in Section 13.3.11.3.1 following theanalysis 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 13.3.11.3.3).

Table 13.3.11.3-1 summarizes the potential magnitude of impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed Wah Wah Valley SEZ.

American Black Bear

Based on land cover analyses, only 16 acres (0.06 km^2) of potentially suitable American black bear habitat could be directly lost by solar energy development within the proposed Wah Wah Valley SEZ. This is less than 0.001% of the potentially suitable American black bear habitat within the SEZ region. Based on mapped ranges, the SEZ is 26 mi (42 km) from both the closest substantial and crucial American black bear habitats. Thus, solar energy development would not directly affect these habitats. Overall, impacts on the American black bear from solar energy development in the SEZ would be small (Table 13.3.11.3-1).

Cougar

Based on land cover analyses, up to 4,878 acres (19.7 km^2) of potentially suitable cougar habitat could be directly lost through solar energy development within the proposed Wah Wah Valley SEZ. This is 0.1% of potentially suitable cougar habitat within the SEZ region. Based on mapped ranges, the SEZ is 2 mi (3 km) from the closest preferred habitat for the cougar (i.e., areas contained within the woodland and shrub-covered low mountain Level IV ecoregion; Figure 13.3.11.3-1). Thus, solar energy development would not directly affect preferred cougar habitat. The transmission line route for the SEZ would occur within preferred cougar habitat. Direct impact would total 518 acres (2 km^2), which represents less than 0.04% of preferred cougar habitat within the SEZ region. The area of preferred cougar habitat within the indirect effects area for the SEZ and transmission line route would total 23,598 acres (95.5 km^2), which is 1.6% of the preferred cougar habitat within the SEZ region. Overall, impacts on cougar from solar energy development in the SEZ would be small.

Elk

Based on land cover analyses, only 5 acres (0.02 km^2) of potentially suitable elk habitat could be directly lost through solar energy development within the proposed Wah Wah Valley SEZ. This is less than 0.001% of potentially suitable elk habitat within the SEZ region. Based on mapped ranges, the SEZ is 2 mi (3 km) from the closest area of crucial elk habitat (Figure 13.3.11.3-2). Thus, solar energy development would not directly affect important elk habitat. The transmission line route for the SEZ would occur within crucial elk habitat. Direct impact would total 444 acres (1.8 km^2), which represents 0.05% of crucial elk habitat within the SEZ region. The area of crucial elk habitat within the indirect effects area for the SEZ and transmission line route would total 22,020 acres (89 km^2), which is 2.5% of the crucial elk habitat within the SEZ region. Overall, impacts on elk from solar energy development in the SEZ would be small.

Mule Deer

Based on land cover analyses, up to 4,878 acres (19.7 km^2) of potentially suitable mule deer habitat could be directly lost through solar energy development within the proposed Wah Wah Valley SEZ. This is 0.2% of potentially suitable mule deer habitat within the SEZ region. Based on mapped ranges, the SEZ is 3 mi (5 km) from the closest area of crucial mule deer habitat (Figure 13.3.11.3-3). Thus, solar energy development would not directly affect crucial mule deer habitat. The transmission line route for the SEZ would occur within crucial mule deer habitat. Direct impact would total 548 acres (2.2 km^2), which represents 0.03% of crucial mule deer habitat within the SEZ region. The area of crucial mule deer habitat within the indirect effects area for the SEZ and transmission line route would total 22,937 acres (93 km^2), which is 1.4% of the crucial mule deer habitat within the SEZ region. Overall, impacts on mule deer from solar energy development in the SEZ would be small.

Pronghorn

Based on land cover analyses, about 1,510 acres (6.1 km^2) of potentially suitable pronghorn habitat could be directly lost through solar energy development within the proposed Wah Wah Valley SEZ. This is 0.1% of potentially suitable pronghorn habitat within the SEZ region. Based on mapped ranges, the SEZ and its transmission line route would be located within crucial pronghorn habitat (Figure 13.3.11.3-4). This could result in the direct reduction of 4,878 acres (20 km^2) of crucial pronghorn habitat within the SEZ and 755 acres (3 km^2) for the transmission line. Fencing, considered a major problem on pronghorn ranges, would present a barrier or hindrance to pronghorn movement (UDWR 2009c). There is about 2,680,900 acres (10,849 km^2) of crucial pronghorn habitat within the SEZ region. Therefore solar energy development would have a small impact, directly eliminating about 0.2% of crucial pronghorn habitat within the SEZ region. The area of crucial pronghorn habitat within the indirect effects area for the SEZ and transmission line route would total 94,791 acres (384.6 km^2), which is 3.5% of the crucial pronghorn habitat within the SEZ region. Overall, impacts on pronghorn from solar energy development in the SEZ would be small.

Other Mammals

Direct impacts on small game, furbearers, and nongame (small) mammal species would be small, as 0.08 to 0.2% of potential habitats identified for these species would be lost (Table 13.3.11.3-1). Larger areas of potentially suitable habitat for these species occur within the area of potential indirect effects (i.e., ranging from 1.4% for the Great Basin pocket mouse to 3.3% for the white-tailed antelope squirrel).

Summary

Overall, direct impacts on mammal species would be small for all species, because only 0.2% or less of potentially suitable habitats for mammal species would be lost (Table 13.3.11.3-1). Larger areas of potentially suitable habitat for mammal species occur within the area of potential indirect effects (e.g., up to 3.4% of potentially suitable habitat for the pronghorn). Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) would be negligible with implementation of programmatic design features.

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

13.3.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. While SEZ-specific design features 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.

- Wah Wah Wash, which could provide an occasional watering and feeding site for some mammal species, should be avoided.

- Instream and nearshore disturbance of the Beaver River should be avoided when constructing the transmission line.

- The intermontane basin big sagebrush shrubland land cover type in the southeastern portion of the SEZ, which is the only identified suitable land cover type for the elk and sagebrush vole and about a third of the suitable habitat for the American black bear in the SEZ, should be avoided.

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

13.3.11.4 Aquatic Biota

13.3.11.4.1 Affected Environment

The proposed Wah Wah Valley SEZ is located in semiarid desert valley where surface waters are typically limited to intermittent washes and dry lakebeds that only contain water for short periods during or following precipitation events. No perennial streams, surface water bodies, seeps, or springs are present on the proposed Wah Wah Valley SEZ. However, direct effects would result from construction of the presumed 250-ft (76-m) wide transmission line corridor that would cross directly over Beaver River, a perennial stream approximately 19 mi (31 km) directly east of the SEZ. The Beaver River is a popular fishing area that supports native and introduced fish species (UDWR 2010a). Approximately 4 mi (6 km) of Wah Wah Wash runs through the eastern portion of the SEZ and is the only intermittent stream in the area of direct effects. Although intermittent, channel incision and sediment deposition patterns observed during site visits indicated that substantial flows occur in Wah Wah Wash during large runoff events. Ephemeral or intermittent streams may contain a diverse seasonal community of fish and invertebrates, with the latter potentially present in a dormant state, even in dry periods (Levick et al. 2008). A study of intermittent desert streams and washes indicated communities consisted of primarily terrestrial invertebrates, but also contained aquatic taxa from *Insecta*, *Hydracarina*, *Crustacea*, *Oligochaeta*, *Hirudinea*, and *Gastropoda* groups as well as tolerant native and introduced fish species (URS Corporation 2006). However, site-specific surveys would be necessary to characterize aquatic biota, if present. Biota in ephemeral or intermittent streams may also contribute to populations in perennial reaches by disbursing downstream during wet periods when hydrologic connectivity is higher (Levick et al. 2008). However, Wah Wah Wash has no hydrologic connection to any permanent stream or water body. Consequently, Wah Wah Wash does not provide habitat or contribute to fish and macroinvertebrate populations in perennial streams. Although there is little comprehensive information about the distribution of wetlands within the area, based on local hydrology, wetlands are unlikely or uncommon (Section 13.3.10.1).

No perennial water bodies or streams are present in the area of potential indirect effects within 5 mi (8 km) of the SEZ. However, 10 mi (16 km) of the intermittent/ephemeral Wah Wah Wash is located within the area of indirect effects and the 1 mi (2 km) area of indirect effects associated with the new transmission line corridor crosses over Beaver River. The Wah Wah

Wash runs from the SEZ to the Wah Wah Valley Hardpan, a dry lake approximately 9 mi (14 km) north of the SEZ boundary. Because these intermittent habitats are usually dry, no significant aquatic biota would be expected to occur in the Wah Wah Valley Hardpan. However, ephemeral or nonpermanent pools, which form within intermittent lakebeds during wet periods, may contain invertebrates that are either aquatic opportunists (i.e., species that occupy both temporary and permanent waters) or specialists adapted to living in temporary aquatic environments (Graham 2001). Although most ephemeral pools are populated with widespread species, some can contain species that are endemic to particular geographic regions or even specific pools (Graham 2001). On the basis of information for other ephemeral pools in the American Southwest, ostracods (seed shrimp) and small planktonic crustaceans (e.g., copepods or cladocerans) are expected to be present, and larger branchiopod crustaceans such as fairy shrimp could occur (Graham 2001). Various types of insects that have aquatic larval stages, such as dragonflies and a variety of midges and other fly larvae, may also occur depending on pool longevity, distance to permanent water features, and the abundance of other invertebrates for prey (Graham 2001).

Outside of the indirect effects area, but within 50 mi (80 km) of the proposed Wah Wah Valley SEZ, there are approximately 1,597 acres (6.5 km^2) of lake and reservoir habitat and 127,494 acres (516 km^2) of dry lake. Also present within 50 mi (80 km) of the SEZ is approximately 272 mi (438 km) of perennial stream, 269 mi (433 km) of intermittent stream, and 32 mi (51 km) of canal.

13.3.11.4.2 Impacts

Because surface water habitats are a unique feature in the arid landscape in the vicinity of the proposed Wah Wah Valley SEZ, the maintenance and protection of such habitats may be important to the survival of aquatic and terrestrial organisms. The types of impacts that aquatic habitats and biota could incur from the development of utility-scale solar energy facilities are described in Section 5.6.3. 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.

Land disturbance within the SEZ could increase the transport of soil to aquatic habitat via waterborne and airborne pathways. However, no permanent water bodies, perennial streams, or wetlands are present within the boundaries of the proposed Wah Wah Valley SEZ, making direct impacts on aquatic habitats or aquatic biota unlikely. In addition, given the proximity of the nearest perennial stream to the SEZ (~20 mi [32 km]), it is unlikely for solar energy development within the SEZ to indirectly affect aquatic habitat outside the SEZ. The intermittent Wah Wah Wash is located within the SEZ and could be adversely affected by site development. In addition, the new transmission line would cross Beaver River, which could cause direct and indirect effects on aquatic habitat and biota. The nature and extent of impacts on aquatic biota are partly a function of construction and design features. Due to the length of the Beaver River, avoidance would be a difficult mitigation option. Overhead transmission lines could potentially be used so that there would be no need to place structures directly within aquatic habitat.

However, overhead transmission lines would shade portions of the Beaver River, resulting in localized physical changes in water temperature and irradiance that could affect biological productivity. The introduction of waterborne sediments to the Wah Wah Wash and Beaver River from areas of ground disturbance could be minimized using common mitigation measures, such as settling basins, silt fences, or the redirection of water draining from developed areas.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater are utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). There are no surface water habitats on the proposed Wah Wah Valley SEZ that could be used to supply water needs. Water demands during normal operations would most likely be met by withdrawing groundwater from wells constructed on-site, potentially affecting water levels in surface water features outside of the proposed SEZ and, as a consequence, potentially reducing habitat size and connectivity and creating more adverse environmental conditions for aquatic organisms in those habitats. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required to further evaluate the potential for impacts from water withdrawals.

As described in Section 5.10.2.4, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning/reclamation of a solar energy facility and during construction of the presumed transmission line. Contaminants have the greatest potential to enter Wah Wah Wash and Beaver River. The level of impacts from releases of toxicants would depend on the type and volume of chemicals entering the waterway, the location of the release, the nature of the water body (e.g., size, volume, and flow rates), and the types and life stages of organisms present in the receiving waterway. In general, lubricants and fuel would not be expected to enter waterways in appreciable quantities as long as heavy machinery is not used in or near waterways, and as long as fueling locations for construction equipment are situated away from the waterway. These practices may be difficult to implement when constructing the new transmission corridor over Beaver River. Consequently, there should be plans in place to control spills that do occur.

13.3.11.4.3 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, the following design feature can be identified at this time:

- Transmission lines should be sited and constructed to minimize impacts on aquatic habitats whenever possible and transmission lines should span Beaver River.

If this SEZ-specific design feature is implemented in addition to other programmatic project design features and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development in the Wah Wah Valley SEZ would be negligible.

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

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Wah Wah Valley SEZ. Special status species include the following types of species[10]:

- 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 Utah[11]; and
- Species that have been ranked by the state of Utah as S1 or S2, or species of concern by the state of Utah or by the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the Wah Wah Valley SEZ center (i.e., the SEZ region) were determined from natural heritage records and other data available through NatureServe Explorer (NatureServe 2010), Utah Division of Wildlife Resources Conservation Data Center (UDWR 2009d), UDWR Vertebrate Information (UDWR 2003b), Utah Plants Atlas (Shultz et al. 2006), *Utah Rare Plant Guide* (UNPS 2009), and SWReGAP (USGS 2004, 2005a, 2007). Information reviewed consisted of county-level occurrences as determined from NatureServe and USGS 7.5-minute quad-level occurrences, 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 Beaver, Iron, Millard, Piute, and Sevier Counties, Utah, as well as Lincoln and White Pine Counties, Nevada. However, the affected area occurs only in Beaver County, Utah (Figure 13.3.12.1-1). See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

13.3.12.1 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

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

[11] According to Utah Administrative Rule R657-48, as described in the *Utah Sensitive Species List* (UDWR 2010c), there are no species that receive a separate regulatory designation from the UDWR or the state of Utah.

proposed Wah Wah Valley SEZ, the area of direct effects included the SEZ and the portion of the transmission line corridor where ground-disturbing activities are assumed to occur (refer to Section 13.3.1.2 for development assumptions). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide transmission corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. Indirect effects considered in the assessment include effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance away from the SEZ. 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 affected area includes both the direct and indirect effects areas.

The primary vegetation community types within the affected area are mixed salt desert scrub and sagebrush (*Artemisia* spp.) (see Section 13.3.10). Potentially unique habitats in the affected area in which special status species may reside include riverine and riparian areas, desert playas, grasslands, woodlands, and rocky cliffs and outcrops. The only aquatic or riparian habitats in the affected area occur within and along the Wah Wah Wash, which occurs along the eastern boundary of the SEZ, and the Beaver River, which intersects the transmission corridor approximately 20 mi (32 km) east of the SEZ (Figure 13.3.12.1-1). There are also playa habitats and man-made earthen livestock watering areas throughout the area of indirect effects (Section 13.3.9).

All special status species that are known to occur within the proposed Wah Wah Valley SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats in Appendix J. Of these species, there are 22 that could occur in the affected area of the SEZ, based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 13.3.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped SWReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 m) away from the SEZ.

Based on information provided by the UDWR, quad-level occurrence records for 13 special status species intersect the proposed Wah Wah Valley SEZ affected area (Table 13.3.12.1-1). These species include the bald eagle, ferruginous hawk, greater sage-grouse, long-billed curlew, northern goshawk, short-eared owl, western burrowing owl, dark kangaroo mouse, fringed myotis, kit fox, pygmy rabbit, spotted bat, and Townsend's big-eared bat. There are no groundwater-dependent species in the vicinity of the SEZ based upon UDWR records, information provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Milford Flats South SEZ region (Section 13.3.9).

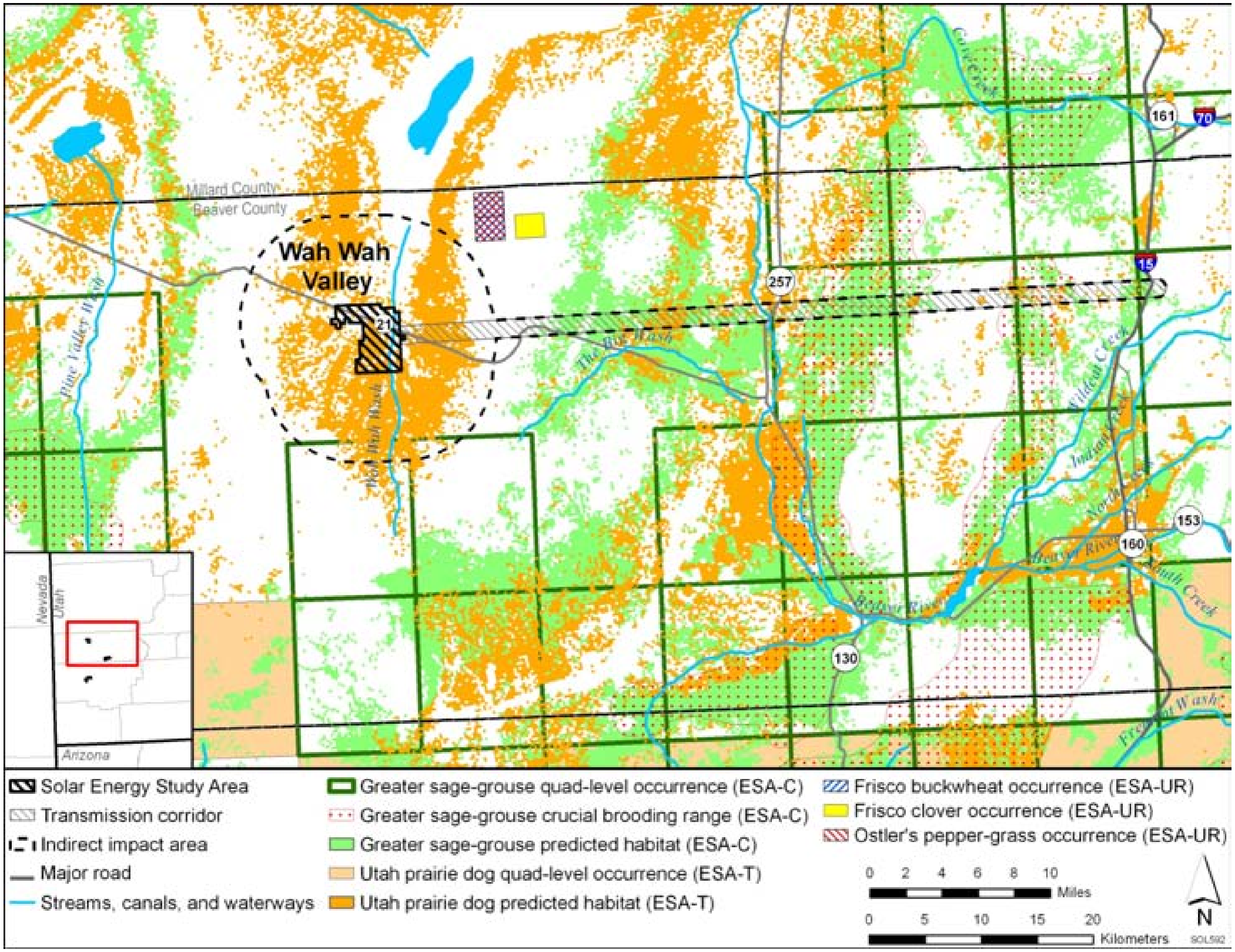

FIGURE 13.3.12.1-1 Known or Potential Occurrences of Species Listed as Endangered, Threatened, Candidates, or under Review for Listing under the ESA That May Occur in the Proposed Wah Wah Valley SEZ Affected Area (Sources: Shultz et al. 2006; USGS 2007; UDWR 2009d)

TABLE 13.3.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Occur on or in the Affected Area of the Proposed Wah Wah Valley SEZ

				Maximum Area of Potential Habitat Affected[c]			
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants							
Compact cat's-eye	*Cryptantha compacta*	BLM-S; FWS-SC; UT-S2	Salt desert shrub and mixed shrub communities at elevations between 5,000 and 8,400 ft.[i] Known from southwestern Millard County and northwestern Beaver County, Utah and eastern Nevada. Nearest recorded occurrence is 25 mi[j] northwest of the SEZ. About 2,866,813 acres[k] of potentially suitable habitat occurs within the SEZ region.	5,132 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	932 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	94,900 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effect; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Frisco buckwheat	*Eriogonum soredium*	ESA-UR; BLM-S; UT-S1	Endemic to a small area in the San Francisco Mountains in Beaver County, Utah, on white limestone outcrops associated with pinyon-juniper communities. Elevation ranges between 6,600 and 7,300 ft. Known to occur in the San Francisco Mountains approximately 7 mi northeast of the SEZ. About 37,100 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	13 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	650 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of rocky cliffs and outcrops in the transmission corridor could reduce impacts. See compact cat's-eye for a list of potential mitigations applicable to all special status plant species.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Frisco clover	*Trifolium friscanum*	ESA-UR; BLM-S; UT-S1	Endemic to four mountain ranges in Beaver and Millard Counties, Utah, on volcanic gravels and limestone substrates in association with pinyon-juniper woodlands at elevations between 6,900 and 7,300 ft. Nearest recorded occurrence is 8 mi northeast of the SEZ. About 1,505,400 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	287 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	18,650 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of woodlands and rocky cliffs and outcrops in the transmission corridor could reduce impacts. See compact cat's-eye for a list of potential mitigations applicable to all special status plant species.
Jone's globemallow	*Sphaeralcea caespitosa*	BLM-S; FWS-SC; UT-S2	Known from at least four occurrences in western Utah and six occurrences in eastern Nevada on federal and state lands on dolomite calcareous soils in association with mixed shrub, pinyon-juniper, and grassland communities at elevations between 5,000 and 6,500 ft. Nearest recorded occurrence is 7 mi west of the SEZ. About 4,471,200 acres of potentially suitable habitat occurs within the SEZ region.	5,360 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	1,221 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	113,700 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. See compact cat's-eye for a list of potential mitigations applicable to all special status plant species.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Long-calyx milkvetch	*Astragalus oophorus lonchocalyx*	BLM-S; FWS-SC; UT-S1	Endemic to the Great Basin in western Utah and eastern Nevada in pinyon-juniper woodlands, sagebrush, and mixed shrub communities at elevations between 5,800 and 7,500 ft. Nearest recorded occurrence is 12 mi northeast of the SEZ. About 4,351,100 acres of potentially suitable habitat occurs within the SEZ region.	5,132 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	1,208 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	112,900 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. See compact cat's-eye for a list of potential mitigations applicable to all special status plant species.
Money wild buckwheat	*Eriogonum nummulare*	BLM-S	Western Utah and eastern Nevada on gravelly washes, flats, and slopes in saltbush and sagebrush communities and pinyon-juniper woodlands. Nearest recorded occurrence is 20 mi north of the SEZ. About 3,760,200 acres of potentially suitable habitat occurs within the SEZ region.	2,900 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	869 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	60,000 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	Small overall impact. See compact cat's-eye for a list of potential mitigations applicable to all special status plant species.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Ostler's ivesia	*Ivesia shockleyi ostleri*	BLM-S; FWS-SC; UT-S1	Endemic to the Wah Wah Mountains and Needle Range of western Beaver County, Utah, in pinyon-juniper and ponderosa pine forests in crevices of quartzite outcrops at elevations between 6,500 and 8,000 ft. Nearest recorded occurrence is 15 mi southwest of the SEZ. About 1,507,100 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	287 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	18,650 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of woodlands and rocky cliffs and outcrops in the transmission corridor could reduce impacts. See compact cat's-eye for a list of potential mitigations applicable to all special status plant species.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Ostler's pepper-grass	*Lepidium ostleri*	ESA-UR; BLM-S; UT-S1	Endemic to a small area in the San Francisco Mountains in Beaver County, Utah, on limestone outcrops within pinyon-juniper communities at elevations between 5,800 and 6,800 ft. Nearest recorded occurrence is within 7 mi northeast of the SEZ.	0 acres	13 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	650 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of rocky cliffs and outcrops in the transmission corridor could reduce impacts. See compact cat's-eye for a list of potential mitigations applicable to all special status plant species.
Birds							
Bald eagle[l]	***Haliaeetus leucocephalus***	BLM-S; UT-SC; UT-S1	A winter resident throughout the SEZ region, most commonly along large bodies of water where fish and waterfowl prey are available. Wintering areas are associated with open water. May occasionally forage in arid shrubland habitats. Quad-level occurrences intersect the SEZ and other portions of the affected area. About 2,666,800 acres of potentially suitable habitat occurs within the SEZ region.	2,982 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	608 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	78,500 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 13.3.12.1-1 (Cont.)

				Maximum Area of Potential Habitat Affected[c]			
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Ferruginous hawk	***Buteo regalis***	BLM-S; UT-SC; UT-S2	A year-round resident in the SEZ region. Grasslands, shrublands, agricultural lands, and the periphery of pinyon-juniper forests throughout the SEZ region. Nests are generally constructed in trees and exposed rock outcrops along cliffs, buttes, and creek banks. Quad-level occurrences intersect the SEZ and other portions of the affected area. About 1,749,900 acres of potentially suitable habitat occurs within the SEZ region.	795 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	551 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	26,650 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	Small overall impact on potentially suitable foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied nesting habitats in the area of direct effect or compensatory mitigation of direct effects on occupied nesting habitats could reduce impacts.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Greater sage-grouse	***Centrocercus urophasianus***	ESA-C; BLM-S; UT-SC; UT-S2	A year-round resident in the SEZ region. Plains, foothills, and mountain valleys dominated by sagebrush throughout the SEZ region. Lek sites are located in relatively open areas surrounded by sagebrush or in areas where sagebrush density is low. Nesting usually occurs on the ground where sagebrush density is higher. Quad-level occurrences intersect the affected area south of the SEZ. Crucial brooding habitat for the species exists about 22 mi east of the SEZ and intersects the transmission corridor. About 1,608,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	626 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	12,650 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats, especially leks and nesting sites in the areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Mitigation should be developed in coordination with the USFWS and UDWR.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Long-billed curlew	***Numenius americanus***	BLM-S; UT-SC; UT-S2	Summer resident and migrant throughout the SEZ region in short-grass grasslands near standing water. Species is likely to be transient only in the vicinity of the SEZ. Quad-level occurrences intersect the affected area within the transmission corridor approximately 20 mi east of the SEZ. About 331,700 acres of potentially suitable habitat occurs within the SEZ region.	142 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	8 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,230 acres of potentially suitable habitat (1.0% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation needed. Only transient individuals are expected in the affected area.
Northern goshawk	***Accipiter gentilis***	BLM-S	A year-round resident in the SEZ region. Mature mountain forest and riparian zone habitats throughout the SEZ region. Nests in trees in mature deciduous, coniferous, and mixed forests. Forages in both heavily forested and relatively open shrubland habitats. Quad-level occurrences intersect the affected area north of the SEZ. About 245,300 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	97 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	4,731 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact on potentially suitable foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied nesting habitats (woodlands) in the area of direct effects or compensatory mitigation of direct effects on occupied nesting habitats could reduce impacts.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Short-eared owl	***Asio flammeus***	BLM-S; UT-SC; UT-S2	Year-round resident within the SEZ region. Inhabits grasslands, shrublands, and other open habitats throughout the SEZ region. Nomadic, often selecting unique breeding sites each year, depending on local rodent densities. Nests on the ground near shrubs. Quad-level occurrences intersect the affected area east and west of the SEZ. About 4,138,850 acres of potentially suitable habitat occurs within the SEZ region.	5,510 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	1,152 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	106,000 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied nesting habitats in the area of direct effect or compensatory mitigation of direct effects on occupied nesting habitats could reduce impacts.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Western burrowing owl	***Athene cunicularia hypugaea***	BLM-S; FWS-SC; UT-SC	A year-round resident in the SEZ region. 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.). Quad-level occurrences intersect the SEZ and other portions of the affected area. About 3,037,300 acres of potentially suitable habitat occurs within the SEZ region.	5,268 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	734 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	91,500 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied burrows in the area of direct effect or compensatory mitigation of direct effects on occupied burrows could reduce impacts.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals							
Dark kangaroo mouse	***Microdiposops megacephalus***	BLM-S; UT-SC; UT-S2	Sagebrush-dominated areas with sandy soils in Great Basin region. Nocturnally active during warm weather, the species remains in underground burrows during the day and cold winter months. Quad-level occurrences intersect the SEZ and other portions of the affected area. About 1,060,500 acres of potentially suitable habitat occurs within the SEZ region.	2,840 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	374 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	26,700 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Fringed myotis	***Myotis thysanodes***	BLM-S; FWS-SC; UT-SC	Wide range of habitats including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roost sites have been reported in buildings and caves. Quad-level occurrences intersect the affected area within the transmission corridor approximately 40 mi east of the SEZ. About 4,433,300 acres of potentially suitable habitat occurs within the SEZ region.	5,822 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	1,200 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	112,050 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact on potentially suitable foraging and roosting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied roosting habitats in the area of direct effect or compensatory mitigation of direct effects on occupied roosting habitats could reduce impacts.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Kit fox	***Vulpes macrotis***	BLM-S; UT-SC	Open prairie, plains, and desert habitats where it inhabits burrows and preys on rodents, rabbits, hares, and small birds. Quad-level occurrences intersect the SEZ and other portions of the affected area. About 2,641,200 acres of potentially suitable habitat occurs within the SEZ region.	5,268 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	657 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	89,200 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of 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 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Transmission Line (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Pygmy rabbit	***Brachylagus idahoensis***	BLM-S; UT-SC; UT-S2	Sagebrush-shrubland habitats throughout the SEZ region. Prefers loose soils to dig burrows. Quad-level occurrences intersect the affected area within the transmission corridor approximately 10 mi east of the SEZ. About 930,850 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	358 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	12,600 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of 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 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Transmission Line (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Spotted bat	***Euderma maculatum***	BLM-S; FWS-SC; UT-SC; UT-S2	Near forests and shrubland habitats throughout the SEZ region. Uses caves and rock crevices for day roosting and winter hibernation. Quad-level occurrences intersect the affected area within the transmission corridor approximately 10 mi east of the SEZ. About 3,404,900 acres of potentially suitable habitat occurs within the SEZ region.	2,840 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	789 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	52,500 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	Small overall impact on potentially suitable foraging and roosting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied roosting habitats in the area of direct effect or compensatory mitigation of direct effects on occupied roosting habitats could reduce impacts.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Townsend's big-eared bat	***Corynorhinus townsendii***	BLM-S; FWS-SC; UT-SC	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. Quad-level occurrences intersect the affected area east of the SEZ. About 3,283,500 acres of potentially suitable habitat occurs within the SEZ region.	5,268 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	712 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	90,200 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	Small overall impact on potentially suitable foraging and roosting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied roosting habitats in the area of direct effect or compensatory mitigation of direct effects on occupied roosting habitats could reduce impacts.

TABLE 13.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Transmission Line (Direct Effects)[e]	Indirect Effects (Outside SEZ and Corridors)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Utah prairie dog	*Cynomys parvidens*	ESA-T; UT-S1	Endemic to southwestern Utah in grasslands in level mountain valleys and areas with deep, well-drained soils. Colonies reside in underground burrow systems, which are dynamic in size and location. Nearest quad-level occurrences are 20 mi south of the SEZ; colonies are known to occur outside of the affected area within 18 mi south of the SEZ. About 641,400 acres of potentially suitable habitat occurs within the SEZ region.	2,982 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	261 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	50,650 acres of potentially suitable habitat (7.9% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the area of direct effect, translocation of individuals from area of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Mitigation should be developed in consultation with the USFWS and UDWR.

Footnotes on next page.

TABLE 13.3.12.1-1 (Cont.)

[a] BLM-S = listed as a sensitive species by the BLM; ESA-C = candidate for listing under the ESA; ESA-T = listed as threatened under the ESA; ESA-UR = under review for listing under the ESA; FWS-SC = USFWS species of concern; UT-S1 = ranked as S1 in the state of Utah; UT-S2 = ranked as S2 in the state of Utah; UT-SC = Utah species of concern.

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

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area.

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

[e] For transmission development, direct effects were estimated within a 42-mi (67-km) long, 250-ft (76-m) wide transmission ROW from the SEZ to the nearest existing line. Direct impacts within this area were determined from the proportion of potentially suitable habitat within the 1-mi (1.6-km) wide transmission corridor. No new access road development is assumed to be needed due to the proximity of this infrastructure to the SEZ.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portion of the transmission corridor where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from 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 mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

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

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

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

[l] Species in bold text have been recorded or have designated critical habitat in the affected area.

13.3.12.1.1 Species Listed under the ESA That Could Occur in the Affected Area

The USFWS did not identify any ESA-listed species in its scoping comments on the proposed Wah Wah Valley SEZ (Stout 2009). However, the Utah prairie dog is listed as threatened under the ESA and has the potential to occur within the affected area of the SEZ on the basis of observed occurrences near the affected area and the presence of potentially suitable habitat in the affected area (Figure 13.3.12.1-1; Table 13.3.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of this species. No other species that is currently listed under the ESA is known to occur within the proposed Wah Wah Valley SEZ affected area.

The Utah prairie dog occurs in grasslands, level mountain valleys, and areas with deep, well-drained soils and low-growing vegetation that allows for good visibility. The Utah prairie dog is one of three prairie dog species in the state of Utah and the only prairie dog species to occur in the vicinity of the SEZ (UDWR 2009d). The USFWS indicated that suitable habitat for the species may occur on the SEZ (Stout 2009). Potential habitat for the Utah prairie dog within the SEZ region is described by SWReGAP as year-round known or probable habitat.

SWReGAP predicts the presence of potentially suitable habitat for the species on the SEZ and throughout other portions of the affected area (Figure 13.3.12.1-1; Table 13.3.12.1-1). The nearest quad-level records for this species are approximately 20 mi (32 km) south of the SEZ. Data provided by the Utah prairie dog colony tracking database[12] also indicates the presence of active Utah prairie dog colonies outside the affected area, approximately 18 mi (29 km) southwest of the SEZ. Critical habitat for this species has not been designated by the USFWS.

13.3.12.1.2 Species That Are Candidates for Listing under the ESA

The greater sage-grouse is the only species that is a candidate for listing as threatened or endangered under the ESA that may occur in the affected area of the proposed Wah Wah Valley SEZ. This species is known to occur in plains, foothills, and mountain valleys dominated by sagebrush. In their scoping comments on the SEZ (Stout 2009), the USFWS indicated that suitable sage-grouse habitat occurs throughout the proposed Wah Wah Valley SEZ region. Potential habitat for the greater sage-grouse within the SEZ region is described by SWReGAP as year-round known or probable habitat.

Quad-level records for this species intersect the affected area south of the SEZ. SWReGAP predicts the presence of potentially suitable habitat for the species on the SEZ and throughout other portions of the affected area. The UDWR has also identified crucial brooding habitat for this species within 22 mi (35 km) east of the SEZ. This crucial brooding habitat also intersects the assumed transmission corridor for the SEZ (Figure 13.3.12.1-1; Table 13.3.12.1-1).

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[12] The Utah prairie dog colony tracking database contains sensitive data that were provided by the Utah Division of Wildlife Resources, for official use only. These data were used for the analyses in this PEIS but the distributions were not displayed on figures in this PEIS.

According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ. However, potentially suitable habitat may occur in the transmission corridor and throughout portions of the area of indirect effects (Table 13.3.12.1-1).

13.3.12.1.3 Species That Are under Review for Listing under the ESA

The USFWS did not identify any species currently being reviewed for listing under the ESA in its scoping comments on the proposed Wah Wah Valley SEZ (Stout 2009). However, there are three species under review for listing under the ESA that have the potential to occur within the affected area of the proposed SEZ on the basis of recorded occurrences near the affected area and the presence of potentially suitable habitat in the affected area. These species are Frisco buckwheat, Frisco clover, and Ostler's pepper-grass (Figure 13.3.12.1-1; Table 13.3.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of these species. General information on each species is provided below.

Frisco Buckwheat

The Frisco buckwheat is a perennial herb endemic to a small area in the San Francisco Mountains in Beaver County, Utah. It is primarily known to occur on private land near the vicinity of the old mining town of Frisco. The species grows in short, dense mats on limestone outcrops in pinyon-juniper communities at elevations between 6,600 and 7,300 ft (2,000 and 2,225 m). The species is known to occur about 7 mi (11 km) northeast of the SEZ within the San Francisco Mountains (Figure 13.3.12.1-1). Suitable habitat for the species does not occur on the SEZ, but potentially suitable habitat may occur within the area of indirect effects and the transmission corridor (Table 13.3.12.1-1).

Frisco Clover

The Frisco clover is a perennial herb endemic to four mountain ranges in Beaver and Millard Counties, Utah. The species grows in short mats on limestone and volcanic gravel substrates, usually on steep slopes, within pinyon-juniper communities at elevations between 6,900 and 7,300 ft (2,100 and 2,225 m). The species is known to occur about 8 mi (13 km) northeast of the SEZ within the San Francisco Mountains (Figure 13.3.12.1-1). Suitable habitat for the species does not occur on the SEZ, but potentially suitable habitat may occur within the area of indirect effects and the transmission corridor (Table 13.3.12.1-1).

Ostler's Pepper-Grass

Ostler's pepper-grass is a perennial herb endemic to a small area in the San Francisco Mountains in Beaver County, Utah. The species grows in short tufts on limestone outcrops within pinyon-juniper communities at elevations between 5,800 and 6,800 ft (1,770 and 2,070 m). The species is known to occur about 7 mi (11 km) northeast of the SEZ within the

San Francisco Mountains (Figure 13.3.12.1-1). Suitable habitat for the species does not occur on the SEZ, but potentially suitable habitat may occur within the area of indirect effects and the transmission corridor (Table 13.3.12.1-1).

13.3.12.1.4 BLM-Designated Sensitive Species

There are 21 BLM-designated sensitive species that may occur in the affected area of the proposed Wah Wah Valley SEZ (see Table 13.3.12.1-1). These BLM-designated species include the following: (1) plants—compact cat's-eye, Frisco buckwheat, Frisco clover, Jone's globemallow, long-calyx milkvetch, money wild buckwheat, Ostler's ivesia, and Ostler's pepper-grass; (2) birds—bald eagle, ferruginous hawk, greater sage-grouse, long-billed curlew, northern goshawk, short-eared owl, and western burrowing owl; and (3) mammals—dark kangaroo mouse, fringed myotis, kit fox, pygmy rabbit, spotted bat, and Townsend's big-eared bat. Quad-level occurrences intersect the SEZ affected area for the following BLM-designated species: bald eagle, ferruginous hawk, long-billed curlew, northern goshawk, short-eared owl, western burrowing owl, dark kangaroo mouse, fringed myotis, kit fox, pygmy rabbit, spotted bat, and Townsend's big-eared bat. Habitats in which these 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 13.3.12.1-1. Four of these species (Frisco buckwheat, Frisco clover, Ostler's pepper-grass, and greater sage-grouse) were discussed in Sections 13.3.12.1.2 and 13.3.12.1.3 because of their status under the ESA. All other BLM-designated sensitive 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.

Compact Cat's-Eye

The compact cat's eye is a perennial herb endemic to the Great Basin of southwestern Utah. It occurs in scattered locations throughout the proposed Wah Wah Valley SEZ region. Suitable habitat includes salt desert shrub-scrub. The species is known to occur about 25 mi (40 km) northwest of the SEZ. Potentially suitable habitat for the species may occur on the SEZ and in other portions of the affected area (Table 13.3.12.1-1).

Jone's Globemallow

Jone's globemallow is a perennial herb endemic to the Great Basin of southwestern Utah. It inhabits mixed shrublands, pinyon-juniper woodlands, and grassland communities. The species is known to occur about 7 mi (11 km) west of the SEZ. Potentially suitable habitat for the species may occur on the SEZ and in other portions of the affected area (Table 13.3.12.1-1).

Long-Calyx Milkvetch

The long-calyx milkvetch is a perennial herb endemic to the Great Basin of southwestern Utah. It inhabits mixed shrublands, pinyon-juniper woodlands, and grassland communities. The species is known to occur about 12 mi (19 km) northeast of the SEZ. Potentially suitable habitat for the species may occur on the SEZ and in other portions of the affected area (Table 13.3.12.1-1).

Money Wild Buckwheat

The money wild buckwheat is a perennial shrub from the southwestern United States. It inhabits saltbush, sagebrush, and pinyon-juniper woodland communities on gravelly substrates. The species is known to occur about 20 mi (32 km) north of the SEZ. Potentially suitable habitat for the species may occur on the SEZ and in other portions of the affected area (Table 13.3.12.1-1).

Ostler's Ivesia

Ostler's ivesia is a perennial herb endemic to the Wah Wah Mountains and Needle Range in Beaver County, Utah. It is found in crevices of rock outcrops within pinyon-juniper forests. The species is known to occur about 15 mi (24 km) southwest of the SEZ. Potentially suitable habitat for the species may occur on portions of the affected area of the proposed Wah Wah Valley SEZ (Table 13.3.12.1-1).

Bald Eagle

The bald eagle is known to occur in the SEZ region and is primarily associated with larger waterbodies. The species has been recorded in the vicinity of the proposed Wah Wah Valley SEZ and quad-level occurrences for this species intersect the SEZ. According to the SWReGAP habitat suitability model, only potentially suitable nonbreeding winter habitat occurs in the SEZ affected area. Suitable nesting habitat does not occur in the affected area, but shrubland habitats suitable for foraging may occur on the SEZ and throughout the affected area (Table 13.3.12.1-1).

Ferruginous Hawk

The ferruginous hawk is known to occur in the SEZ region, where it forages in shrubland habitats. Quad-level occurrences for this species intersect the proposed Wah Wah Valley SEZ and other portions of the affected area. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat may occur in the SEZ affected area (Table 13.3.12.1-1). Most of the suitable habitat in the affected area is represented by foraging habitat (shrublands); however, potentially suitable nesting habitat (woodlands and rocky cliffs and outcrops) may occur in portions of the affected area. On the basis of an evaluation of SWReGAP land cover types, there are no forested habitats or rocky cliffs and outcrops on the SEZ that may be potentially suitable nesting habitat for the ferruginous hawk. However, approximately 9,000 acres (36 km^2) of forested habitat within the transmission corridor may provide potentially suitable nesting habitat for this species. In addition, approximately 12,750 acres (52 km^2) of forested habitat occurs throughout other portions of the area of indirect effects outside the SEZ and the transmission corridor. Approximately 220 acres (1 km^2) of rocky cliffs and outcrops may occur in the transmission corridor; an additional 650 acres (2.5 km^2) of rocky cliffs and outcrops may occur in the area of indirect effects outside the SEZ and the transmission corridor.

Long-Billed Curlew

The long-billed curlew is known to occur in the SEZ region, where it may occur as a summer resident and migrant in short-grass grasslands near standing water. Quad-level occurrences for this species intersect the affected area of the proposed Wah Wah Valley SEZ within the transmission corridor approximately 20 mi (32 km) east of the SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, potentially suitable nonbreeding migratory habitat is expected to occur on the SEZ and other portions of the affected area. Suitable nesting habitat does not occur in the affected area, but the species may be observed as a transient in grassland habitats throughout the affected area (Table 13.3.12.1-1).

Northern Goshawk

The northern goshawk is known to occur in the SEZ region, where it forages in montane forests and valley shrubland habitats. Quad-level occurrences for this species intersect the affected area north of the proposed Wah Wah Valley SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat may occur in the affected area (Table 13.3.12.1-1). Suitable foraging or nesting habitat is not expected to occur on the SEZ; however, suitable habitat may occur within the transmission corridor and other portions of the affected area. Most of this suitable habitat in the affected area is represented by foraging habitat (shrublands); however, potentially suitable nesting habitat (woodlands) may occur in portions of the affected area. On the basis of an evaluation of SWReGAP land cover types, approximately 9,000 acres (36 km^2) of woodland habitat that may be potentially suitable nesting habitat occurs in the transmission corridor; approximately 12,750 acres (52 km^2) of this habitat occurs in the area if indirect effects outside the SEZ and the transmission corridor.

Short-Eared Owl

The short-eared owl is known to occur in the SEZ region, where it forages in grasslands, shrublands, and other open habitats. Quad-level occurrences for this species intersect the affected area east and west of the proposed Wah Wah Valley SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat occurs in the SEZ region. Open grasslands suitable for foraging and nesting may occur in the area of direct effects and throughout other portions of the affected area (Table 13.3.12.1-1).

Western Burrowing Owl

The western burrowing owl is known to occur in the SEZ region, where it forages in grasslands, shrublands, and open disturbed areas. This species typically nests in burrows constructed by mammals such as prairie dogs. Quad-level occurrences for this species intersect the proposed Wah Wah Valley SEZ and other portions of the affected area. According to the SWReGAP habitat suitability model, only potentially suitable summer breeding habitat is expected to occur in the SEZ affected area (Table 13.3.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but grassland and shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Dark Kangaroo Mouse

The dark kangaroo mouse occurs in the Great Basin region in areas dominated by sagebrush and is known to occur within the SEZ region. Quad-level occurrences for this species intersect the proposed Wah Wah Valley SEZ and other portions of the affected area. According to the SWReGAP habitat suitability model, suitable habitat is expected to occur throughout the SEZ and other portions of the affected area (Table 13.3.12.1-1).

Fringed Myotis

The fringed myotis is known to occur in the SEZ region, where it occurs in a variety of habitats including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. The species roosts in buildings and caves. Quad-level occurrences for this species intersect the affected area of the proposed Wah Wah Valley SEZ within the transmission corridor approximately 40 mi (64 km) east of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat may be present within the affected area (Table 13.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ. However, approximately 220 acres (1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 650 acres (2.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects outside the SEZ and the transmission corridor.

Kit Fox

The kit fox is widely distributed throughout western North America. Within the Wah Wah Valley SEZ region, this species is known to occur in open grassland and shrubland habitats, where it uses burrows for resting and breeding. Quad-level occurrences for this species intersect the SEZ and other portions of the affected area. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat for the species may occur on the SEZ and in other portions of the affected area (Table 13.3.12.1-1).

Pygmy Rabbit

The pygmy rabbit is widely distributed throughout the Great Basin and intermountain regions of western North America. This species is known to occur in western Utah, where it prefers areas with tall dense sagebrush and loose soils. Quad-level occurrences for this species intersect the affected area of the proposed Wah Wah Valley SEZ within the transmission corridor approximately 10 mi (16 km) east of the Wah Wah Valley SEZ. According to the SWReGAP habitat suitability model, suitable habitat for the pygmy rabbit does not occur on the SEZ. However, potentially suitable year-round habitat may occur in the transmission corridor and throughout portions of the area of indirect effects (Table 13.3.12.1-1).

Spotted Bat

The spotted bat is known to occur in the SEZ region, where it inhabits forest and shrubland habitats and roosts in caves and rock crevices. Quad-level occurrences for this species intersect the affected area of the proposed Wah Wah Valley SEZ within the transmission corridor approximately 10 mi (16 km) east of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat may be present within the affected area (see Table 13.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ. However, approximately 220 acres (1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 650 acres (2.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects outside the SEZ and the transmission corridor.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is known to occur in the SEZ region, where it inhabits forest and shrubland habitats and roosts in caves, mines, and buildings. Quad-level occurrences for this species intersect the affected area east of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat may be present within the affected area (see Table 13.3.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ. However, approximately 220 acres (1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 650 acres (2.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects outside the SEZ and the transmission corridor.

13.3.12.1.5 State-Listed Species

According to Utah Administrative Rule R657-48, as described in the *Utah Sensitive Species List* (UDWR 2010c), there are no species that receive a separate regulatory designation from the UDWR or the state of Utah.

13.3.12.1.6 Rare Species

There are 20 species that have a state status of S1 or S2 in Utah or that are considered species of concern by the state of Utah or the USFWS may occur in the affected area of the proposed Wah Wah Valley SEZ (see Table 13.3.12.1-1). All of these species have been previously discussed as ESA-listed (see Section 13.3.12.1.1), ESA candidate (see Section 13.3.12.1.2), species under review for ESA listing (see Section 13.3.12.1.3), or BLM-designated sensitive (see Section 13.3.12.1.4).

13.3.12.2 Impacts

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

The assessment of impacts on special status species is based on available information on the presence of species in the affected area, as presented in Section 13.3.12.1, following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 13.3.12.3).

Solar energy development within the proposed Wah Wah Valley SEZ could affect a variety of habitats (see Sections 13.3.10 and 13.3.11). These impacts on habitats could in turn affect special status species that are dependent on those habitats. Based on UDWR records, quad-level occurrences of the following 13 special status species intersect the affected area of the proposed Wah Wah Valley SEZ: bald eagle, ferruginous hawk, greater sage-grouse, long-billed curlew, northern goshawk, short-eared owl, western burrowing owl, dark kangaroo mouse, fringed myotis, kit fox, pygmy rabbit, spotted bat, and Townsend's big-eared bat. Other special status species may occur on the SEZ or within the affected area based upon the presence of potentially suitable habitat. As discussed in Section 13.3.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effect outside the SEZ are presented in Table 13.3.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming programmatic design features are in place) is presented along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 13.3.1.2, a 42-mi (67-km) long transmission corridor is assumed to be needed to serve solar facilities within this SEZ. No new access roads are assumed to be needed to serve solar energy developments within this SEZ because of existing infrastructure adjacent to or within the SEZ.

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

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., pinyon-juniper woodlands). 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.

13.3.12.2.1 Impacts on Species Listed under the ESA

The Utah prairie dog is the only species listed under the ESA that has the potential to occur in the affected area of the proposed Wah Wah Valley SEZ. Although the USFWS did not identify this species in their scoping comments on the proposed Wah Wah Valley SEZ (Stout 2009), potentially suitable shrubland habitat occurs throughout the affected area, and the nearest quad-level occurrences for this species are 20 mi (32 km) south of the SEZ (Figure 13.3.12.1-1). Furthermore, information provided by the Utah prairie dog colony tracking database indicates the presence of Utah prairie dog colonies outside the affected area, about 18 mi (29 km) southwest of the SEZ. According to SWReGAP, about 2,982 acres (12 km^2) of potentially suitable habitat on the SEZ and 261 acres (1 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct effects area represents about 0.5% of available potentially suitable habitat of the Utah prairie dog in the SEZ region. About 50,650 acres (205 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 7.9% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

The overall impact on the Utah prairie dog from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Wah Wah Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region.

The implementation of programmatic design features and complete avoidance of all suitable habitats could reduce impacts to negligible levels. Impacts could also be reduced by conducting pre-disturbance surveys, buffering the locations of known prairie dog colonies, and avoiding or minimizing disturbances within those areas, as recommended by the USFWS (Stout 2009). Formal consultation with the USFWS under Section 7 of the ESA is required for any federal action that may adversely affect an ESA-listed species. Therefore, prior to development, consultation with the USFWS would be necessary to discuss potential impacts on the Utah prairie dog, develop an approved pre-disturbance survey protocol, develop site-specific mitigation, authorize incidental take statements, and develop a Utah prairie dog translocation and monitoring program (if necessary).

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 Utah prairie dog populations. Compensation can be accomplished by improving the carrying capacity for the Utah prairie dog on the acquired lands. As for other mitigation actions, consultations with the USFWS and the UDWR would be necessary to determine the appropriate mitigation ratio to acquire, enhance, and preserve these lands.

13.3.12.2.2 Impacts on Species That Are Candidates for Listing under the ESA

The greater sage-grouse is the only species that is a candidate for listing under the ESA that could occur in the affected area of the proposed Wah Wah Valley SEZ. Quad-level occurrences for this species intersect the affected area south of the SEZ and potentially suitable sagebrush habitat occurs throughout the affected area (see Figure 13.3.12.1-1). In their scoping comments on the SEZ, the USFWS identified a potential impact on greater sage-grouse habitat resulting from solar energy development on the SEZ (Stout 2009). According to SWReGAP, suitable habitat for this species does not occur on the SEZ itself. However, about 626 acres (2.5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct effects area represents less than 0.1% of available potentially suitable habitat for the greater sage-grouse in the SEZ region. About 12,650 acres (51 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 0.8% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

The overall impact on the greater sage-grouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Wah Wah Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features alone may not be sufficient to reduce impacts to negligible levels because potentially suitable sagebrush habitats are widespread within the transmission corridor.

Efforts to mitigate the impacts of solar energy development on the greater sage-grouse in the proposed Wah Wah Valley SEZ should be developed in consultation with the USFWS and UDWR following the *Strategic Plan for Management of Sage Grouse* (UDWR 2009e) and *Guidelines to Manage Sage Grouse Populations and Their Habitats* (Connelly et al. 2000). Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the area of direct effects, especially leks and nesting areas. 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. Any mitigation plans should be developed in coordination with the USFWS and UDWR.

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

The USFWS did not identify any species currently being reviewed for listing under the ESA in its scoping comments on the proposed Wah Wah Valley SEZ (Stout 2009). However, there are three species under review for listing under the ESA that have the potential to occur within the affected area of the proposed SEZ: Frisco buckwheat, Frisco clover, and Ostler's pepper-grass. Impacts on these species are discussed below.

Frisco Buckwheat

The Frisco buckwheat is not known to occur in the affected area of the proposed Wah Wah Valley SEZ, and potentially suitable habitat for this species does not occur on the SEZ. However, approximately 13 acres (<0.1 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents less than 0.1% of available potentially suitable habitat in the SEZ region. About 650 acres (3 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 1.8% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

The overall impact on the Frisco buckwheat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Wah Wah Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region.

The implementation of programmatic design features and avoidance of all suitable habitats (e.g., rock outcrops) may be sufficient to reduce impacts to negligible levels. If avoidance of all suitable habitats is not possible, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats within the area of direct effects. If avoidance or minimization is not a feasible option, plants could be translocated from areas of direct effect 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. Any mitigation plans for this species should be developed in coordination with the USFWS and UDWR.

Frisco Clover

The Frisco clover is not known to occur in the affected area of the proposed Wah Wah Valley SEZ, and potentially suitable habitat for this species does not occur on the SEZ. However, approximately 287 acres (1 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents less than 0.1% of available potentially suitable habitat in the SEZ region. About 18,650 acres (75 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 1.2% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

The overall impact on the Frisco clover from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Wah Wah Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region.

The implementation of programmatic design features and avoidance of all suitable habitats (e.g., rock outcrops and pinyon-juniper woodlands) may be sufficient to reduce impacts to negligible levels. If avoidance of all suitable habitats is not possible, impacts could be reduced by implementing the mitigation options described previously for the Frisco buckwheat. The need for mitigation should first be determined by conducting preconstruction surveys for the species and its habitat on the SEZ. Any mitigation plans for this species should be developed in coordination with the USFWS and UDWR.

Ostler's Pepper-Grass

The Ostler's pepper-grass is not known to occur in the affected area of the proposed Wah Wah Valley SEZ, and potentially suitable habitat for this species does not occur on the SEZ. However, approximately 13 acres (<0.1 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents less than 0.1% of available potentially suitable habitat in the SEZ region. About 650 acres (3 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 1.2% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

The overall impact on the Ostler's pepper-grass from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Wah Wah Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region.

The implementation of programmatic design features and avoidance of all suitable habitats (e.g., rock outcrops) may be sufficient to reduce impacts to negligible levels. If avoidance of all suitable habitats is not possible, impacts could be reduced by implementing the mitigation options described previously for the Frisco buckwheat. The need for mitigation should first be determined by conducting preconstruction surveys for the species and its habitat on the SEZ. Any mitigation plans for this species should be developed in coordination with the USFWS and UDWR.

13.3.12.2.4 Impacts on BLM-Designated Sensitive Species

Of the 21 BLM-designated sensitive species that could occur in the affected area of the proposed Wah Wah Valley SEZ, four species—Frisco buckwheat, Frisco clover, Ostler's pepper-grass, and greater sage-grouse—were discussed in Sections 13.3.12.2.2 and 13.3.12.2.3 because of their status under the ESA. Impacts on all other BLM-designated sensitive species that have potentially suitable habitat within the affected area of the proposed Wah Wah Valley SEZ are discussed below.

Compact Cat's-Eye

The compact cat's-eye is not known to occur in the affected area of the proposed Wah Wah Valley SEZ; however, approximately 5,132 acres (21 km^2) of potentially suitable habitat on the SEZ and 932 acres (4 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.2% of available potentially suitable habitat in the SEZ region. About 94,900 acres (384 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.3% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

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

Avoidance of all potentially suitable habitats to mitigate impacts on the compact cat's-eye is not feasible because potentially suitable shrubland habitats are widespread throughout the area of direct effect. For this species and other special status plants, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not a feasible option, plants could be translocated from areas of direct effect 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.

Jone's Globemallow

Jone's globemallow is not known to occur in the affected area of the proposed Wah Wah Valley SEZ; however, approximately 5,360 acres (22 km^2) of potentially suitable habitat on the SEZ and 1,221 acres (5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (Table 13.3.12.1-1). This direct impact area represents about 0.1% of available potentially suitable habitat in the SEZ region. About 113,700 acres (460 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 2.5% of the available potentially suitable habitat in the SEZ region (Table 13.3.12.1-1).

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

Avoidance of all potentially suitable habitats to mitigate impacts on the Jone's globemallow is not feasible because these habitats (i.e., shrublands) are widespread throughout the area of direct effects. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the compact cat's-eye. The need for mitigation should first be determined by conducting preconstruction surveys for the species and its habitat in the area of direct effects.

Long-Calyx Milkvetch

The long-calyx milkvetch is not known to occur in the affected area of the proposed Wah Wah Valley SEZ; however, approximately 5,132 acres (21 km^2) of potentially suitable habitat on the SEZ and 1,208 acres (5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.2% of available potentially suitable habitat in the SEZ region. About 112,900 acres (457 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 2.6% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

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

Avoidance of all potentially suitable habitats to mitigate impacts on the long-calyx milkvetch is not feasible because these habitats (i.e., sagebrush and shrublands) are widespread throughout the area of direct effects. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the compact cat's-eye. The need for mitigation should first be determined by conducting preconstruction surveys for the species and its habitat in the area of direct effects.

Money Wild Buckwheat

The money wild buckwheat is not known to occur in the affected area of the proposed Wah Wah Valley SEZ; however, approximately 2,900 acres (12 km^2) of potentially suitable habitat on the SEZ and 869 acres (0.3 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.1% of available potentially suitable habitat in the SEZ region. About 83,450 acres (338 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 2.4% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

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

Avoidance of all potentially suitable habitats to mitigate impacts on the money wild buckwheat is not feasible because these habitats (i.e., sagebrush and shrublands) are widespread throughout the area of direct effects. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the compact cat's-eye. The need for mitigation should first be determined by conducting preconstruction surveys for the species and its habitat in the area of direct effects.

Ostler's Ivesia

Ostler's ivesia is not known to occur in the affected area of the proposed Wah Wah Valley SEZ, and potentially suitable habitat for this species does not occur on the SEZ. However, approximately 287 acres (1 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents less than 0.1% of available potentially suitable habitat in the SEZ region. About 18,650 acres (75 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 1.2% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

The overall impact on the Ostler's ivesia from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Wah Wah Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region.

The implementation of programmatic design features and avoiding or minimizing disturbance of all suitable habitats (e.g., rock outcrops and pinyon-juniper forests) may be sufficient to reduce impacts to negligible levels. If avoidance of all potentially suitable habitats is not possible, impacts could be reduced by implementing the mitigation options described previously for the compact cat's-eye. The need for mitigation should first be determined by conducting preconstruction surveys for the species and its habitat in the area of direct effects.

Bald Eagle

The bald eagle is a winter resident within the proposed Wah Wah Valley SEZ region. Approximately 2,982 acres (12 km^2) of potentially suitable foraging habitat on the SEZ and 608 acres (2 km^2) of potentially suitable foraging habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.1% of available potentially suitable foraging habitat in the SEZ region. About 78,500 acres (318 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.9% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

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

Ferruginous Hawk

The ferruginous hawk is a year-round resident within the proposed Wah Wah Valley SEZ region, and potentially suitable breeding and nonbreeding may occur in the affected area. Approximately 795 acres (3 km^2) of potentially suitable habitat on the SEZ and 551 acres (2 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.1% of available suitable habitat in the SEZ region. About 26,650 acres (108 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 1.5% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1). Most of the suitable habitat in the affected area is represented by foraging habitat (shrublands); however, potentially suitable nesting habitat (woodlands and rocky cliffs and outcrops) may occur in portions of the affected area. On the basis of an evaluation of SWReGAP land cover types, there are no forested habitats or rocky cliffs and outcrops on the SEZ. However, approximately 9,000 acres (36 km^2) of forested habitat within the transmission corridor may provide potentially suitable nesting habitat for this species. In addition, approximately 12,750 acres (52 km^2) of forested habitat occurs throughout other portions of the area of indirect effects outside the SEZ and the transmission corridor. Approximately 220 acres (1 km^2) of rocky cliffs and outcrops may occur in the transmission corridor; an additional 650 acres (2.5 km^2) of rocky cliffs and outcrops may occur in the area of indirect effects outside the SEZ and the transmission corridor.

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

Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and may be readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all occupied nesting habitat (woodlands and rocky cliffs and outcrops) in the area of direct effects is feasible, and could reduce impacts. If avoiding or minimizing disturbance of all occupied nesting habitat is not a feasible option, 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.

Long-Billed Curlew

The long-billed curlew is a summer resident and migrant within the proposed Wah Wah Valley SEZ region, and individuals may occur as migratory transients in grassland and wetland habitats (playas) in the affected area. Approximately 142 acres (0.5 km^2) of potentially suitable habitat on the SEZ and 8 acres (<0.1 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents less than 0.1% of available potentially suitable habitat in the SEZ region. About 3,230 acres (13 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 1.0% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1). Most of this area could serve as foraging habitat (i.e., grasslands); the species is not expected to nest in the affected area.

The overall impact on the long-billed curlew from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Wah Wah Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels. No species-specific mitigation of direct effects is warranted because the species occurs only as a transient in the affected area and the affected area represents a very small proportion of potentially suitable foraging habitat in the SEZ region.

Northern Goshawk

The northern goshawk is considered to be a year-round resident within the proposed Wah Wah Valley SEZ region, where it occurs in montane forests and shrubland habitats. According to the SWReGAP habitat suitability model, potentially suitable habitat does not exist on the SEZ. However, approximately 97 acres (0.4 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents less than 0.1% of available suitable habitat in the SEZ region. About 4,731 acres (19 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 1.9% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1). Most of this suitable habitat in the affected area is represented by foraging habitat (shrublands); however, potentially suitable nesting habitat (woodlands) may occur in portions of the affected area. On the basis of an evaluation of SWReGAP land cover types, approximately 9,000 acres (36 km^2) of woodland habitat that may be potentially suitable nesting habitat occurs in the transmission corridor; approximately 12,750 acres (52 km^2) of this habitat occurs in the area if indirect effects outside the SEZ and the transmission corridor.

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

The avoidance of all potentially suitable foraging habitats (shrublands) is not feasible to mitigate impacts on the northern goshawk because these habitats are widespread throughout the area of direct effects and the SEZ region. However, avoiding or minimizing disturbance of all occupied nesting habitat (woodlands) within the transmission corridor is feasible, and could reduce impacts. If avoiding or minimizing disturbance of all occupied nesting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that 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.

Short-Eared Owl

The short-eared owl is considered to be a year-round resident within the proposed Wah Wah Valley SEZ region, where it is known to occur in open grasslands and shrublands. Approximately 5,510 acres (22 km^2) of potentially suitable habitat on the SEZ and 1,152 acres (5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.2% of available potentially suitable habitat in the SEZ region. About 106,000 acres (429 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.6% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1). Most of this area could serve as foraging habitat (i.e., shrublands), although open grassland and shrubland habitats that could serve as suitable nesting habitat could occur in the affected area.

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

The avoidance of all potentially suitable foraging habitats (shrublands) is not feasible to mitigate impacts on the short-eared owl because these habitats are widespread throughout the area of direct effects and may be readily available in other portions of the SEZ region. However, impacts on the short-eared owl could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoiding or minimizing disturbance of all occupied habitat 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.

Western Burrowing Owl

The western burrowing owl is considered to be a summer resident within the proposed Wah Wah Valley SEZ region, where it is known to forage in grasslands and shrublands. Within the SEZ region, the species nests in burrows constructed by mammals such as prairie dogs. Approximately 5,268 acres (21 km^2) of potentially suitable habitat on the SEZ and 734 acres (3 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.2% of available potentially suitable habitat in the SEZ region. About 91,500 acres (370 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.0% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1). 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 Wah Wah Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the western burrowing owl because potentially suitable shrubland habitats are widespread throughout the area of direct effect and may be readily available in other portions of the SEZ region. However, impacts on the western burrowing owl could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows and habitat in the area of direct effects. If avoiding or minimizing disturbance of all occupied habitat 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.

Dark Kangaroo Mouse

The dark kangaroo mouse is considered to be a year-round resident within the proposed Wah Wah Valley SEZ region, where it is known to occur in sandy regions dominated by sagebrush. Approximately 2,840 acres (11 km^2) of potentially suitable habitat on the SEZ and 374 acres (1.5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.3% of available potentially suitable habitat in the SEZ region. About 26,700 acres (108 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.5% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

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

The avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the dark kangaroo mouse because potentially suitable sagebrush habitats are widespread throughout the area of direct effects. However, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization 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 uses one or both of these options could be designed to completely offset the impacts of development.

Fringed Myotis

The fringed myotis is considered to be a year-round resident within the proposed Wah Wah Valley SEZ region, where it is known to forage in riparian, shrubland, and forested habitats. Approximately 5,822 acres (23.5 km^2) of potentially suitable habitat on the SEZ and 1,200 acres (5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.2% of available potentially suitable habitat in the SEZ region. About 112,050 acres (453 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.5% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1). Most of this suitable habitat in the affected area is represented by foraging habitat (shrublands); however, potentially suitable roosting habitat (rocky cliffs and outcrops) may occur in portions of the affected area. On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat on the SEZ. However, approximately 220 acres (1 km^2) of potentially suitable roosting habitat may occur in the transmission corridor; an additional 650 acres (2.5 km^2) of potentially suitable roosting habitat occurs in the area of indirect effects outside the SEZ and the access road and transmission corridors.

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

Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and may be readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all occupied roosting habitat (rocky cliffs and outcrops) within the transmission corridor is feasible, and could reduce impacts. If avoiding or minimizing disturbance of all occupied roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that 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.

Kit Fox

The kit fox is considered to be a year-round resident within the proposed Wah Wah Valley SEZ region, where it is known to occur in grassland and shrubland habitats. Approximately 5,268 acres (21 km^2) of potentially suitable habitat on the SEZ and 657 acres (3 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.2% of available potentially suitable habitat in the SEZ region. About 89,200 acres (361 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.4% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

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

The avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the kit fox because potentially suitable shrubland habitats are widespread throughout the area of direct effects. However, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization is not a feasible option, a translocation and compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Coordination with the appropriate federal and state agencies should be required for the development of any translocation and compensatory mitigation plans. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Pygmy Rabbit

The pygmy rabbit is considered to be a year-round resident within the proposed Wah Wah Valley SEZ region, where it is known to occur in sagebrush habitats. According to the SWReGAP habitat suitability model, potentially suitable habitat does not exist on the SEZ. However, approximately 358 acres (1.5 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents less than 0.1% of available potentially suitable habitat in the SEZ region. About 12,600 acres (51 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 1.4% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1).

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

The avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the pygmy rabbit because potentially suitable sagebrush habitats are widespread throughout the area of direct effects. However, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the area of direct effects could reduce impacts. If avoidance or minimization is not a feasible option, a translocation and compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Coordination with the appropriate federal and state agencies should be required for the development of any translocation and compensatory mitigation plans. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Spotted Bat

The spotted bat is considered to be a year-round resident within the proposed Wah Wah Valley SEZ region, where it is known to forage in shrubland and forested habitats. Approximately 2,840 acres (11.5 km^2) of potentially suitable habitat on the SEZ and 789 acres (3 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.1% of available potentially suitable habitat in the SEZ region. About 52,500 acres (212 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 1.5% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1). Most of this suitable habitat in the affected area is represented by foraging habitat (shrublands); however, potentially suitable roosting habitat (rocky cliffs and outcrops) may occur in portions of the affected area. On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat on the SEZ. However, approximately 220 acres (1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 650 acres (2.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects outside the SEZ and the access road and transmission corridors.

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

Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and may be readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all occupied roosting habitat (rocky cliffs and outcrops) within the transmission corridor is feasible, and could reduce impacts. If avoiding or minimizing disturbance of all occupied roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that 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.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is considered to be a year-round resident within the proposed Wah Wah Valley SEZ region, where it is known to forage in shrubland and forested habitats. Approximately 5,268 acres (21 km^2) of potentially suitable habitat on the SEZ and 712 acres (3 km^2) of potentially suitable habitat in the transmission corridor could be directly affected by construction and operations (see Table 13.3.12.1-1). This direct impact area represents about 0.2% of available potentially suitable habitat in the SEZ region. About 90,200 acres (365 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.7% of the available potentially suitable habitat in the SEZ region (see Table 13.3.12.1-1). Most of this suitable habitat in the affected area is represented by foraging habitat (shrublands); however, potentially suitable roosting habitat (rocky cliffs and outcrops) may occur in portions of the affected area. On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat on the SEZ. However, approximately 220 acres (1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 650 acres (2.5 km^2) of this potentially suitable roosting habitat occurs in the area of indirect effects outside the SEZ and the access road and transmission corridors.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the proposed Wah Wah Valley

SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and may be readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all occupied roosting habitat (rocky cliffs and outcrops) within the transmission corridor is feasible, and could reduce impacts. If avoiding or minimizing disturbance of all occupied roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that 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.

13.3.12.2.5 Impacts on State-Listed Species

According to Utah Administrative Rule R657-48, as described in the *Utah Sensitive Species List* (UDWR 2010c), there are no species that receive a separate regulatory designation from the UDWR or the state of Utah.

13.3.12.2.6 Impacts on Rare Species

There are 20 species with a state status of S1 or S2 in Utah or species of concern by the state of Utah or the USFWS that may occur in the affected area of the proposed Wah Wah Valley SEZ. Impacts have been previously discussed for all of these species because of their status under the ESA (see Sections 13.3.12.2.1, 13.3.12.2.2, and 13.3.12.2.3) or the BLM (see Section 13.3.12.2.4).

13.3.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- Pre-disturbance surveys should be conducted to determine the presence and abundance of special status species, including those identified in Table 13.3.12.1-1; disturbance to occupied habitats for these species should be avoided or impacts on occupied habitats 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 of rocky cliff and outcrop habitats in the area of direct effect could reduce impacts on the following special status species: Frisco buckwheat, Ostler's pepper-grass, ferruginous hawk (nesting), fringed myotis (roosting), spotted bat (roosting), and Townsend's big-eared bat (roosting).

- Avoiding or minimizing disturbance of woodland habitats in the area of direct effect could reduce impacts on the following special status species: Frisco clover, Ostler's ivesia, ferruginous hawk (nesting), and the northern goshawk (nesting).

- Consultation with the USFWS and the UDWR should be conducted to address the potential for impacts on the Utah prairie dog—a species listed as threatened under the ESA. Consultation would identify an appropriate survey protocol, avoidance 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 UDWR should be conducted to address the potential for impacts on the greater sage-grouse—a candidate species for listing under the ESA. Coordination with the USFWS and UDWR should also be conducted for the following species that are under review for listing under the ESA: Frisco buckwheat, Frisco clover, and Ostler's pepper-grass. Coordination with the USFWS and UDWR would identify an appropriate pre-disturbance survey protocol, avoidance measures, and any potential compensatory mitigation actions for each of these species.

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

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

13.3.13 Air Quality and Climate

13.3.13.1 Affected Environment

13.3.13.1.1 Climate

The proposed Wah Wah Valley SEZ is located in southwestern Utah, in the northwestern portion of Beaver County. The SEZ is at an elevation of about 4,960 ft (1,512 m) and thus experiences lower air temperatures than lower elevations of comparable latitude. Pacific storms along with prevailing westerly winds lose moisture as they ascend the Cascade and Sierra Nevada Ranges. Therefore, air masses reaching Utah are relatively dry, resulting in light precipitation over the state (NCDC 2009a). Subzero temperatures and prolonged cold spells during the winter months are rare over most parts of the state, because mountain ranges to the east and north block Arctic air masses. Utah experiences relatively strong insolation (solar radiation) during the day and rapid nocturnal cooling because of its relatively thin atmosphere, resulting in wide ranges in daily temperature. In general, the climate of the proposed SEZ is temperate and dry (NCDC 1989). Meteorological data collected at the Milford Municipal Airport, which is about 20 mi (32 km) east of the proposed Wah Wah Valley SEZ, and at Wah Wah Ranch, just outside the north boundary of the proposed SEZ, are summarized below.

A wind rose from the Milford Municipal Airport for the 5-year period 2004 to 2008 and taken at a level of 33 ft (10 m) is presented in Figure 13.3.13.1-1 (NCDC 2009b). During this period, the annual average wind speed at the airport was about 10.5 mph (4.7 m/s), with a prevailing wind direction from the south–southwest (about 22.4% of the time) and secondarily from the south (about 15.9% of the time), parallel to nearby mountain ranges. About half of the time, winds blew from these directions, ranging from south to southwest inclusive. Winds blew predominantly from the south–southwest every month throughout the year, except in March from the north. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (almost 9% of the time). Average wind speeds were relatively uniform by season with the highest in fall at 11.1 mph (5.0 m/s); lower in spring and winter at 10.4 mph (4.6 m/s); and lowest in summer at 10.1 mph (4.5 m/s).

For the 1955 to 2008 period, the annual average temperature at Wah Wah Ranch was 51.4°F (10.8°C) (WRCC 2009). January was the coldest month, with an average minimum temperature of 14.2°F (–9.9°C), and July was the warmest month with an average maximum temperature of 94.7°F (34.8°C). In summer, daytime maximum temperatures were frequently above 90°F (32.2°F), and minimum temperatures were in the 50s. On most days of colder months (November through February), the minimum temperatures recorded were below freezing (≤32°F [0°C]); subzero temperatures also occurred about 4 and 3 days in January and December, respectively. During the same period, the highest temperature, 108°F (42.2°C), was reached in July 2003, and the lowest, –30°F (–34.4°C), in December 1990. Each year, about 70 days had a maximum temperature of ≥90°F (32.2°C), while about 167 days had minimum temperatures at or below freezing.

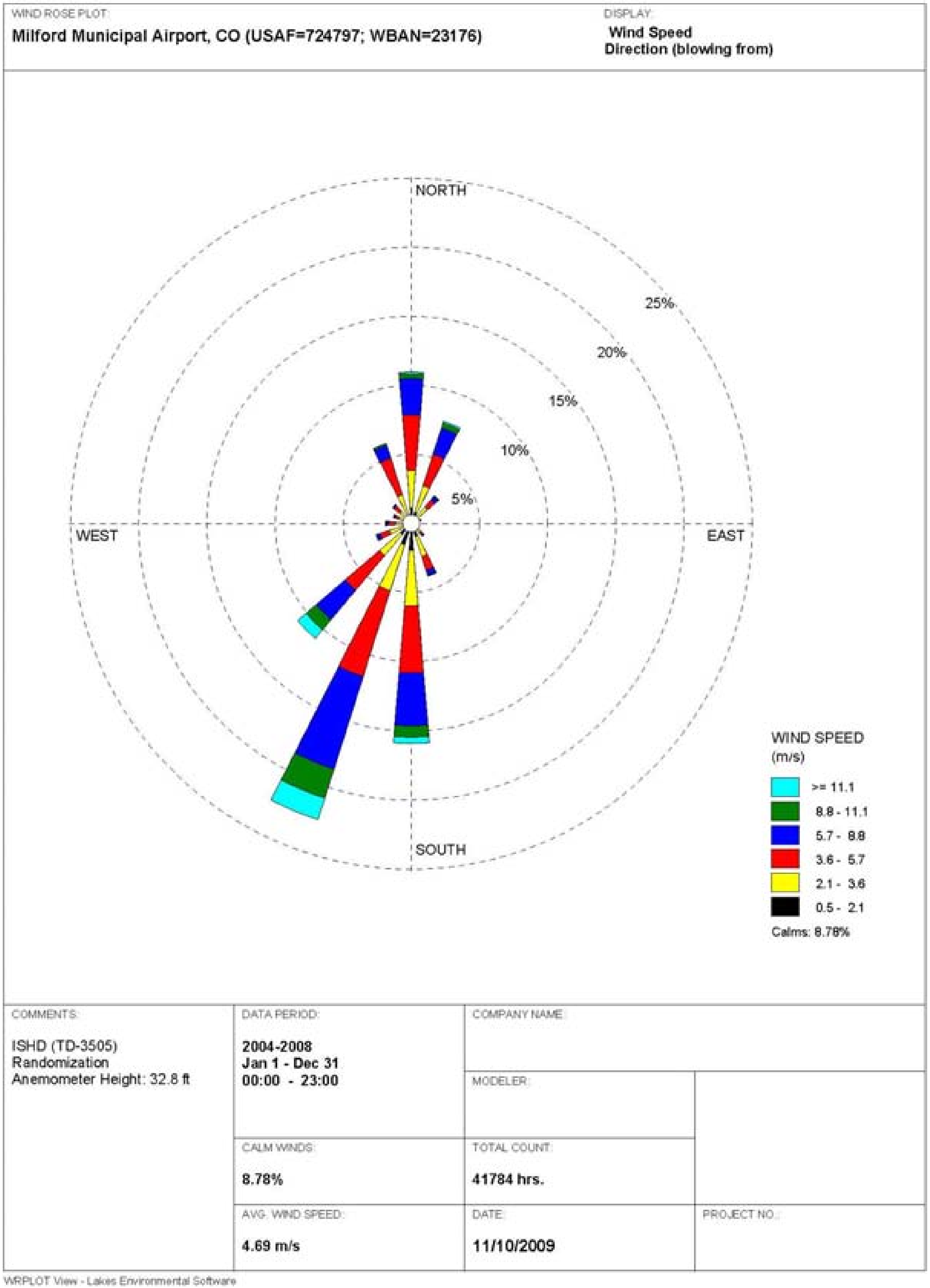

FIGURE 13.3.13.1-1 Wind Rose at 33-ft (10-m) Height at Milford Municipal Airport, Milford, Utah, 2004 to 2008 (Source: NCDC 2009b)

For the 1955 to 2008 period, annual precipitation at Wah Wah Ranch averaged about 6.77 in. (17.2 cm) (WRCC 2009). There is an average of 35 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). Precipitation is the lowest in winter and evenly distributed over spring through fall. During summer months, low-pressure storm systems in the area are rare, and precipitation during this period occurs as showers and thundershowers in widely varying amounts (NCDC 1989). Snow is usually light and powdery with below-average moisture content, starting as early as September and continuing as late as April; most of the snow falls from November through March. The annual average snowfall at Wah Wah Ranch is about 5.2 in. (13.2 cm) (WRCC 2009).

Because the area surrounding the proposed SEZ is so far from major water bodies (e.g., about 410 mi [660 km] to the Pacific Ocean) and because surrounding mountain ranges block air masses, severe weather events, such as thunderstorms and tornadoes, are rare.

No flood and high wind event were reported in Beaver County (NCDC 2010).

In Beaver County, two hail events in total, which caused no damage, have been reported since 1981. Hail measuring 1.00 in. (2.5 cm) in diameter was reported in 1981. Since 1956, 22 thunderstorm wind events up to a maximum wind speed of 79 mph (35 m/s) occurred on occasion, mostly during the summer months, but caused minimal damage (NCDC 2010).

During a fall 2009 site visit, windblown dusts were observed in Beaver County. However, no dust storm events were reported in Beaver County (NCDC 2010). The ground surface of the SEZ is covered predominantly with silty clay loams, fine sandy loams, and sandy clay loams, which have relatively moderate dust storm potential. Occasional dust storms can deteriorate air quality and visibility and have adverse respiratory health effects. High winds in combination with dry soil conditions result in blowing dust in Utah (UDEQ 2009), typically during the spring through fall months.

Complex terrain typically disrupts the mesocyclones associated with tornado-producing thunderstorms, and thus tornadoes in Beaver County, which encompasses the proposed Wah Wah Valley SEZ, occur infrequently. In the period from 1950 to July 2010, a total of six tornadoes (0.1 per year each) were reported in Beaver County (NCDC 2010). However, all tornadoes occurring in Beaver County were relatively weak (i.e., all were F0 on the Fujita tornado scale). None of these tornadoes caused deaths, injuries, or property damage or hit the area near the Wah Wah Valley SEZ (more than 15 mi [24 km] from the SEZ).

13.3.13.1.2 Existing Air Emissions

Beaver County, which encompasses the proposed Wah Wah Valley SEZ, has only a few industrial emission sources, and the amount of their emissions is relatively low. Mobile source emissions, primarily from I-15, account for substantial portions of total NO_X and CO emissions in Beaver County.

TABLE 13.3.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Beaver County, Utah, Encompassing the Proposed Wah Wah Valley SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)
SO_2	238
NO_x	2,294
CO	17,633
VOCs	43,589
PM_{10}	755
$PM_{2.5}$	164

[a] Includes point, area (including fugitive dust), onroad and nonroad mobile, biogenic, and fire emissions.

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

Source: WRAP (2009).

Data for 2002 on annual emissions of criteria pollutants and VOCs in Beaver County are presented in Table 13.3.13.1-1 (WRAP 2009). Emission data are classified into six source categories: point, area (including fugitive dust), onroad mobile, nonroad mobile, biogenic, and fire (e.g., wildfires, prescribed fires, agricultural fires, structural fires). In Beaver County, area sources were the major contributors to SO_2, PM_{10}, and $PM_{2.5}$[13]—about 58, 83, and 57%, respectively, of total county emissions. Onroad sources were major contributors to NO_x and CO emissions (48 and 60%, respectively). Biogenic sources (e.g., naturally occurring emissions from vegetation, including trees, plants, and crops) accounted for most of the VOC emissions (about 98%) and were a secondary contributor to CO emissions (about 34%). Nonroad sources were secondary contributors to SO_2, NO_x, and $PM_{2.5}$ (about 32, 38, and 26%, respectively, of total county emissions), while point sources were minor sources of criteria pollutants and VOCs. (Fire emissions were not estimated in Beaver County in 2002.)

Information on GHG emissions was not available at the county level in Utah. In 2005, the state of Utah produced about 69 MMt of *gross*[14] CO_2e emissions[15] (Roe et al. 2007). Gross GHG emissions in Utah increased by about 40% from 1990 to 2005, which was more than twice as fast as the national rate (about 16%). In 2005, electricity production (37.2%) was the primary contributor to gross GHG emission sources in Utah, followed by transportation (24.6%). Fossil fuel use (in the residential, commercial, and nonfossil industrial sectors) accounted for about 17.7% of total state emissions, while fossil fuel industry and agriculture accounted for about 6% each. Utah's *net* CO_2e emissions were about 31 MMt, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated that in 2005, CO_2 emissions from fossil fuel combustion were 66 MMt, which is comparable to the state's estimate. The electric power generation (53%) and transportation (25%) sectors accounted for more than

[13] Particulate matter (PM) is dust, smoke, and other solid particles and liquid droplets in the air. The size of the particulate is important and is measured in micrometers (μm). A micrometer is 1 millionth of a meter (0.000039 in.). PM_{10} is PM with an aerodynamic diameter less than or equal to 10 μm, and $PM_{2.5}$ is PM with an aerodynamic diameter less than or equal to 2.5 μm.

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

[15] 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.

three-fourths of the CO_2 emissions total, and the residential, commercial, and industrial sectors accounted for the remainder.

13.3.13.1.3 Air Quality

The State of Utah has adopted NAAQS for six criteria pollutants: SO_2, NO_2, CO, O_3, particulate matter (PM_{10}, and $PM_{2.5}$), and Pb (EPA 2010; Prey 2009). The NAAQS for criteria pollutants are presented in Table 13.3.13.1-2.

Beaver County, which encompasses the proposed Wah Wah Valley SEZ, is located administratively within the Utah Intrastate AQCR, along with the remaining 15 counties in Utah, except the Wasatch Front Intrastate AQCR (including Salt Lake City) and the Four Corners Interstate AQCR (including southern and east central counties in Utah). Currently, Beaver County is designated as being in unclassifiable/attainment for all criteria pollutants (Title 40, Part 81, Section 345 of the *Code of Federal Regulations* [40 CFR 81.345]).

Because of low population density, little industrial activity (except for agricultural and hog production activities), and low traffic volumes (except on I-15), anthropogenic emissions in Beaver County are small; thus, ambient air quality is relatively good. The primary air quality concern for the lower elevations in Beaver County (e.g., around the Wah Wah Valley SEZ) is soil erosion (NRCS 2005). High winds, coupled with soils that are susceptible to wind erosion, cause dust storms that can damage human health, livestock, and crops and degrade the environmental stability of the area. Many farming and ranching operations have to deepen wells and increase pump capacities to obtain access to the available well waters. Larger engines and motors to drive the higher capacity pumps have increased energy consumption and associated air emissions. Another occasional problem in the area is objectionable odor, primarily from feedlots.

No measurement data are available for criteria pollutants in Beaver County (EPA 2009b). Background concentrations of SO_2, NO_2, CO, PM_{10}, and $PM_{2.5}$ representative of Beaver County have been developed by the Utah Division of Air Quality for air-quality-modeling purposes and are presented in Table 13.3.13.1-2 (Prey 2009). Ambient air quality in Beaver County is relatively good, considering that background levels representative of Beaver County were lower than their respective standards (up to 55%), except O_3. The background O_3 concentration presented in the table taken at Zion NP from 2004 to 2008 exceeds the NAAQS. Albeit in a remote area, both local and distant point and mobile emission sources, including power plants, refineries, and lime kilns, would affect air quality at Zion NP.

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. There are several Class I areas around the proposed Wah Wah Valley SEZ, none of which are situated within 62 mi (100 km). The nearest Class I area is Zion NP (40 CFR 81.430), about 65 mi (105 km) south–southeast of the SEZ, and the other nearby Class I areas include Bryce Canyon NP and

TABLE 13.3.13.1-2 NAAQS and Background Concentration Levels Representative of the Proposed Wah Wah Valley SEZ

Pollutant[a]	Averaging Time	NAAQS[b]	Background Concentration Level	
			Concentration[c,d]	Measurement Location, Year
SO_2	1-hour	0.075 ppm[e]	NA[f]	NA
	3-hour	0.5 ppm	0.008 ppm (1.6%)	Estimate
	24-hour	0.14 ppm	0.004 ppm (2.9%)	Estimate
	Annual	0.03 ppm	0.002 ppm (6.7%)	Estimate
NO_2	1-hour	0.100 ppm[g]	NA	NA
	Annual	0.053 ppm	0.005 ppm (9.4%)	Estimate
CO	1-hour	35 ppm	1 ppm (2.9%)	Estimate
	8-hour	9 ppm	1 ppm (11%)	Estimate
O_3	1-hour	0.120 ppm[h]	NA	NA
	8-hour	0.075 ppm	0.091 ppm (121%)	Zion NP, Washington County, 2005; highest of fourth-highest daily maximum during 2004 to 2008
PM_{10}	24-hour	150 $\mu g/m^3$	83 $\mu g/m^3$ (55%)	Graymont Lime Kiln, about 17 mi (27 km) north–northeast of Black Rock in Millard County
	Annual	50 $\mu g/m^3$ [i]	21.8 $\mu g/m^3$ (44%)	
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	18 $\mu g/m^3$ (51%)	St. George, Washington County, 2005
	Annual	15.0 $\mu g/m^3$	8 $\mu g/m^3$ (53%)	Estimate, 2006
Pb	Calendar quarter	1.5 $\mu g/m^3$	0.08 $\mu g/m^3$ (5.3%)	Magna, Salt Lake County, 2005
	Rolling 3-month	0.15 $\mu g/m^3$ [j]	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] The State of Utah has adopted NAAQS for all criteria pollutants.

[c] Background concentrations for SO_2, NO_2, CO, PM_{10}, and $PM_{2.5}$ are developed for the Beaver County by the Utah Division of Air Quality for NAAQS and/or PSD modeling purposes.

[d] Values in parentheses are background concentration levels as a percentage of NAAQS. Calculation of 1-hour SO_2, 1-hour NO_2, and rolling 3-month Pb to NAAQS was not made, because no measurement data based on new NAAQS are available. Although not representative of the Beaver County, highest monitored value of Pb in Utah is presented to show that Pb is not an issue in the state of Utah.

[e] Effective August 23, 2010.

[f] NA = not applicable or not available.

[g] Effective April 12, 2010.

Footnotes continued on next page.

TABLE 13.3.13.1-2 (Cont.)

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[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 December 18, 2006, the EPA revoked the annual PM_{10} standard of 50 μg/m^3 but annual PM_{10} concentrations are presented for comparison purposes.

[j] Effective January 12, 2009.

Sources: EPA (2009b, 2010); Prey (2009).

Capital Reef NP, about 85 mi (136 km) southeast and 105 mi (169 km) east–southeast of the SEZ, respectively. These Class I areas are not located directly downwind of prevailing winds at the SEZ (see Figure 13.3.13.1-1).

13.3.13.2 Impacts

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

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Wah Wah Valley SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 13.3.13.3 below identifies SEZ-specific design features of particular relevance to the Wah Wah Valley SEZ.

13.3.13.2.1 Construction

The proposed Wah Wah Valley SEZ has a relatively flat terrain; thus only minimum 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, which has 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 2009c). 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 levels at the site boundaries and nearby communities and with PSD increment levels at nearby Class I areas.[16,17] However, no receptors were modeled for PSD analysis at the nearest Class I area, Zion NP, because it is about 65 mi (105 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for AERMOD. Instead, several regularly spaced receptors in the direction of the Zion NP were selected as surrogates for the PSD analysis. For the Wah Wah Valley SEZ, the modeling was conducted based on the following assumptions and input:

- Emissions were distributed uniformly over the 3,000 acres (12.1 km^2), and in the upper half of the SEZ, close to the nearest residences adjacent to the northern SEZ boundary;

- Surface hourly meteorological data came from the Milford Municipal Airport and upper air sounding data from Salt Lake City for the 2004 to 2008 period; and

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

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 13.3.13.2-1. The maximum 24-hour PM_{10} concentration increment modeled at the site boundaries is 576 $\mu g/m^3$, which far exceeds the relevant standard of 150 $\mu g/m^3$. The total 24-hour PM_{10} concentration (increment plus background) of 659 $\mu g/m^3$ would further exceed this standard at the SEZ boundary. However,

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16 To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS 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.

17 In Utah, construction lasting less than 180 days might be considered temporary and not require modeling (Maung 2009). For a longer development time, modeling would be required if PM_{10} emissions exceeded 5 tons/yr. However, for a staged development in which different areas were being developed at different times, the decision to require modeling would depend on the details of the development plan. In all situations, the state must be informed of development plans and must be presented with a written fugitive dust control plan.

TABLE 13.3.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Wah Wah Valley SEZ

			Concentration ($\mu g/m^3$)				Percentage of NAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS	Increment	Total
PM_{10}	24-hour	H6H	576	83	659	150	384	439
	Annual[d]	NA[e]	87.7	21.8	110	50	175	219
$PM_{2.5}$	24-hour	H8H	42.0	18	60.0	35	120	171
	Annual	NA[e]	8.8	8	16.8	15.0	58	112

[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 13.3.13.1-2 (Source: Prey [2009]).

[d] Effective December 18, 2006, the EPA revoked the annual PM_{10} standard of 50 $\mu g/m^3$ but annual PM_{10} concentrations are presented for comparison purposes.

[e] NA = not applicable.

high PM_{10} concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. The predicted maximum 24-hour concentration increment is about 353 $\mu g/m^3$ at the nearest residences, adjacent to the northern SEZ boundary. There are no communities north of the Wah Wah Valley SEZ, which is downwind of prevailing winds in the area. Predicted maximum 24-hour PM_{10} concentration increments would be much lower, about 5 $\mu g/m^3$ or less at communities along the nearby valley; about 4 $\mu g/m^3$ at Milford and less than 1 $\mu g/m^3$ at Minersville. Annual modeled PM_{10} concentration increments and total concentration at the SEZ boundary are 88 and 110 $\mu g/m^3$, respectively. These concentrations are higher than the standard of 50 $\mu g/m^3$, which was revoked by the EPA in 2006. Annual PM_{10} concentration increments would be lower at the aforementioned residences or communities—about 51 $\mu g/m^3$ at the nearest residences, and 0.2 $\mu g/m^3$ or less at aforementioned communities.

Total 24-hour $PM_{2.5}$ concentrations would be about 60 $\mu g/m^3$ at the SEZ boundary, which is higher than the standard of 35 $\mu g/m^3$; modeled concentrations are more than twice the background concentrations in this total. The total annual average $PM_{2.5}$ concentration would be about 16.8 $\mu g/m^3$, which is somewhat higher than the standard of 15.0 $\mu g/m^3$. At the nearest residences, the predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about of about 28 and 5.1 $\mu g/m^3$, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I area—Zion NP—would be about 8.2 and 0.26 $\mu g/m^3$, or 102 and 6.6% of the PSD increments for the Class I area, respectively. These surrogate receptors are more than 36 mi (58 km) from Zion NP, and thus predicted concentrations in the Zion NP would be lower than those values (about 47% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

In conclusion, during the construction of solar facilities, predicted 24-hour and annual PM_{10} and $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas. 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 residences (except the nearest residences adjacent to the northern SEZ boundary) and communities would be lower. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area (Zion NP). Construction activities are not subject to the PSD program, and the comparison provides only a screen to gauge the size of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearest federal Class I area, Zion NP, which is not located directly downwind of prevailing winds. SO_x emissions from engine exhaust would be very low, because programmatic design features would require that ultra-low-sulfur fuel with a sulfur content of 15 ppm be used. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary and thus would cause some unavoidable but short-term impacts.

Transmission lines within a designated ROW would be constructed to connect to the nearest regional grid. A regional 138-kV transmission line is located about 42 mi (68 km) southeast of the Wah Wah Valley SEZ; thus construction of a transmission line over this relatively long distance would likely be needed. Construction activities would result in fugitive dust emissions from soil disturbance and engine exhaust emissions from heavy equipment and vehicles. The duration of transmission line construction from the Wah Wah Valley SEZ could be performed in about three years. However, the construction site along the transmission line ROW would move continuously; thus no particular area would be exposed to air emissions for a prolonged period. Therefore, potential air quality impacts on nearby residences along the transmission line ROW, if any, would be minor and temporary.

13.3.13.2.2 Operations

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

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

Estimates of potential air emissions displaced by solar project development at the Wah Wah Valley SEZ are presented in Table 13.3.13.2-2. Total power generation capacity ranging from 542 to 976 MW is estimated for the Wah Wah Valley SEZ for various solar technologies (see Section 13.3.1.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009d). If the Wah Wah Valley SEZ were fully developed, it is expected that emissions avoided would be substantial. Development of solar power in the SEZ would result in avoided air emissions ranging from 2.6 to 4.6% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Utah (EPA 2009d). Avoided emissions would be up to

TABLE 13.3.13.2-2 Annual Emissions from Combustion-Related Power Generation Displaced by Full Solar Development of the Proposed Wah Wah Valley SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emission Rates (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
6,097	542–976	950–1,709	945–1,701	1,807–3,253	0.004-0.007	1,024–1,844
Percentage of total emissions from electric power systems in Utah[d]			2.6–4.6%	2.6–4.6%	2.6–4.6%	2.6–4.6%
Percentage of total emissions from all source categories in Utah[e]			1.7–3.1%	0.74–1.3%	NA[f]	1.4–2.5%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.38–0.68%	0.49–0.88%	0.13–0.23%	0.39–0.70%
Percentage of total emissions from all source categories in the six-state study area[e]			0.20–0.36%	0.07-0.12%	NA	0.12–0.22%

[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% is assumed.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 1.99, 3.81, 7.8×10^{-6}, and 2,158 lb/MWh, respectively, were used for the state of Utah.

[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] NA = not estimated.

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

0.9% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities would displace up to 3.1% of SO_2, 1.3% of NO_x, and 2.5% of CO_2 emissions in the state of Utah (EPA 2009a; WRAP 2009). These emissions would be up to 0.4% of total emissions from all source categories in the six-state study area Power generation from fossil fuel–fired power plants accounts for about 97.5% of the total electric power generation in Utah, most of which is from coal combustion (more than 94%). Thus, solar facilities built in the Wah Wah Valley 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 higher voltage lines during rain or very humid conditions. Since the proposed SEZ in Utah 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.

13.3.13.2.3 Decommissioning/Reclamation

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

13.3.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Wah Wah Valley SEZ (as by increased watering frequency or road paving or treatment) is a required programmatic 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.

13.3.14 Visual Resources

13.3.14.1 Affected Environment

As shown in Figure 13.3.14.1-1, the proposed Wah Wah Valley SEZ is located in Wah Wah Valley, a north–south trending valley northwest of the Escalante Desert, across the Shauntie Hills, and lying between the Wah Wah Mountains to the west and southwest, the Shauntie Hills to the south and southeast, and the San Francisco Mountains to the east. Within the SEZ, elevation ranges from 4,874 to 5,093 ft (1,486 to 1,552 m).

The SEZ is within a flat, treeless, relatively narrow north–south trending valley. The horizon line and forms of mountains to the east and west of the SEZ are the dominant visual features. Vegetation consists primarily of low shrubs (generally less than 1 ft [0.3 m] in height), but during a September 2009 site visit, much of the SEZ appeared devoid of vegetation, or nearly so, with broad expanses of gravel and sand flats dominating foreground-middleground views. The area may be more heavily vegetated during different seasons. During the site visit, the very sparse vegetation presented a range of pale yellows, light browns, and grays, with very little banding or other variation. Most areas presented a uniform gray from bare soil, with an occasional plant; however, slightly more vegetation is present in the far southern portion of the site. During the site visit, significant windblown dust was present constantly, severely limiting visibility. Some or all of the vegetation might be snow-covered in winter, which might significantly affect the visual qualities of the area by changing the color contrasts associated with the vegetation, which could in turn change the contrasts associated with the introduction of solar facilities into the landscape. No water features are present on the site. This landscape type is common within the region. Panoramic views of the site are shown in Figures 13.3.14.1-2, 13.3.14.1-3, and 13.3.14.1-4.

State Route 21 passes through the northern portion of the SEZ. Travelers on the highway would be the primary viewers of the SEZ, because there are few inhabitants in the area and few visitors to the SEZ and its immediate surroundings. Several unpaved roads cross the site. An historic power line with poles is visible crossing portions of the site. No active electric transmission lines are located within the SEZ. Other than State Route 21, the few dirt roads, and wire fences, there is little evidence of cultural modifications within the SEZ that detract from the site's scenic quality.

Off-site views include the Wah Wah Mountains to the west and south and the San Francisco Mountains to the east. These mountains are large enough and close enough to dominate views to the east and west from the SEZ. Furthermore, the visual line of State Route 21 draws the viewer's attention to the mountains, particularly to the west, because that is where the highway extends through a mountain pass (Wah Wah Pass), which makes a pronounced visual break in the line of the Wah Wah Mountains. Both the Wah Wah Mountains and San Francisco Mountains add to the scenic quality of the SEZ by providing a dramatic backdrop to views that include them.

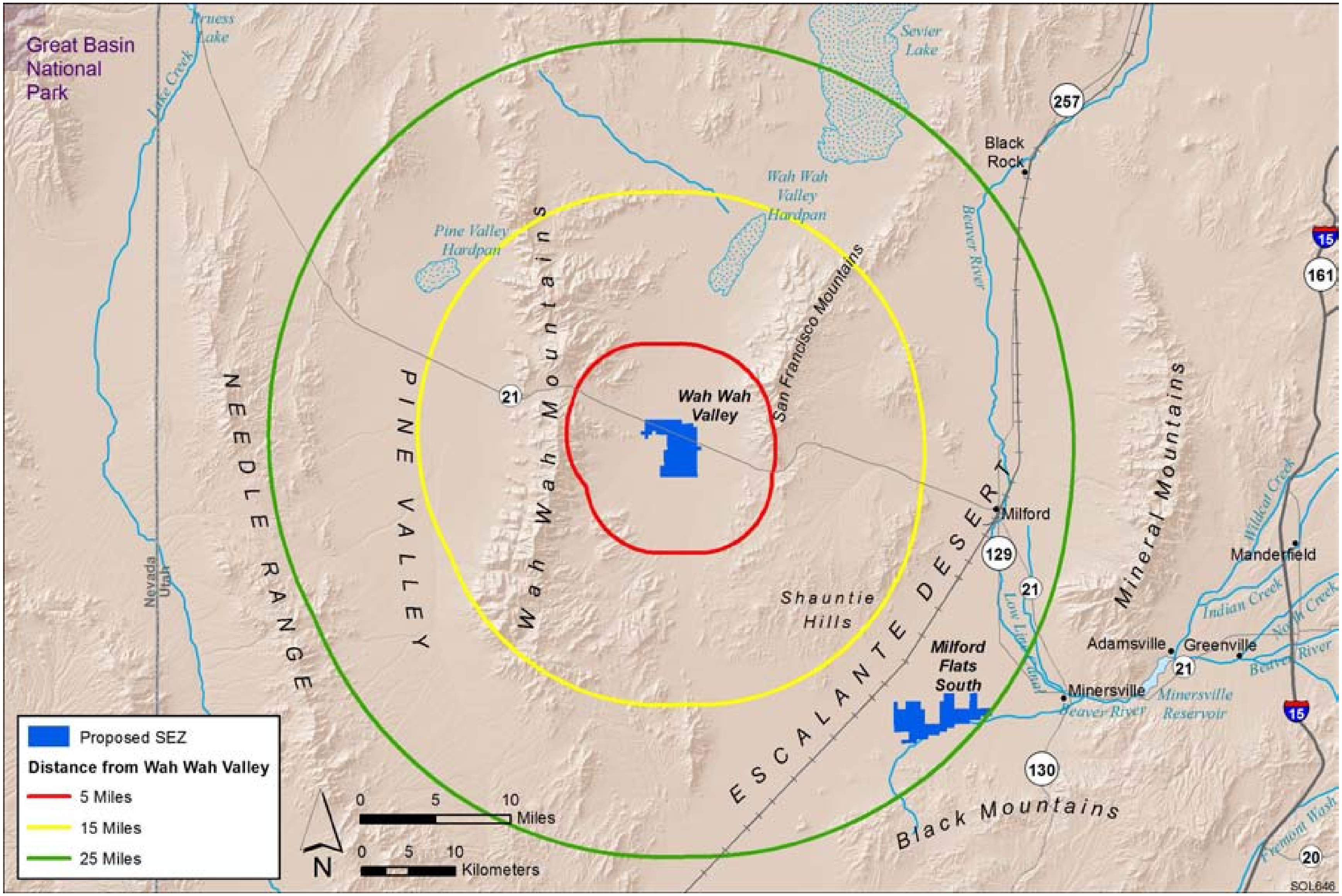

FIGURE 13.3.14.1-1 Proposed Wah Wah Valley SEZ and Surrounding Lands

FIGURE 13.3.14.1-2 Approximately 180° Panoramic View of the Proposed Wah Wah Valley SEZ, Looking West from the Eastern Boundary of the Proposed SEZ on State Route 21

FIGURE 13.3.14.1-3 Approximately 120° Panoramic View of the Proposed Wah Wah Valley SEZ, Looking North–Northwest from the Northwest Portion of the Proposed SEZ, with Off-Site Ranch Visible at Far Right and Wah Wah Mountains Left and Center

FIGURE 13.3.14.1-4 Approximately 120° Panoramic View of the Proposed Wah Wah Valley SEZ, Looking East from Central Section of the Proposed SEZ, with Frisco Peak Visible at Far Left

Other than State Route 21, few off-site cultural disturbances are visible from the SEZ; however, a ranch with irrigated agricultural lands is immediately north of the northern boundary of the SEZ and is visible from the northern portion of the SEZ. The ranch includes several low buildings that introduce strong regular geometry into the landscape and provide contrast in form, color, and texture. The ranch also includes many trees, which introduce contrasts in form, line, color, and texture in the otherwise treeless, flat landscape; however they provide a natural appearing screen to some of the man-made structures.

Current land uses within the SEZ include grazing, general outdoor recreation, backcountry driving and OHV use, and hunting for both small and big game. The land is used mostly by local residents, but usage levels are low. Because the SEZ location is remote, with few people living nearby and with frequent windblown dust, there are few visitors, and the number of viewers is relatively low. As noted previously, most viewers would be travelers on State Route 21, but that road is relatively lightly traveled.

The BLM conducted a VRI for the SEZ and surrounding lands in 2009 to 2010 (BLM 2010a). The VRI evaluates BLM-administered lands based on *scenic quality*; *sensitivity level,* in terms of public concern for preservation of scenic values in the evaluated lands; and *distance* from travel routes or key observation points. Based on these three factors, BLM-administered lands are placed into one of four Visual Resource Inventory Classes, which represent the relative value of the visual resources. Classes I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas 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 available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI values for the SEZ and immediate surroundings are VRI Class IV, indicating low relative visual values. The inventory indicates low scenic quality for the SEZ and its immediate surroundings, based primarily on the lack of topographic relief and water features, grazing damage, and the relative commonness of the landscape type within the region. The SEZ also received very low scores for variety in vegetation types and color. The SEZ was noted as being in need of rehabilitation to restore visual values. A positive visual attribute noted in the inventory was the attractive off-site views; however, this positive attribute was insufficient to raise the scenic quality to the “Moderate” level. The inventory indicates low sensitivity for the SEZ and its immediate surroundings, due in part to relatively low levels of use and public interest. More information about the VRI methodology is available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

Lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain 57,070 acres (230.95 km^2) of VRI Class II areas, primarily in the mountains east and west of the SEZ; 9.014 acres (36.48 km^2) of Class III areas on mountain slopes mountains northeast and southwest of the SEZ; and 84,806 acres (343.20 km^2) of VRI Class IV areas, concentrated primarily in the Wah Wah Valley and nearby mountain ranges south of the SEZ. The VRI map for the SEZ and surrounding lands is shown in Figure 13.3.14.1-5.

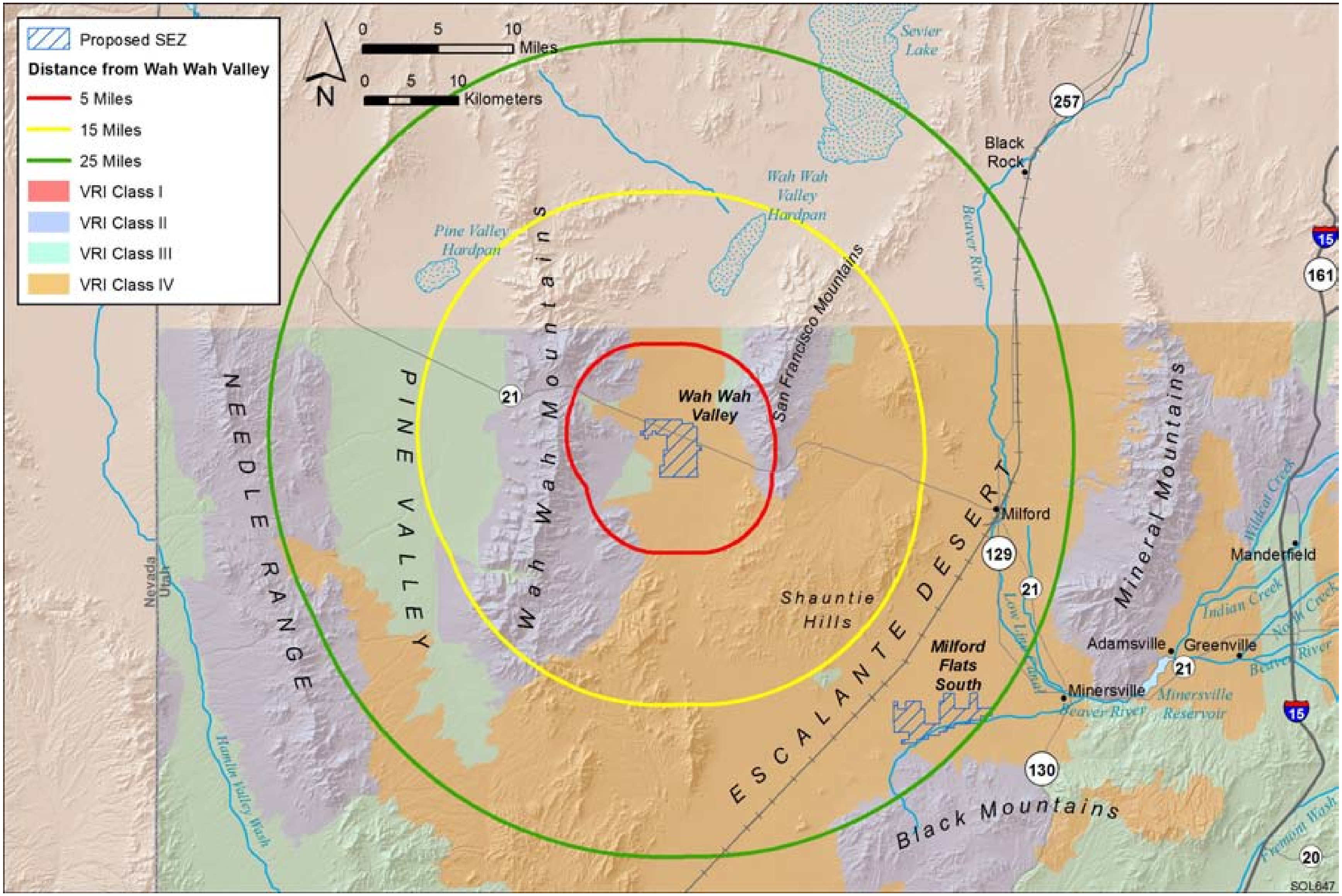

FIGURE 13.3.14.1-5 Visual Resource Inventory Values for the Proposed Wah Wah Valley SEZ and Surrounding Lands

The Pinyon Management Framework Plan (BLM 1983a) indicates that the entire SEZ is managed as VRM Class IV, which permits major modification of the existing character of the landscape. The VRM map for the SEZ and surrounding lands is shown in Figure 13.3.14.1-6. More information about the BLM VRM program is available in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

13.3.14.2 Impacts

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

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

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

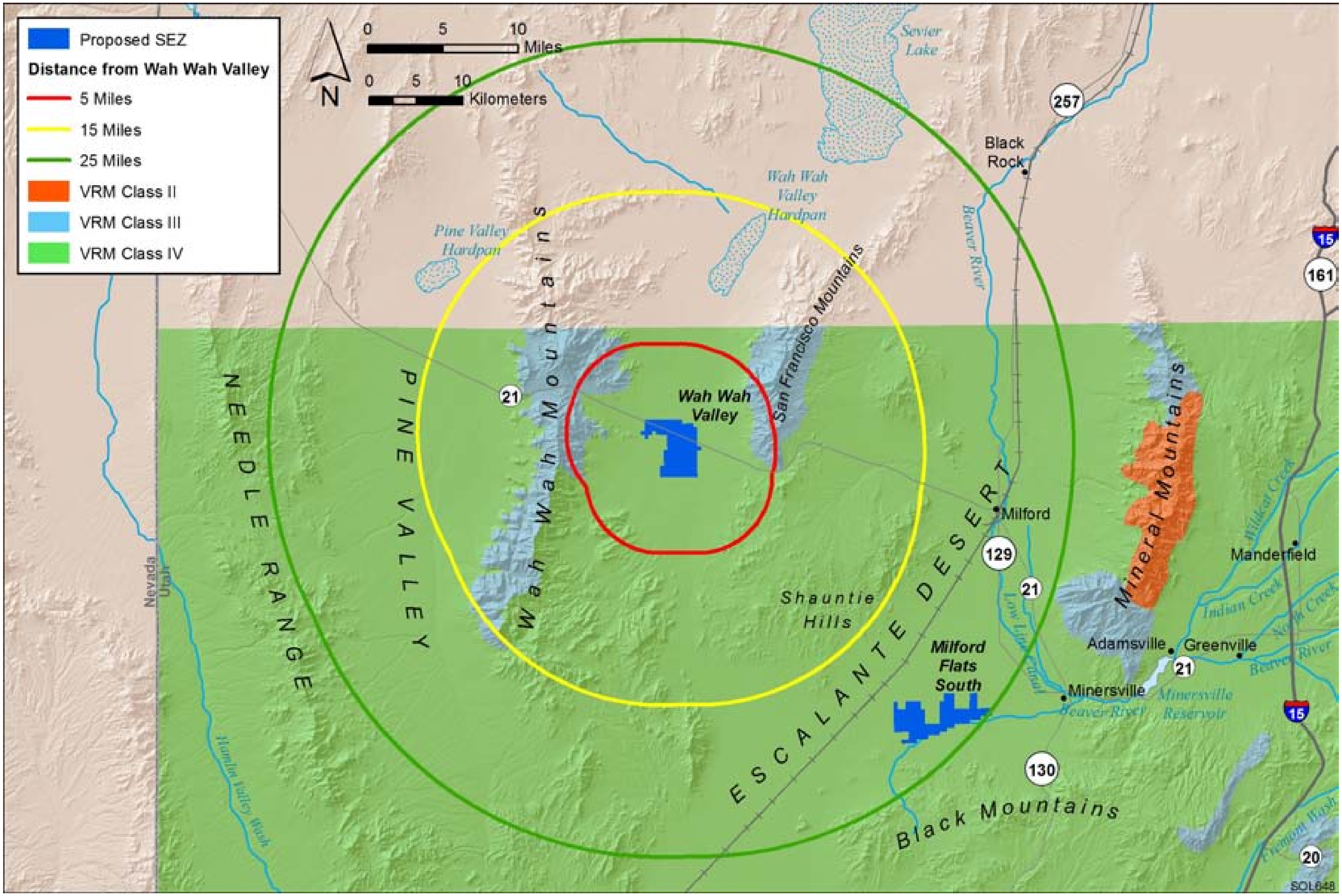

FIGURE 13.3.14.1-6 Visual Resource Management Classes for the Proposed Wah Wah Valley SEZ and Surrounding Lands

13.3.14.2.1 Impacts on the Proposed Wah Wah Valley SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts would occur on the SEZ as a result of the construction, operation, and decommissioning of solar energy facilities. In addition, large impacts could occur at solar facilities using highly reflective surfaces or major light-emitting facility components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby.

Additional potential 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 6.5.

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 available 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.

13.3.14.2.2 Impacts on Lands Surrounding the Proposed Wah Wah Valley SEZ

Impacts on Selected Sensitive Visual Resource Areas

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 5.7). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendix M for important information on assumptions and limitations of the methods used). Four viewshed analyses were run, one each for four different heights assumed to be 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 available in Appendix N.

Figure 13.3.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and presence of adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

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

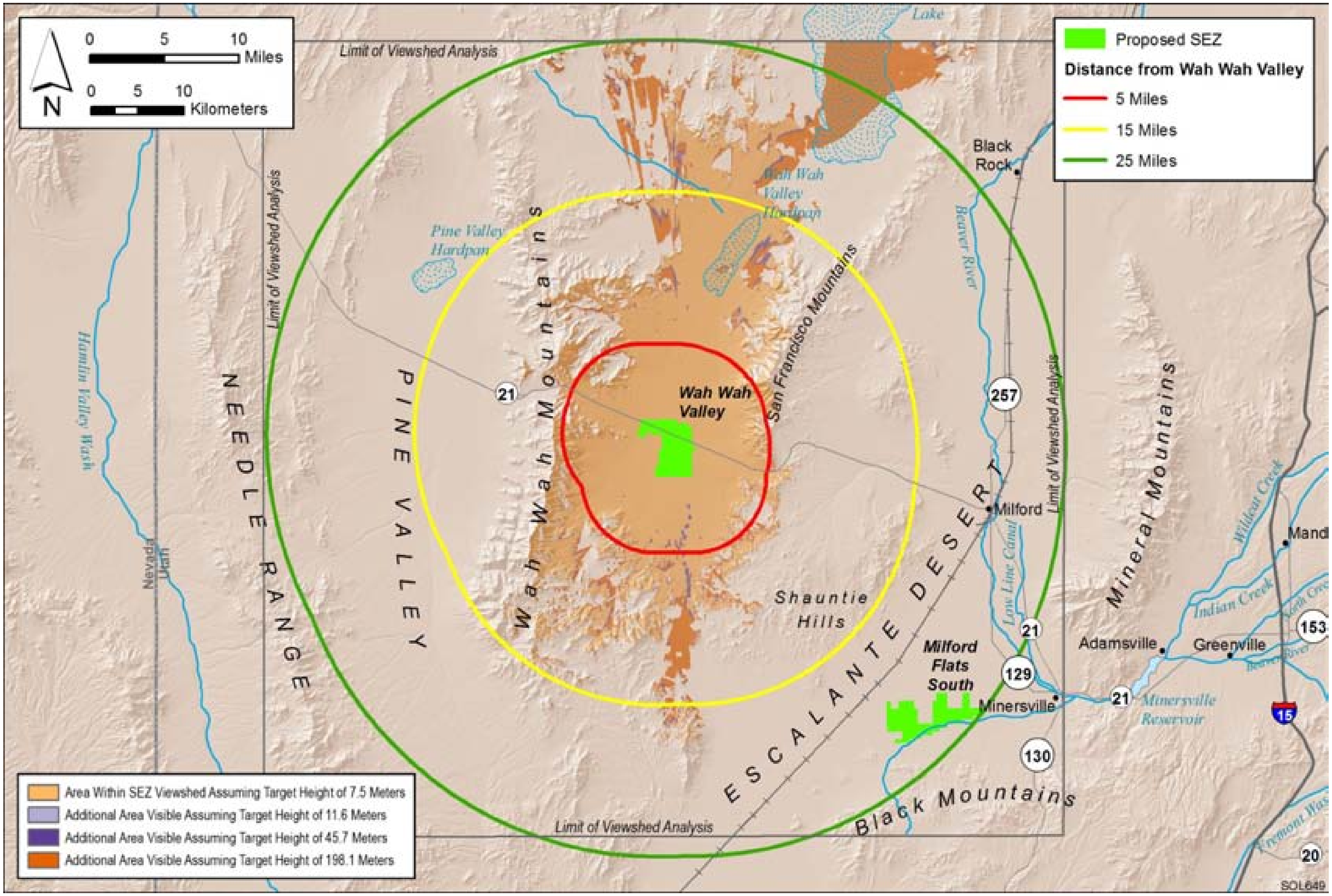

FIGURE 13.3.14.2-1 Viewshed Analyses for the Proposed Wah Wah Valley SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

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

Figure 13.3.14.2-2 shows the results of a GIS analysis that overlaid selected federal, state, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds to illustrate which of these sensitive visual resource areas could have views of solar facilities within the SEZ and therefore would potentially 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 to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analysis were as follows:

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

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Wah Wah Valley SEZ are discussed below. The results of this analysis are also summarized in Table 13.3.14.2-1. Further discussion of impacts on these areas is available in Sections 13.3.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 13.3.17 (Cultural Resources) of this PEIS.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the landscape as seen by viewers, including

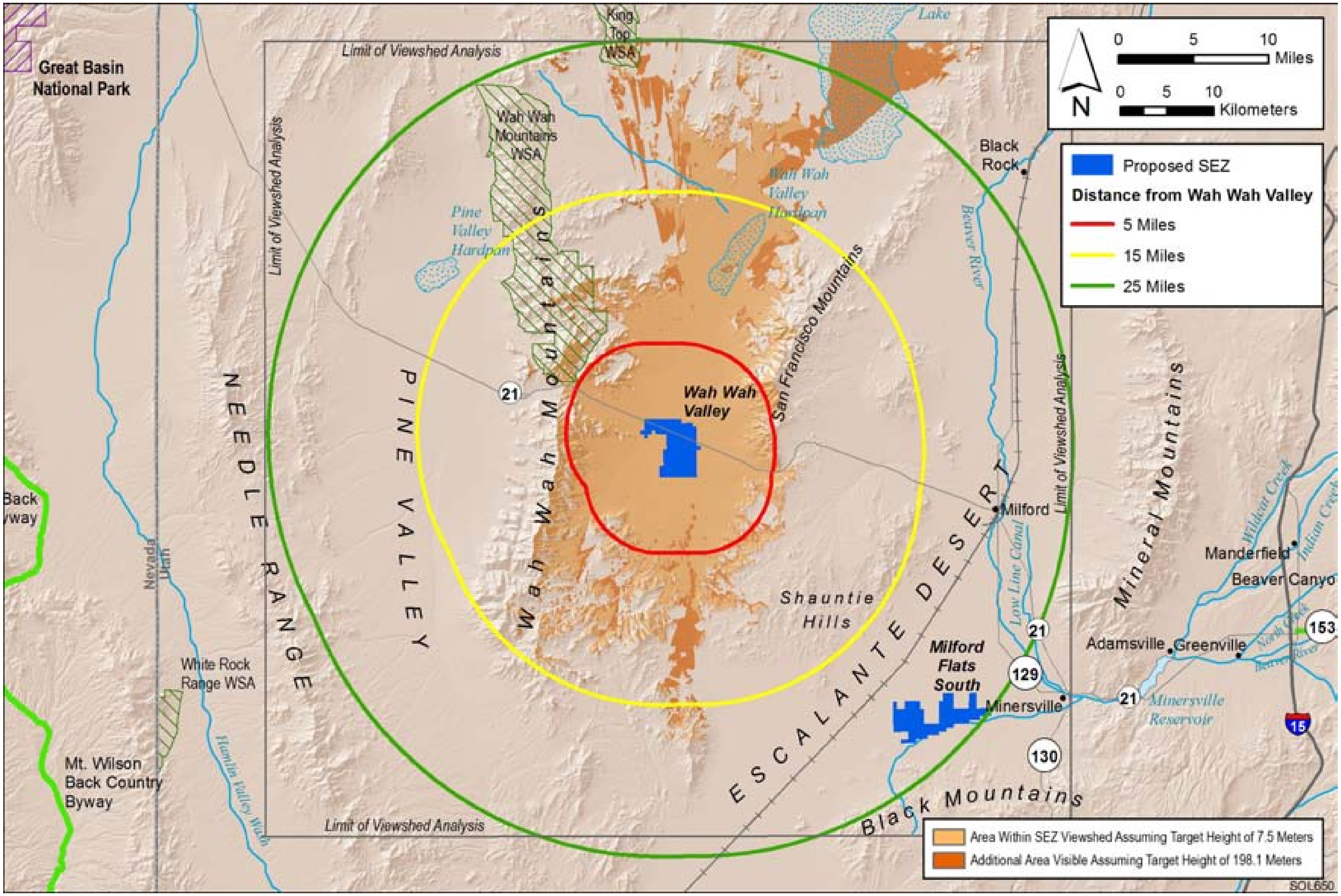

FIGURE 13.3.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Wah Wah Valley SEZ

TABLE 13.3.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40.2-km) Viewshed of the Proposed Wah Wah Valley SEZ, Assuming a Viewshed Analysis Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[a]		
			Visible between	
Feature Type	Feature Name and Total Acreage	Visible within 5 mi	5 and 15 mi	15 and 25 mi
WSA	King Top (92,808 acres)	0 acres	0 acres	969 acres (1%)[b]
	Wah Wah Mountains (49,406 acres)	0 acres	3,777 acres (8%)	0 acres

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

[b] Percentage of total feature area for areal features.

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 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.

Wilderness Study Areas

- *Wah Wah Mountain*s. The Wah Wah Mountains WSA is about 5 mi (8 km) northwest of the SEZ at the point of closest approach and encompasses 49,406 acres (200 km^2). Elevations in the southern mountains of the WSA range from 6,400 ft (1,951 m) to 8,900 ft (2,713 m). The Wah Wah Mountains ACEC is located within the southern portion of the WSA and was designated for its biological resources.

  As shown in Figure 13.3.14.2-2, solar energy facilities within the SEZ could be visible from much of the southeast portion of the WSA (about 3,777 acres [15.3 km^2] in the 650-ft (198.1-m) viewshed, or 8% of the total WSA acreage. Portions of the WSA within the 24.6-ft (7.5-m) viewshed encompass about 3,288 acres (13.31 km^2) or 6.7% of the total WSA acreage. The main visible area of the WSA extends from the point of closest approach to a few small areas of visibility out to approximately 10.3 mi (16.6 km).

Figure 13.3.14.2-3 is a three-dimensional Google Earth perspective visualization of the SEZ (highlighted in orange) as seen from a high, unnamed peak (elevation about 8,900 ft [2,700 m]) at the far southern end of the WSA, about 6.8 mi (11 km) from the northwest corner of the SEZ, and 4,000 ft (1,230 m) above the valley floor. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aide for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (139.9-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing about 100 MW of electric generating capacity. Two models were placed in the SEZ for this and other visualizations shown in this section of the PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The upper slopes and peaks of the Wah Wah Mountains are covered with scattered low trees and shrubs, insufficient for screening views of the SEZ from most locations within the WSA. As shown in the visualization, the entire SEZ would be visible from this location and would occupy a substantial portion of the field of view. At this and other higher-elevation viewpoints within the WSA, the angle of view would not be great enough that the tops of solar collector arrays within the SEZ would be visible.

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

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.

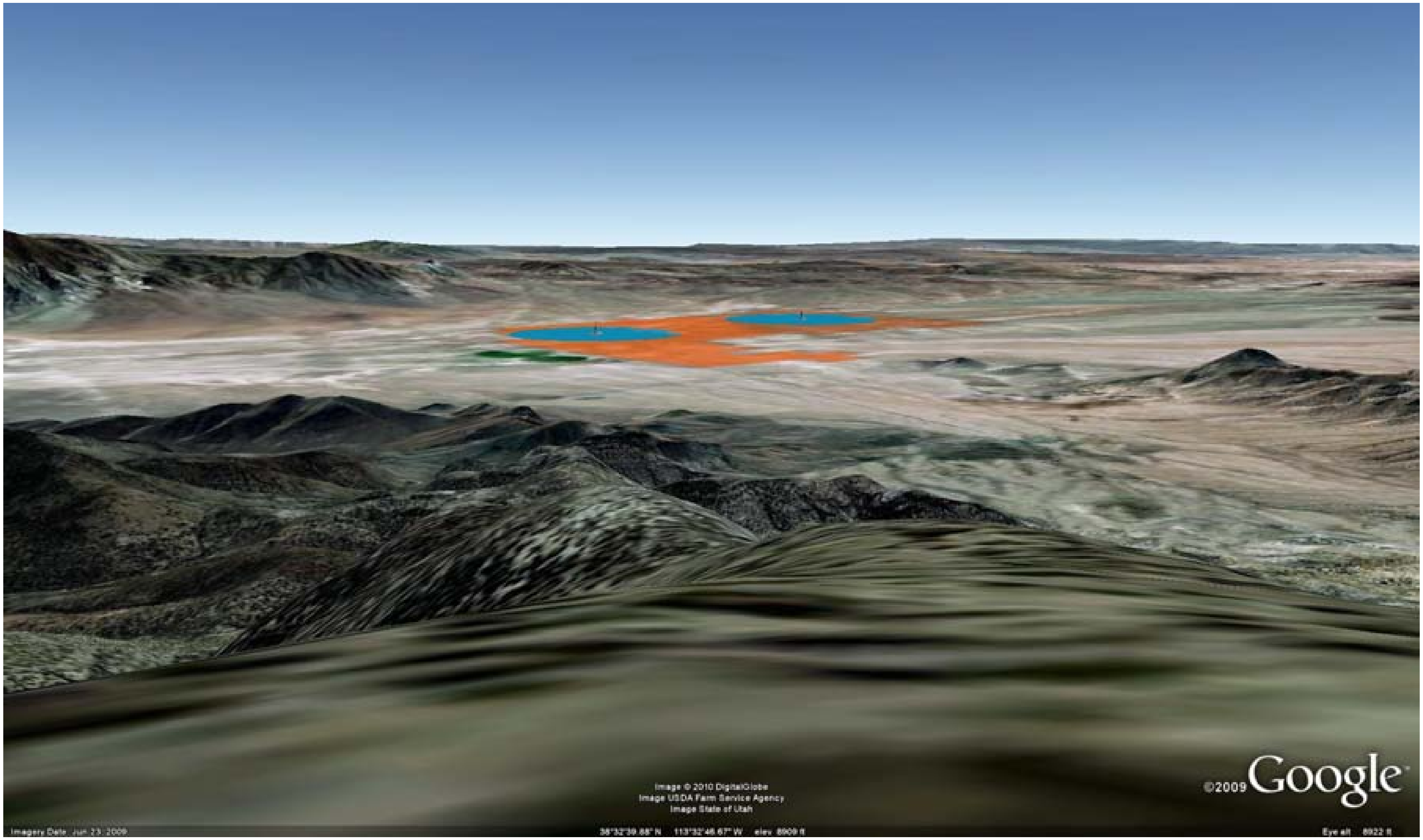

FIGURE 13.3.14.2-3 Google Earth Visualization of the Proposed Wah Wah Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Southern Peak in the Wah Wah Mountains WSA

also be possible, but their extent would depend on the materials and surface treatments utilized in the facilities.

If operating power towers were present within the SEZ, the receivers would likely appear as bright points of light atop discernable tower structures against the backdrop of the Wah Wah Valley floor, and could be conspicuous from this viewpoint. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WSA at night, and could be conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

The potential visual contrast expected for this viewpoint would depend on 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 this PEIS, solar facilities within the SEZ would be expected to create moderate visual contrasts as viewed from this location.

Figure 13.3.14.2-4 is a Google Earth visualization of the SEZ as seen from an unnamed peak (elevation about 8,900 ft [2,700 m]) near the northern limit of the SEZ viewshed within the WSA, 9.7 mi (15.5 km) from the northwest corner of the SEZ and about 3,200 ft (980 m) above the valley floor.

As shown in the visualization, nearly the entire SEZ is visible from this location, except the far northwest corner. The SEZ occupies a substantial portion of the field of view. Because of the increased distance and lower viewpoint elevation, the SEZ is seen at a somewhat lower viewing angle than in Figure 13.3.14.2-3, reducing the apparent size of the SEZ and the model facilities shown in the view. Also, this viewing angle shows the model facilities more edge on so that they appear to repeat the line of the horizon, tending to reduce visual contrast somewhat. The angle of view is still high enough that the tops of solar collector arrays within the SEZ would be visible. Taller solar facility components, such as transmission towers, could be visible, depending on lighting, but might not be noticed by casual observers.

If operating power towers were present within the SEZ, the receivers would likely appear as bright points of light atop discernable tower structures against the backdrop of the Wah Wah Valley floor. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from this viewpoint from this viewpoint at night. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario

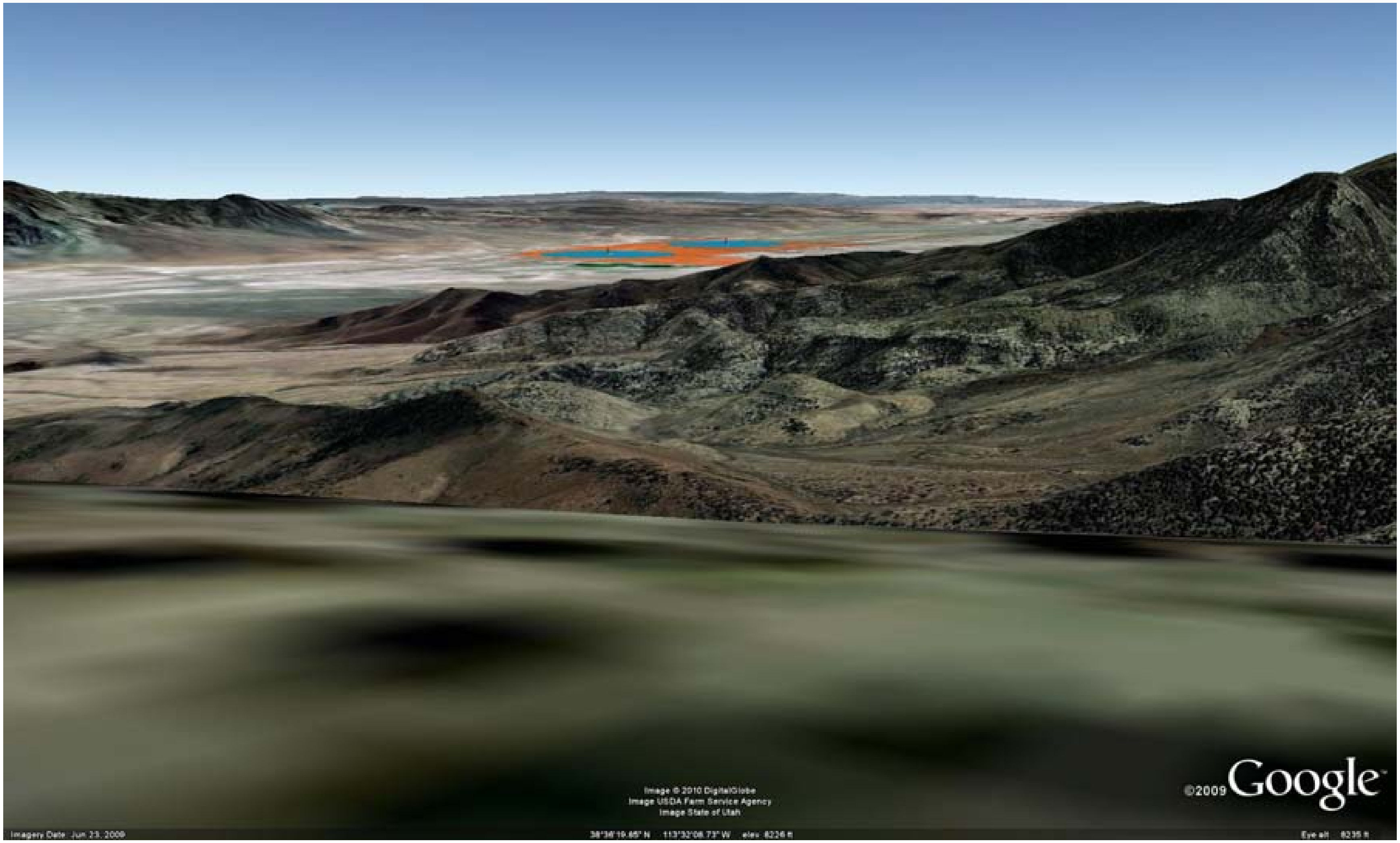

FIGURE 13.3.14.2-4 Google Earth Visualization of the Proposed Wah Wah Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak near the Northern Limit of the SEZ Viewshed in the Wah Wah Mountains WSA

analyzed in this PEIS, solar facilities within the SEZ would be expected to create weak visual contrasts as viewed from this location.

In general, potential visual contrast expected for viewers within the WSA would be highly dependent on viewer locations in the WSA, but would also depend on the numbers, types, sizes, and locations of solar facilities in the SEZ, as well as other project- and site-specific factors. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create weak to moderate visual contrasts as viewed from the WSA. The highest levels of visual contrast would be expected for viewing locations at higher elevations in the far southern portion of the WSA, with less visibility and lower contrast levels expected at the more distant locations in the SEZ viewshed farther north within the WSA and at lower elevations.

- *King Top.* King Top WSA is located about 23.6 mi (38.0 km) north of the SEZ at the point of closest approach and encompasses 92,808 acres (375.6 km^2). Within the 25-mi (40-km) SEZ viewshed analyzed in the PEIS, the Wah Wah Valley SEZ is visible from portions of the Confusion Range in the far southern end of the King Top WSA. As shown in Figure 13.3.14.2-2, the closest points in the WSA are farther than 23 mi (38 km) from the SEZ, and much of the western portion of the SEZ is screened from view by intervening mountain ranges. Portions of the WSA within the 650-ft (198.1-m) viewshed (approximately 969 acres [3.9 km^2], or 1% of the total WA acreage) extend from the point of nearest approach to beyond 25 mi (40 km) from the SEZ. Portions of the WSA within the 24.6-ft (7.5-m) viewshed encompass about 587 acres (2.4 km^2) or 0.6% of the total WSA acreage.

  Because of the large distance to the SEZ and partial screening of the SEZ from view, the SEZ would occupy a very small portion of the field of view as seen from the King Top WSA. Furthermore, the angle of view would be quite low, so that solar facilities within the visible portion of the SEZ would be seen edge on, reducing their visible area and repeating the line of the horizon, which would tend to reduce visual contrast. At more than 23 mi (38 km), low-height solar facilities and some other solar and ancillary facilities might be hard to distinguish from the background textures and colors. Power tower receivers within the visible portion of the WSA would likely be visible as distant points of light just under the southern horizon, viewed against the Wah Wah Valley floor. If sufficiently tall, power towers within the SEZ could have red or white flashing hazard navigation lights that could be visible at night from this and other locations in the Kingtop WSA.

  Visual contrasts associated with solar energy development within the SEZ would depend on viewer location within the WSA; solar facility type, size, and location within the SEZ; and other visibility factors. Where there was a clear view of the SEZ, weak levels of visual contrast would be expected under the 80% development scenario analyzed in the PEIS.

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other nonfederal sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. Currently, there are no suitable transmission lines within the proposed SEZ; thus, construction and operation of a transmission line both inside and outside the proposed SEZ would be required. 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

State Route 21. As shown in Figure 13.3.14.2-2, approximately 16 mi (26 km) of State Route 21 is within the 650-ft (198.1-m) viewshed of the Wah Wah Valley SEZ, with about 3.8 mi (6.1 km) of the route passing through the northern half of the SEZ from east-southeast to west-northwest. State Route 21 crosses the Wah Wah Valley from east-southeast to west-northwest through two mountain passes on either side of the valley. From both directions, State Route 21 descends long slopes to the SEZ in the middle of the valley floor. Consequently, motorists traveling both directions on State Route 21 would have extended, open views of solar facilities within the SEZ. These views would be from elevated viewpoints near the passes, but from successively lower elevations approaching the SEZ. For travelers approaching the SEZ at highway speeds, the SEZ would be in view for about five minutes prior to entering the SEZ, regardless of the direction of travel, and three to four minutes would be required to cross the SEZ itself.

Figure 13.3.14.2-5 is a Google Earth perspective visualization of the SEZ as seen from State Route 21, about 5.2 mi (8.3 km) east of the SEZ, facing northwest toward the northern portion of the SEZ. The visualization suggests that from this location, the SEZ would occupy much of the horizontal field of view, but the viewing angle would be low, and the SEZ would appear as a horizontal band across the valley floor at the base of the Wah Wah Mountains. The

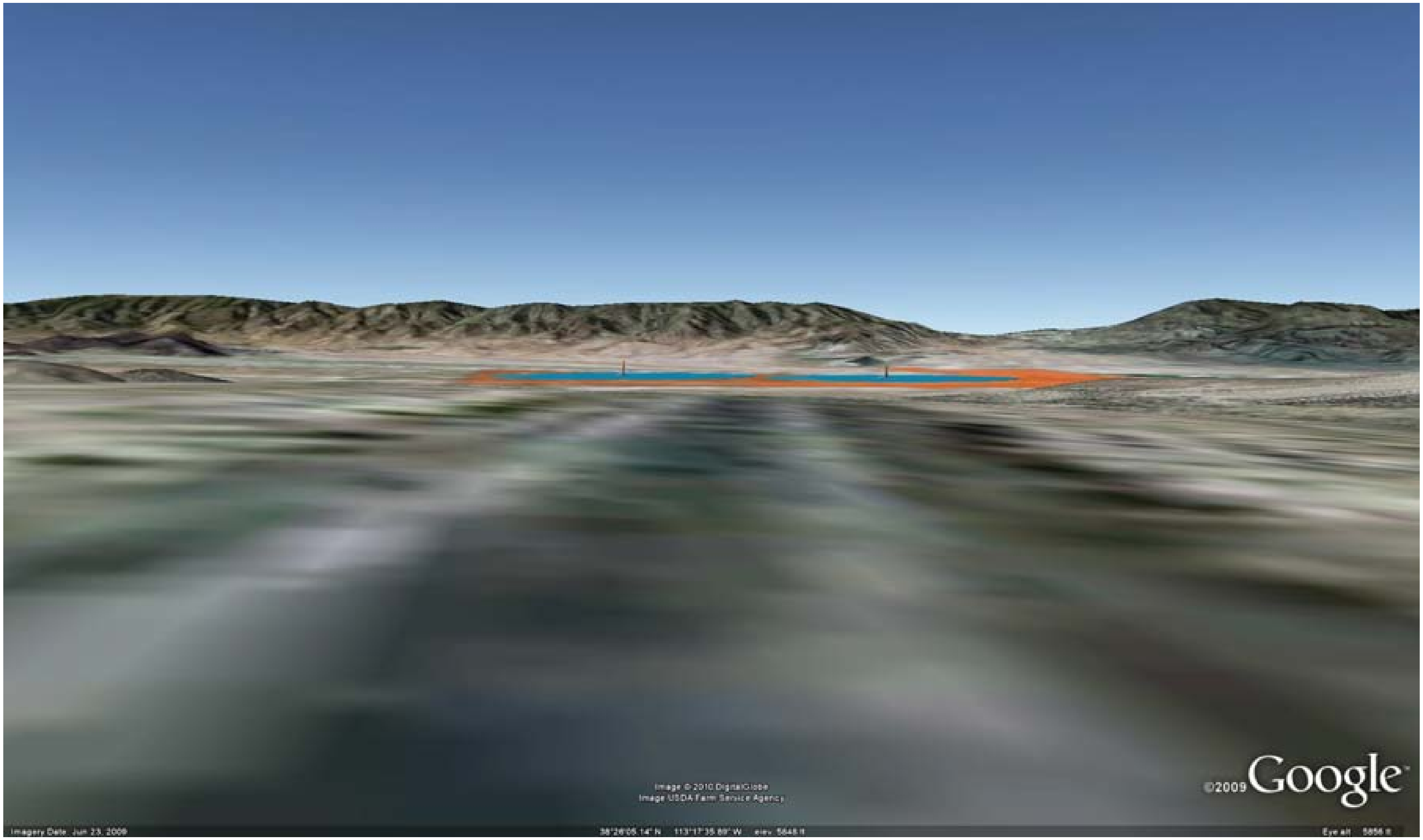

FIGURE 13.3.14.2-5 Google Earth Visualization of the Wah Wah Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from State Route 21 Approximately 5.2 mi (8.3 km) East of the SEZ

low angle of view would reduce the visible area of solar facilities within the SEZ, and the low horizontal forms would repeat the line of the horizon, tending to reduce visual contrast.

Taller, ancillary facilities such as buildings, transmission structures, cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and their structural details could be evident at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

The receivers of power towers in the eastern portion of the SEZ would likely appear as very bright, nonpoint (i.e., having visible cylindrical or rectangular areas) light sources atop plainly discernable tower structures that would attract visual attention from this viewpoint. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from this location at night. They could be very conspicuous, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

Figure 13.3.14.2-6 is a Google Earth perspective visualization of the SEZ as seen from State Route 21, approximately 1.4 mi (2.3 km) east of the SEZ, facing northwest toward the northern portion of the SEZ. The visualization suggests that if viewed from this location on State Route 21, the SEZ could occupy enough of the field of view that viewers would have to turn their heads to encompass the whole SEZ. Solar energy developments within the SEZ would likely strongly attract attention and could dominate the view from State Route 21, depending on the technology employed and other visibility factors.

From this viewpoint, solar collector arrays would be seen nearly edge on and would repeat the horizontal line of the plain in which the SEZ is situated. This would tend to reduce visual line contrast, but as the viewer approached the SEZ, the collector arrays could increase in apparent size until they no longer appeared as horizontal lines against the natural-appearing backdrop. Steam plumes, transmission towers, and other tall facility components would likely project above the collector/reflector arrays of solar facilities within the SEZ, and would be visible against the mountain backdrop. Their forms, lines, colors, and textures could create substantial additional contrasts. Structural details of some facility components would likely be visible.

If operating power tower receivers were present within the SEZ, the receivers would appear as brilliant, white, nonpoint-light sources, and the towers would likely project above the valley floor and could potentially interfere with views of the Wah Wah Mountains to the west. In addition, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). When operating, the power towers would be likely to strongly attract visual attention, as seen from this viewpoint. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from this location at night; they could be very conspicuous, given the dark night skies in the vicinity of the SEZ.

FIGURE 13.3.14.2-6 Google Earth Visualization of the Proposed Wah Wah Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from State Route 21 Approximately 1.4 mi (2.3 km) East of the SEZ

Visual contrast would increase further as travelers on State Route 21 entered the SEZ. If power tower facilities were located in the SEZ, the receivers could appear as brilliant light sources on either side of the roadway and would likely strongly attract viewers. If solar facilities were located on both the north and south sides of the road, the banks of solar collectors on both sides of the roadway could form a visual "tunnel" that travelers would pass through briefly. If solar facilities were located close to the roadway, given the 80% development scenario analyzed in the PEIS, they would be expected to dominate views from State Route 21 and would create strong visual contrasts for the three to four minutes required to cross the SEZ.

Road travelers heading east on State Route 21 would, in general, be subjected to the same types of visual contrasts and would have a very similar visual experience.

In summary, for travelers on State Route 21, visual contrasts associated with solar energy development within the SEZ would be highly dependent on the highway, with respect to the SEZ; solar facility type, size, and location within the SEZ; and other visibility factors. As travelers approached and passed through the SEZ on State Route 21, under the 80% development scenario analyzed in this PEIS, contrast levels would gradually rise, and strong levels of visual contrast would be expected.

13.3.14.2.3 Summary of Visual Resource Impacts for the Proposed Wah Wah Valley SEZ

Because under the 80% development scenario analyzed in the PEIS there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, a visually complex, industrial landscape with a man-made appearance could result. This essentially industrial-appearing landscape would contrast greatly with the surrounding generally natural-appearing lands. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development due to major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within and outside the SEZ.

The SEZ is in an area of low scenic quality. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ. State Route 21 passes through the SEZ, and travelers on that road could be subjected to very strong visual contrasts from solar development within the SEZ, but typically their exposure would be brief.

Utility-scale solar energy development within the proposed Wah Wah Valley SEZ could cause moderate levels of visual contrast as observed from the Wah Wah Mountains WSA at distances between 5 and 10 mi (8 and 16 km) from the SEZ. A very small portion of the King Top WSA is within the viewshed of the SEZ, but it is too far away to be affected significantly by visual impacts resulting from solar development within the SEZ. The closest community is more than 25 mi (40 km) from the SEZ and is therefore likely to experience minimal, to no, visual impacts from solar development within the SEZ.

13.3.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified to protect visual resources for the proposed Wah Wah Valley SEZ. As noted in Section 5.12, the presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of 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 site- and project-specific levels. 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.

13.3.15 Acoustic Environment

13.3.15.1 Affected Environment

The proposed Wah Wah Valley SEZ is located in southwestern Utah, in the northwestern portion of Beaver County. The State of Utah and Beaver County, which encompasses the proposed Wah Wah Valley SEZ, have no applicable quantitative noise-level regulations. However, neighboring Iron County has quantitative noise limits applicable to solar power plants, which are used for the analysis. No solar power plant should exceed 65 dBA as measured at the property line, or 50 dBA as measured at the nearest neighboring inhabitable building (Iron County 2009).

State Route 21 passes southeast–northwest through the northern half of the SEZ. The UP Railroad runs about 18 mi (29 km) to the southeast. The nearest airport is Milford Municipal Airport, about 20 mi (32 km) east of the SEZ. Small-scale irrigated agricultural lands are present on the northern boundary of the SEZ. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist around the SEZ, except residences adjacent to the northern SEZ boundary. No communities exist within a 20-mi (32-km) radius of the SEZ. The nearest population center with schools is Milford, about 20 mi (32 km) east–southeast. Accordingly, noise sources around the SEZ include road traffic, aircraft flyover, and agricultural activities. Other noise sources are associated with current land use around the SEZ, including grazing, outdoor recreation, backcountry and OHV use, and hunting. The proposed Wah Wah Valley SEZ is in a remote and undeveloped area, the overall character of which is rural. To date, no environmental noise survey has been conducted around the proposed Wah Wah Valley SEZ. On the basis of the population density, the day-night average sound level (L_{dn} or DNL) is estimated to be 26 dBA for Beaver County, lower than the level typical of a rural area, which would be in the range of 33 to 47 dBA L_{dn}[18] (Eldred 1982; Miller 2002).

13.3.15.2 Impacts

Potential noise impacts associated with solar projects in the Wah Wah Valley SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts on the nearest residences (just next to the northern boundary) associated with operation of heavy equipment and vehicular traffic would be anticipated, albeit of short duration. During the operations phase, potential impacts on the nearest residences would be anticipated, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the Wah Wah Valley SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional SEZ-specific design features applied

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[18] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than the daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

(see Section 13.3.15.3). This section discusses potential noise impacts on humans, although potential noise impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

13.3.15.2.1 Construction

The proposed Wah Wah Valley SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area, where key components (e.g., steam turbine/ generator) needed to generate electricity are located; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 50 dBA at a distance of 0.5 mi (0.8 km) from the power block area. This noise level is the same as the Iron County regulation of 50 dBA for a solar facility. 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 Iron County regulation levels would occur at distances somewhat shorter than 0.5 mi (0.8 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the northern SEZ boundary, estimated noise levels would be about 74 dBA[19] at the nearest residences, which is well above both the Iron County regulation of 50 dBA for a solar facility and typical daytime mean rural background level of 40 dBA. In addition, an estimated 70 dBA L_{dn}[20] at these residences is well above the EPA guideline of 55 dBA L_{dn} for residential areas.

There are no specially designated areas within 5 mi (8 km) of the Wah Wah Valley SEZ, which is the greatest distance at which noise (other than extremely loud noise) would be discernable. Thus, no noise impact analysis for nearby specially designated areas was conducted.

Depending on the soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used would be relatively small and quiet, such as

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[19] Typically, public access would not be allowed within 330 ft (100 m) from the construction site for safety reasons. Therefore, construction of a solar facility would not occur within this distance from the nearest residences.

[20] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, were assumed, which resulted in day-night average noise level (L_{dn}) of 40 dBA.

vibratory or sonic drivers, rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearest residences (just next to the northern SEZ boundary) would be anticipated to be minor, except when pile driving occurs near the residences.

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 (typically a few years). Construction at the Wah Wah Valley SEZ would cause negligible impacts on nearby communities due to considerable separation distances. However, construction would cause unavoidable but localized short-term noise impacts on the nearest residences, for activities occurring near the northern SEZ boundary.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are close. Therefore, no adverse vibration impacts are anticipated from construction activities, including from pile driving for dish engines.

Transmission lines within a designated ROW would be constructed to connect to the nearest regional grid. A regional 138-kV transmission line is located about 42 mi (68 km) southeast of the Wah Wah Valley SEZ; thus, construction of a transmission line over this relatively long distance would be needed if that line were used to connect to the regional grid. For construction of transmission lines, noise sources and their noise levels might be similar to construction noise at an industrial facility of comparable size. Transmission line construction from the Wah Wah Valley SEZ could be performed over about three years. However, the construction site along the transmission line ROW would move continuously, thus no particular area would be exposed to noise for a prolonged period. Therefore, potential noise impacts on nearby residences along the transmission line ROW, if any, would be minor and temporary in nature.

13.3.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking; maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area; commuter/visitor/support/delivery traffic within and around the solar facility; and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and firewater pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the northern SEZ boundary, the predicted noise level would be about 51 dBA at the nearest residences, just next to the SEZ boundary; this is comparable to the Iron County regulation of 50 dBA, and above 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[21]), 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 49 dBA L_{dn} would be estimated, which is lower than the EPA guideline of 55 dBA L_{dn} for residential areas. However, if TES were used during nighttime hours, day-night average noise levels higher than those estimated above by using simple noise modeling would be anticipated, as explained below and in Section 4.13.1.

On a calm, clear night, typical of the proposed Wah Wah Valley 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[22] within 1 or 2 mi (1.6 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are the lowest. To estimate the day-night average sound level (L_{dn}), six-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to sound 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 (just next to the northern SEZ boundary and about 0.5 mi [0.8 km] from the power block area) would be 61 dBA, which is higher than both the Iron County regulation of 50 dBA and the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 63 dBA L_{dn}, which is higher than 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; thus, it is likely that sound levels would be lower than 63 dBA L_{dn} at the nearest residences, even if TES were used at

21 Maximum possible operating hours at the summer solstice, but limited to seven to eight hours at the winter solstice.

22 A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

a solar facility. Consequently, operating parabolic trough or power tower facilities using TES and located near the northern SEZ boundary could result in adverse noise impacts at the nearest residences, depending on background noise levels and meteorological conditions. In the permitting process, refined noise propagation modeling would be warranted along with measurement of background noise levels.

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the Wah Wah Valley SEZ, on the basis of the assumption of dish engine facilities of up to 542-MW total capacity (covering 80% of the total area, or 4,878 acres [19.7 km^2]), up to 21,680 25-kW dish engines could be employed. In addition, for a large dish engine facility, several hundred step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, for example, about 49 dBA at 1.0 mi (1.6 km) and 44 dBA at 2 mi (3 km) from the boundary of the squarely shaped dish engine solar field, both of which are lower than the Iron County regulation of 50 dBA for a solar facility but higher than the typical daytime mean rural background level of 40 dBA. Noise levels would be higher than the Iron County regulation up to 0.8 mi (1.3 km) from a dish engine facility. However, the 50-dBA level would occur at a distance somewhat shorter than the aforementioned 0.8 mi (1.3 km), 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 over 80% of the Wah Wah Valley SEZ at intervals of 98 ft (30 m). Under this assumption, the estimated noise level at the nearest residences just next to the northern boundary of the SEZ would be about 58 dBA, which is higher than both the Iron County regulation of 50 dBA for a solar facility and the typical daytime mean rural background level of 40 dBA. If a 12-hour daytime operation is assumed, the estimated 55 dBA L_{dn} at these residences is equivalent to the EPA guideline for residential areas. A dish engine facility near the northern SEZ boundary, close to the nearest residences, could result in adverse impacts on the nearest residences, depending on background noise levels and meteorological conditions. Thus, consideration of minimizing noise impacts is very important in the siting of dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also limit noise impacts.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are close enough to the Wah Wah Valley SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be minimal.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and not be heard at the nearest residences, assuming a 0.5-mi (0.8-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and no buffer to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be minimal.

For impacts from transmission line corona discharge noise (Section 5.13.1.5) during rainfall events, the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line tower would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. Corona noise includes high-frequency components, which may be judged to be more annoying than other environmental noises. However, corona noise would not likely cause impacts, unless a residence was located close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The proposed Wah Wah Valley SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residents along the transmission line ROW, if any, would be negligible.

13.3.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations; disposal of debris; grading; and revegetation as needed. Activities for decommissioning would be similar to those for construction, but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minor and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction, and thus, minimal.

13.3.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- Noise levels from cooling systems equipped with TES should be managed so that levels at the nearest residences adjacent to the northern SEZ boundary are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

- Dish engine facilities within the Wah Wah Valley SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residences (i.e., the facilities should be located in the lower half of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at nearby residences.

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13.3.16 Paleontological Resources

13.3.16.1 Affected Environment

The Wah Wah Valley SEZ is 100% covered in Quaternary alluvium (classified as Qa on geological maps). This Quaternary deposit is classified as PFYC Class 2 on the basis of the PFYC map from the Utah State Office (Murphey and Daitch 2007). Class 2 indicates that the potential for occurrence of significant fossil material is low (see Section 4.14 for a discussion of the PFYC system).

13.3.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in the proposed SEZ. Vertebrate paleontological resources have been found in ancient lacustrine deposits associated with ancient Lake Bonneville, particularly in caves (Madsen 2000). Therefore, 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 remain classified as PFYC Class 2, further assessment of paleontological resources is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. Section 5.14 discusses the types of impacts that could occur to any significant paleontological resources found within the Wah Wah Valley SEZ. Impacts will be minimized through the implementation of applicable general mitigation measures listed in Section 5.14 as well as required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources, such as looting or vandalism, are not likely for a PFYC Class 2 area. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new roads are anticipated to be needed to access the Wah Wah Valley SEZ, assuming existing roads would be used. Approximately 42 mi (68 km) of transmission line is anticipated be needed to connect to the nearest existing line, resulting in approximately 1,273 acres (5.2 km^2) of disturbance, also in areas predominantly classified as PFYC Class 2, as well as in PFYC Class 1 areas (Murphey and Daitch 2007). Class 1 indicates that the occurrence of significant fossils is nonexistent or extremely rare. Few, if any, impacts on paleontological resources are anticipated in areas of PFYC Class 1 and 2 deposits related to these additional ROWs. However, similar to the SEZ footprint, important resources could exist; and if identified, they would need to be managed on a case-by-case basis. 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.

13.3.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features as described in Appendix A, Section A.2.2. If the geological deposits are determined to be as described above and remain classified as PFYC Classes 1 or 2, SEZ-specific design features for mitigating impacts on paleontological resources within the Wah Wah Valley SEZ and associated ROW are not likely to be necessary.

13.3.17 Cultural Resources

13.3.17.1 Affected Environment

13.3.17.1.1 Prehistory

The proposed Wah Wah Valley SEZ is located in a valley adjacent to the Escalante Desert of southwest Utah and follows a similar prehistoric sequence as was presented for the proposed Escalante Valley SEZ in Section 13.1.17.1.1.

13.3.17.1.2 Ethnohistory

The Wah Wah Valley is located within the traditional use area generally attributed to the Numic-speaking Southern Paiute, although their linguistically related neighbors, the Utes and Western Shoshone, probably traversed the area as well. The proposed Wah Wah Valley SEZ lies within *Yanawant*, the traditional eastern subdivision of the Southern Paiute traditional territory (Stoffle et al. 1997). It is nominally within the territory of the Southern Paiute Beaver group (Kelly 1934). The traditional use area of the Beaver group overlaps with that of the Pahvant Band of Utes, who ranged from their core territory around Sevier Lake almost to the present Nevada border (Callaway et al. 1986; Duncan 2010). The Western Shoshone and Goshute core territories were located to the northwest and north of the valley (Crum 1994; Defa 2010). The Wah Wah Valley is situated between the area that the Indian Claims Commission ruled was the traditional territory of the Southern Paiutes and the area the commission determined was the traditional territory of the Uintah Utes (Royster 2008). The ethnohistory of these tribes is discussed in Section 13.1.17.1.2.

13.3.17.1.3 History

The historic framework for the proposed Wah Wah Valley SEZ follows closely with that of all of the Utah SEZs and is summarized in Section 13.1.17.1.3 for the proposed Escalante Valley SEZ. Items of particular relevance to the Wah Wah Valley SEZ are added below, including a summary of Beaver County history as relevant for both the Milford Flats South and the Wah Wah Valley SEZs (only Iron County history is summarized for the Escalante Valley SEZ).

The area of Beaver County was explored by the Mormon, Albert Carrington. Beaver County growth was based on a blend of agriculture, livestock, mining, transportation, and trade. The Lincoln Mine, 5 mi (8 km) outside of Minersville, was the first lead mine to open in Utah (1858); it produced lead that was shipped to Salt Lake to make ammunition (University of Utah 2009a). The Horn Silver Mine was discovered in 1875. The mining camp/boomtown of Frisco was established to support it in 1876. The mine was an important producer of both silver and lead. Between 1875 and 1910, the mine produced more than $74 million worth of materials

(Carr 1972). By 1920, Frisco was deserted. The charcoal kilns that supported the mine smelter are still standing and are listed in the NRHP. The town of Milford was established in 1870, predominantly for mining and cattle raising; by 1880, when the Utah Southern Railroad arrived, it had become a regional transportation center for shipping ore and livestock. When the railroad line was extended to Frisco, Milford also became a supply center and shipping station for local mines (University of Utah 2009a).

Situated just 2 mi (3.5 km) east of the proposed Wah Wah Valley SEZ is the Newhouse town site. Periodic silver mining in the San Francisco Mountains occurred for several decades before the Cactus Mine was bought by Samuel Newhouse in 1900. Newhouse provided the necessary capital to extract the ore from the mine, and a community developed around the mine, initially referred to as "Tent-town." By 1905, permanent buildings, such as a library, hospital, livery stable, opera house and dance hall were constructed in the town as it was assumed that the mine would be prosperous and sustainable; the city adopted the Newhouse name the same year. A railroad depot associated with the Utah Southern Extension Railroad was also erected in the town. Newhouse was unique in that the community refused to allow a saloon or red-light district to operate within the city limits, a sharp contrast to the "Wild West" mentality that prevailed in many other mining towns. The Cactus Mine stopped producing in 1910, and the town quickly folded. Most of the buildings were either moved to Milford or abandoned; however, the local café continued to operate until it burned down in 1921 (Carr 1972).

Railroad lines are discussed in Section 13.1.17.1.3; the Utah Southern Railroad spur that ran from Milford to Frisco near the proposed Wah Wah Valley SEZ no longer exists.

13.3.17.1.4 Traditional Cultural Properties

The Southern Paiute see themselves as persisting in a cultural landscape composed of many culturally significant features bound together into the land called *Puaxant Tuvi,* (sacred land or power land). They see themselves as having been created by a supernatural being who established a birthright relationship between them and the land where they were created. Especially important features, such as the mountain *Nuvagntu* (Mount Charleston in southwestern Nevada), have meaning for all Southern Paiutes (Stoffle et al. 1997), while other sites have local significance. Traditional cultural properties that are significant to the Southern Paiute culture could be present or within sight of the proposed Wah Wah Valley SEZ.

Government-to-government consultation is ongoing with the Southern Paiutes and neighboring Tribes, who also traditionally used the Wah Wah Valley, so that their concerns, including any potential impacts on traditional cultural properties, can be adequately addressed in this PEIS (see also Section 13.3.18 on Native American Concerns and Chapter 14 and Appendix K for a summary of government-to-government consultation).

To date, no traditional cultural properties have been identified within the proposed Wah Wah Valley SEZ, nor have concerns been raised regarding traditional cultural properties or sacred areas located in the vicinity of the SEZ. However, in the past, the Southern Paiutes have identified mountains, springs, clay and rock sources, burial sites, rock art, trails, shrines, ceremonial areas, and former habitation sites as sites of cultural importance (Stoffle and Dobyns 1983) (see also Section 13.3.18). Identification of traditional cultural properties may be considered sensitive and therefore may not be fully described or disclosed in this PEIS.

13.3.17.1.5 Cultural Surveys and Known Archaeological and Historic Resources

Only one small 2-acre (0.01-km^2) survey for a gravel pit has been conducted within the proposed Wah Wah Valley SEZ; consequently, no archaeological sites have been recorded by the BLM in the SEZ (Dalley 2009). However, the Utah Division of State History GIS database indicates one site near the western boundary of the SEZ; no data are available on the site at this time (Utah SHPO 2009). Of several other surveys in the valley—conducted for seismic projects, fence lines, pipelines, sample units for a proposed MX missile system, and land exchange parcels—few sites have been recorded on the valley floor. Known sites in the area predominantly start at the base of the slopes and proceed into the higher elevations, predominantly along washes or gulches. Within 5 mi (8 km) of the SEZ, only four additional sites have been recorded.

The SEZ has the potential to contain significant cultural resources, although the potential is relatively low. An old power line that was noted during a preliminary site visit should be investigated as the line is still strung and some transformers are still in place; the line appears to have supplied power from Milford to the Rocky Mountain Research Station Desert Experimental Range, located nearby to the west. The line runs just south of Utah State Route 21. Additional artifacts also could be encountered in the area.

National Register of Historic Places

None of the 115 properties currently listed in the NRHP for Beaver County are located within the SEZ or within a 5-mi (8-km) radius of the SEZ. The gold mining towns of Frisco and Newhouse are located in relatively close proximity to the proposed Wah Wah Valley SEZ in the San Francisco Mountains east of the valley, but of these properties, only the Frisco Charcoal Kilns (6 mi [10 km] from the SEZ) are listed in the NRHP. The Desert Experimental Range Station is listed in the NRHP as a historic district and is located about 18 mi (29 km) northwest of the proposed SEZ on the other side of the Wah Wah Mountains.

13.3.17.2 Impacts

No adverse impacts are currently anticipated in the proposed Wah Wah Valley SEZ, but such could be possible if significant cultural resources are found in the area during the survey. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. Section 5.15 discusses the types of impacts that could occur on any significant cultural resources found to be present within the proposed Wah Wah Valley SEZ. Impacts would be minimized through the implementation of applicable general mitigation measures listed in Section 5.15 and required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur. No traditional cultural properties have been identified to date within the vicinity of the SEZ. The low density of sites recorded in basin interiors in this region suggests that the possibility of significant sites within the SEZ is low (Dalley 2009).

Indirect impacts on cultural resources that result from erosion outside of the SEZ boundary (including along ROWs) are unlikely, assuming programmatic design features to reduce water runoff and sedimentation are implemented (as described in Appendix A, Section A.2.2). Indirect impacts, such as from looting or vandalism on nearby sites is possible, but would be reduced with programmatic design features to educate the workforce on the importance of the resources and the consequences of disturbing them. If indirect impacts are likely to occur on the setting of historic properties, then these should be examined and mitigated in an appropriate manner at the project-specific level.

No new roads are anticipated to be needed to access the proposed Wah Wah Valley SEZ, assuming existing roads would be used. Approximately 42 mi (68 km) of transmission line is anticipated to be needed to connect to the nearest existing line, resulting in approximately 1,273 acres (5.2 km^2) of disturbance. Impacts on cultural resources are possible in areas related to the associated ROW, as new areas of potential cultural significance could be directly impacted by construction or opened to increased access due to transmission ROW construction and use. Indirect impacts are also possible from unauthorized surface collection, depending on the proximity of the ROW to potential archaeological sites. 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. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur with the transmission line, as with the SEZ footprint.

13.3.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features, cultural awareness training for the workforce, and measures for addressing possible looting/vandalism issues through formalized agreement documents, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined during consultations with the Utah SHPO and affected Tribes, and would depend on the findings of cultural surveys.

13.3.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Wah Wah Valley SEZ, Section 13.3.17 discusses archaeological sites, structures, landscapes, and traditional cultural properties; Section 13.3.8 discusses mineral resources; Section 13.3.9.1.3 discusses water rights and water use; Section 13.3.10 discusses plant species; Section 13.3.11 discusses wildlife species, including wildlife migration patterns; Section 13.3.13 discusses air quality; Section 13.3.14 discusses visual resources; Sections 13.3.19 and 13.3.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21. This section focuses on concerns that are specific to Native Americans and to which Native Americans bring a distinct perspective.

13.3.18.1 Affected Environment

The three Utah SEZs are clustered in the valleys and deserts of west-central Utah. They fall within a Tribal traditional use area generally attributed to the Southern Paiute. The proposed Wah Wah Valley SEZ lies between the area so recognized by the courts and the judicially established Uintah-Ute territory (Royster 2008). It is also close to the traditional ranges of the Western Shoshone and the Goshutes, with whom the Southern Paiute interacted. It is likely that members of all these Tribes were present from time to time within the SEZ. All federally recognized Tribes with Southern Paiute roots or possible associations with the Utah SEZs have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 13.3.18.1-1. A listing of all federally recognized Tribes contacted for this PEIS can be found in Appendix K.

13.3.18.1.1 Territorial Boundaries

The traditional territorial boundaries of the Southern Paiutes, the Western Shoshone (including the Goshutes), and the Utes are discussed in Section 13.1.18.1.1.

13.3.18.1.2 Plant Resources

The vegetation present at the proposed Wah Wah Valley SEZ is described in Section 13.3.10. The cover types present at the SEZ are from the Inter-Mountain Basins series. They are mostly Semi-Desert Shrub-Steppe and Mixed Salt Desert Scrub. There are smaller areas of Greasewood Flat and Big Sagebrush Shrubland. Greasewood and sagebrush are dominant species. Native Americans made use of these plants for medicinal purposes, and greasewood seeds were harvested for food. As shown in Table 13.3.18.1-2, very few of the many other known plant species traditionally used by Native Americans for food (Stoffle et al. 1999; Stoffle and Dobyns 1983) are likely to be present in the SEZ.

TABLE 13.3.18.1-1 Federally Recognized Tribes with Traditional Ties to the Utah SEZs

Tribe	Location	State
Chemehuevi Indian Tribe	Havasu Lake	California
Colorado River Indian Tribes	Parker	Arizona
Confederated Tribes of the Goshute Reservation	Ibapah	Utah
Ely Shoshone Tribe	Ely	Nevada
Hopi Tribe	Kykotsmovi	Arizona
Kaibab Paiute Tribe	Fredonia	Arizona
Las Vegas Paiute Tribe	Las Vegas	Nevada
Moapa Band of Paiutes	Moapa	Nevada
Pahrump Paiute Tribe	Pahrump	Nevada
Paiute Indian Tribe of Utah	Cedar City	Utah
Cedar Band	Cedar City	Utah
Indian Peak Band	Cedar City	Utah
Kanosh Band	Kanosh	Utah
Koosharem Band	Cedar City	Utah
Shivwits Band	Ivins	Utah
San Juan Southern Paiute Tribe	Tuba City	Arizona
Skull Valley Band of Goshute Indians	Grantsville	Utah
Ute Indian Tribe	Fort Duchesne	Utah
Ute Mountain Ute Tribe	Towaoc	Colorado

TABLE 13.3.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Wah Wah Valley SEZ

Common Name	Scientific Name	Status
Food		
Chokecherry	*Prunus virginiana*	Possible
Dropseed	*Sporobolus* spp.	Possible
Greasewood	*Sarcobatus vermiculatus*	Observed
Indian ricegrass	*Achnatherum hymenoides*	Observed
Prickly Pear	*Opuntia* sp.	Observed
Saltbush	*Atriplex* spp.	Observed
Saltgrass	*Distichlis spicata*	Possible
Wolfberry	*Lycium andersonii*	Possible
Medicine		
Greasewood	*Sarcobatus vermiculatus*	Observed
Mormon Tea	*Ephedra nevadensis*	Observed
Rabbitbrush	*Ericameria nauseosa*	Observed
Sagebrush	*Artemisia* spp.	Observed

Sources: Field visit and USGS (2005a).

13.3.18.1.3 Other Resources

Wildlife likely to be found in the proposed Wah Wah Valley SEZ is described in Section 13.3.11. Due to the general aridity of the SEZ, there are few game species traditionally important to Native Americans within the SEZ. The most important are the black-tailed jackrabbit (*Lepus californicus*) and the pronghorn antelope (*Antilocapra americana*) (Stoffle and Dobyns 1983; Kelly and Fowler 1986). Of the large game species, mule deer (*Odocoileus hemionus*) occur in the surrounding mountains, but they are less common on the desert floor. Smaller game important to Native Americans found in the SEZ include cottontails (*Sylvilagus audubonii*), chipmunks (*Neotamias minimus*), and woodrats (*Neotoma lepida*).

Other animals traditionally important to the Southern Paiute include lizards, seven species of which are likely to occur in the SEZ, and the golden eagle (*Aquila chrysaetos*). The SEZ falls within the range of the wide-ranging eagle. Table 13.3.18.1-3 lists animal species of traditional importance to Native American Tribes.

No surface water, springs, or wetlands were observed at the SEZ. However, Wah Wah Springs is located less than 2 mi (3 km) west of the SEZ.

Other natural resources traditionally important to the Southern Paiute include salt, clay for pottery, and naturally occurring mineral pigments for the decoration and protection of the skin (Stoffle and Dobyns 1983).

13.3.18.2 Impacts

In the past, Southern Paiutes and the Western Shoshone have expressed concern over project impacts on a variety of resources. They tend to take a holistic view of their traditional homelands. For them, both cultural and natural features are inextricably bound together. Effects on one part have ripple effects on the whole. Western distinctions between the sacred and the secular have no meaning in their traditional worldview (Stoffle and Dobyns 1983). While no comments specific to the proposed Wah Wah Valley SEZ have been received from Native American Tribes to date, the Paiute Indian Tribe of Utah and the Skull Valley Band of Goshute Indians have asked to be kept informed of project developments. During energy development projects in adjacent areas, Southern Paiutes have expressed concern over adverse effects on a wide range of resources. Geophysical features and physical cultural remains are listed in Section 13.3.17.1.4. However, these places 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 mentioned as important include food plants, medicinal plants, plants used in basketry, and plants used in construction; large game animals, small game animals, and birds; and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those likely to be found within the proposed Wah Wah Valley SEZ are discussed in Section 3.1.18.1.2. Traditional plant knowledge is found most abundantly in Tribal elders, especially female elders (Stoffle et al. 1999).

TABLE 13.3.18.1-3 Animal Species used by Native Americans as Food Whose Range Includes the Proposed Wah Wah Valley SEZ

Common Name	Scientific Name	Status
Mammals		
Black-tailed jackrabbit	*Lepus californicus*.	All year
Chipmunks	Various species	All year
Coyote	*Canis latrans*	All year
Desert cottontail	*Sylvilagus audubonii*	All year
Great Basin pocket mouse	*Perognathus parvus*	All year
Kangaroo rat	*Dipodomys ordii*	All year
Kit fox	*Vulpes macotis*	All year
Mule deer	*Odocoileus hemionus*	All year
Mountain cottontail	*Sylvilagus nuttallii*	All year
Mountain lion	*Puma concolor*	All year
Pocket gophers	*Thomomys* spp.	All year
Porcupine	*Erethizon dorsatum*	All year
Pronghorn	*Antilocarpa americana*	All year
Rock squirrel	*Spermophilus variegates*	All year
White-tailed antelope squirrel	*Ammospermophilus leucurus*	All year
Woodrats	*Neotoma* spp.	All year
Birds		
Burrowing owl	*Athene cunicularia*	Summer
Common raven	*Corvus corax*	All year
Ferruginous hawk	*Buteo regalis*	Summer
Golden eagle	*Aquila chrysaetos*	All year
Great horned owl	*Bubo virginianus*	All year
Horned lark	*Eremophila alpestris*	All year
Mourning dove	*Zenaida macroura*	All year
Northern mockingbird	*Mimus polyglottos*	All year
Piñon jay	*Gymnorhinus cyanocephalus*	All year
Prairie falcon	*Falco mexicanus*	All year
Red-tailed hawk	*Buteo jamaicensis*	All year
Rough-legged hawk	*Buteo lagopus*	Winter
Swainson's hawk	*Buteo swainsoni*	Summer
Western meadow lark	*Sturnella neglecta*	All year
Reptiles		
Horned lizard	*Phrynosoma platyrhinos*	All year
Large lizards	Various species	All year
Western rattlesnake	*Crotalis viridis*	All year

Sources: USGS (2005b); Fowler (1986).

The Wah Wah Valley is adjacent to the Escalante Desert, which appears to have been a no-man's-land that, for the most part, was rarely used by the surrounding Native American groups. While it includes some plant species traditionally important to Native Americans, these species appear to be relatively scant. The most important traditionally collected resource is likely to be the black-tailed jackrabbit. Development of utility-scale solar energy facilities in the proposed SEZ would result in the loss of some plants that are traditionally important to Native Americans, as well as the associated habitat of traditionally important animals. As discussed in Sections 13.3.10 and 13.3.11, the impacts of these losses are expected to be small because the plants and associated animals are widely distributed beyond the SEZ, and because required programmatic design features would mitigate some effects. However, project specific consultation with the affected Tribes will be necessary to verify that effects would be small.

As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native American concerns will be expressed over potential visual and other effects of solar energy development within the SEZ, on specific resources, and any culturally important landscape.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

Whether there are any issues relative to socioeconomics, environmental justice, or health and safety relative to Native American populations, has yet to be determined.

13.3.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to address impacts of potential concern to Native Americans, such as avoidance of sacred sites, water sources, and tribally important plant and animal species, are provided in Appendix A, Section A.2.2.

The need for and nature of SEZ-specific design features regarding potential issues of concern would be determined during government-to-government consultation with affected Tribes listed in Table 13.3.18.1-1.

Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 13.3.17.3, in addition to the design features for historic properties discussed in Section A.2.2 in Appendix A.

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13.3.19 Socioeconomics

13.3.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Wah Wah Valley SEZ. The ROI consists of Beaver, Iron, and Millard Counties in Utah. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and non-payroll expenditures from the construction, operation, and decommissioning phases of solar facility development within the proposed SEZ are expected to take place.

13.3.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 29,232 (Table 13.3.19.1-1). Over the period 1999 to 2008, annual average employment growth rates were highest in Iron County (3.4%), followed by Millard County (2.9%), and then Beaver County (2.5%). At 3.2%, growth rates in the ROI as a whole were somewhat higher than the average state rate for Utah (2.1%).

In 2006, the service sector provided the highest percentage of employment in the ROI at 34.3%, followed by wholesale and retail trade with 19.6%, and agriculture with 16.2% (Table 13.3.19.1-2). Smaller employment shares were held by manufacturing (9.8%); transportation and public utilities (5.2%); and finance, insurance, and real estate (4.1%). Within the individual counties, the distribution of employment across sectors varies from that in the ROI as a whole, with a higher percentage of employment in agriculture in Beaver County (41.7%) and Millard County (32.5%), and a lower percentage in Iron County (7.0%). Employment shares in Iron County in construction (13.8%), manufacturing (13.1%), and services (38.2%) are higher than in the ROI as a whole.

TABLE 13.3.19.1-1 Employment in the ROI Surrounding the Proposed Wah Wah Valley SEZ

SEZ and Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Beaver County	2,369	3,025	2.5
Iron County	14,571	20,300	3.4
Millard County	4,443	5,907	2.9
ROI	21,383	29,232	3.2
Utah	1,080,441	1,336,556	2.1

Sources: U.S. Department of Labor (2009a,b).

TABLE 13.3.19.1-2 Employment, by Sector, in 2006 in the ROI Surrounding the Proposed Wah Wah Valley SEZ

	Beaver County		Iron County		Millard County		ROI	
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	927	41.7	934	7.0	1,271	32.5	3,132	16.2
Mining	60	2.7	10	0.1	60	1.5	130	0.7
Construction	60	2.7	1,829	13.8	60	1.5	1,949	10.1
Manufacturing	10	0.4	1,732	13.1	163	4.2	1,905	9.8
Transportation and public utilities	216	9.7	363	2.7	435	11.1	1,014	5.2
Wholesale and retail trade	368	16.5	2,650	20.0	785	20.1	3,803	19.6
Finance, insurance, and real estate	70	3.1	646	4.9	70	1.8	786	4.1
Services	551	24.8	5,068	38.2	1,041	26.6	6,660	34.3
Other	0	0.0	10	0.1	10	0.3	20	0.1
Total	2,225		13,250		3,915		19,390	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009a).

13.3.19.1.2 ROI Unemployment

Unemployment rates have varied slightly across the three counties in the ROI. Over the period 1999 to 2008, the average rate in Iron County over this period was 4.1%, with slightly lower rates in Beaver and Millard Counties (3.9%) (Table 13.3.19.1-3). The average rate in the ROI over this period was 4.0%, slightly lower than the average rate for Utah (4.1%). Unemployment rates for the first five months of 2009 contrast somewhat with rates for 2008 as a whole; in Iron County the unemployment rate increased to 6.4%, while rates reached 5.5% and 4.5% in Beaver and Millard Counties, respectively. The average rate for the ROI (5.9%), and Utah (5.2%) were also higher during this period than the corresponding average rates for 2008.

13.3.19.1.3 ROI Urban Population

The population of the ROI in 2006 to 2008 was 80% urban, with a group of cities and towns centered around Cedar City in the southwestern portion of Iron County, and along the I-15 corridor in eastern Beaver County and Millard County.

The largest urban area in Iron County, Cedar City, had an estimated 2008 population of 28,439; other cities in the county include Enoch (5,076) and Parowan (2,606) (Table 13.3.19.1-4). In addition, there are three other urban areas in the county; Paragonah (477), Kannaraville (314), and Brian Head (126). Most of these cities and towns are about 30 mi (48 km) from the site of the proposed SEZ. Population growth rates among these cities and towns have varied over the period 2000 to 2008. Enoch grew at an annual rate of 4.9% during this period, with higher than average growth also experienced in Cedar City (4.2%). The cities of

TABLE 13.3.19.1-3 Unemployment Rates (%) in the ROI Surrounding the Proposed Wah Wah Valley SEZ in Utah

Location	1999–2008 (average)	2008	2009[a]
Beaver County	3.9	3.4	5.5
Iron County	4.1	4.2	6.4
Millard County	3.9	3.2	4.5
ROI	4.0	3.9	5.9
Utah	4.1	3.4	5.2

[a] Rates for 2009 are the average for January through May.

Sources: U.S. Department of Labor (2009a–c).

Brian Head (0.8%), Parowan (0.2%), and Kannaraville (0.1%) experienced lower growth rates between 2000 and 2008.

In Beaver County, in addition to Beaver City, with a 2008 population of 2,604, there are two urban areas, Milford (1,405) and Minersville (822). Population growth between 2000 and 2008 has been low in Beaver City (0.7%), with annual growth rates of 0.1% in Minersville and −0.4% in Milford. These urban areas are less than 20 mi (32 km) from the proposed SEZ. There are two cities in Millard County—Delta City (3,176) and Fillmore (2,137)—with 2008 populations of more than 1,000 people, and seven other towns with between 206 and 710 inhabitants. Population growth between 2000 and 2008 has been low in urban areas in Millard County, with an annual growth rate of 0.3% in Scipio and 0.2% in Hinckley, and negative growth in the remaining seven urban areas. These cities and towns are between 40 and 100 mi (64 and 161 km) from the proposed SEZ.

13.2.19.1.4 ROI Urban Income

Median household incomes varied considerably across cities and towns in the ROI. One city, Oak City ($60,996), had median incomes in 1999 that were higher than the average for the state ($58,873), while incomes in Brian Head ($56,732) were only slightly lower than the average (Table 13.3.19.1-4). The cities of Fillmore ($40,839), Scipio ($38,918), and Meadow ($33,797) had relatively low median incomes in 1999.

Data on median household incomes for the period 2006 to 2008 were only available for one city in the ROI. The median income growth rate for the periods 1999 and 2006 to 2008 for Cedar City declined slightly (–0.1%). The average median household income growth rate for the state as a whole over this period was –0.5%.

13.3.19.1.5 ROI Population

Table 13.3.19.1-5 presents recent and projected populations for the ROI surrounding the proposed SEZ and for the state as a whole for the period 2000 to 2008. The growth rate for the ROI (3.2%) was higher than the rate for the state of Utah as a whole (2.5%) during that time frame.

Beaver County and Iron County have experienced growth in population since 2000, while population in Millard County has declined slightly. Populations in each county are expected to increase through 2023 (Governor's Office of Planning and Budget 2009).

13.3.19.1.6 ROI Income

Personal income in the ROI stood at $1.4 billion in 2007 and has grown at an annual average rate of 2.8% over the period 1998 to 2007 (Table 13.3.10.1-6). ROI personal income per capita also rose over the same period at a rate of 0.7%, increasing from $21,960 to $23,591. Per

TABLE 13.3.19.1-4 Urban Population and Income for the Proposed Wah Wah Valley SEZ ROI

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Cedar City	20,527	28,439	4.2	41,719	41,318	–0.1
Enoch	3,467	5,076	4.9	48,112	NA[b]	NA
Delta City	3,209	3,176	–0.1	48,633	NA	NA
Parowan	2,565	2,606	0.2	41,749	NA	NA
Beaver City	2,454	2,604	0.7	43,320	NA	NA
Filmore	2,253	2,137	–0.7	40,839	NA	NA
Milford	1,451	1,405	-0.4	47,075	NA	NA
Minersville	817	822	0.1	46,105	NA	NA
Hinckley	698	710	0.2	45,868	NA	NA
Oak City	650	606	–0.9	60,996	NA	NA
Paragonah	470	477	0.2	43,721	NA	NA
Kanosh	485	472	-0.3	41,730	NA	NA
Holden	400	372	–0.9	43,776	NA	NA
Kannaraville	311	314	0.1	44,258	NA	NA
Scipio	290	298	0.3	38,918	NA	NA
Meadow	NA	237	NA	33,797	NA	NA
Leamington	217	206	–0.6	55,524	NA	NA
Brian Head	118	126	0.8	56,732	NA	NA

[a] Data are averages for the period 2006 to 2008.

[b] NA = data not available.

Source: U.S. Bureau of the Census (2009b–d).

capita incomes were slightly higher in Beaver County ($28,154) in 2007 than in Millard County ($27,342) and Iron County ($21,922). Personal income growth rates were higher in Iron County (3.5%), and lower in Beaver County (2.0%), and Millard County (1.5%) than for the state as a whole (2.9%). Personal income per capita was higher in Utah ($30,927) in 2007 than in the ROI as a whole.

Median household income in the ROI in 2006 to 2008 varied from $42,687 in Iron County to $46,580 in Millard County (U.S. Bureau of the Census 2009d).

13.3.19.1.7 ROI Housing

In 2007, nearly 26,000 housing units were located in the Wah Wah Valley ROI (Table 13.3.19.1-7). Owner-occupied units constituted 80% of the occupied units.

TABLE 13.3.19.1-5 Population in the ROI Surrounding the Proposed Wah Wah Valley SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Beaver County	6,005	6,182	0.4	11,770	12,213
Iron, County	33,779	44, 194	3.4	66,796	69,173
Millard County	12,405	12,095	–0.3	18,791	19,602
ROI	52,189	62,471	2.3	97,357	100,987
Utah	2,233,169	2,727,343	2.5	3,546,228	3,666,248

Sources: U.S. Bureau of the Census (2009e,f); Governor's Office of Planning and Budget (2009).

TABLE 13.3.19.1-6 Personal Income in the ROI Surrounding the Proposed Wah Wah Valley SEZ

Location	1998	2007	Annual Average Growth Rate, 1998–2007 (%)
Beaver County			
Total income[a]	0.1	0.2	2.0
Per capita income	23,734	28,154	1.7
Iron County			
Total income[a]	0.7	0.9	3.5
Per capita income	21,352	21,922	0.3
Millard County			
Total income[a]	0.3	0.3	1.5
Per capita income	22,677	27,342	1.9
ROI			
Total income[a]	1.1	1.4	2.8
Per capita income	21,960	23,591	0.7
Utah			
Total income[a]	61.9	82.4	2.9
Per capita income	28,567	30,927	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).

TABLE 13.3.19.1-7 Housing Characteristics in the ROI Surrounding the Proposed Wah Wah Valley SEZ

Parameter	2000	2007[a]
Beaver County		
Owner-occupied	1,566	1,691
Rental	416	449
Vacant units	678	732
Seasonal and recreational use	399	NA[b]
Total units	2,660	2,872
Iron County		
Owner-occupied	7,040	8,387
Rental	3,587	5,387
Vacant units	2,991	4,202
Seasonal and recreational use	1,986	NA
Total units	13,618	17,976
Millard County		
Owner-occupied	3,062	3,277
Rental	778	833
Vacant units	682	730
Seasonal and recreational use	217	NA
Total units	4,522	4,839
ROI		
Owner-occupied	11,668	13,354
Rental	4,781	6,669
Vacant units	4,351	5,664
Seasonal and recreational use	2,602	NA
Total units	20,800	25,687

[a] 2007 data for number of owner-occupied, rental, and vacant units for Beaver Counties were not available; 2007 data are based on total housing units and 2000 data on housing tenure.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009h–j).

The housing vacancy rate in 2007 in the ROI was 22.1%. In 2007, an estimated 1,886 rental units would have been available to construction workers in the ROI surrounding the proposed Wah Wah Valley SEZ. There were 2,602 seasonal, recreational, or occasional-use units vacant at the time of the 2000 Census. Housing stock in the Wah Wah Valley ROI as a whole grew at the annual rate of 3.1% over the period 2000 to 2007.

The median value of owner-occupied housing in 2006 to 2008 varied between $84,700 in Millard County and $112,200 in Iron County (U.S. Bureau of the Census 2009g).

13.3.19.1.8 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 13.3.19.1-8. In addition, there is one Tribal government located in the ROI, and there may be members of other Tribal groups located in the ROI whose Tribal governments are located in adjacent states.

13.3.19.1.9 ROI Community and Social Services

This section describes educational, healthcare, law enforcement, and firefighting resources in the ROI for the proposed Wah Wah Valley SEZ.

Schools

In 2007, there were a total of 35 public and private elementary, middle, and high schools in the three-county ROI (NCES 2009). Table 13.3.19.1-9 provides summary statistics for enrollment, educational staffing, and two indices of educational quality—student-teacher ratios

TABLE 13.3.19.1-8 Local Government Organizations and Social Institutions in the ROI Surrounding the Proposed Wah Wah Valley SEZ

Governments	
City	
Cedar City	Oak City
Enoch	Paragonah
Delta City	Kanosh
Parowah	Holden
Beaver City	Scipio
Filmore	Meadow
Milford	Leamington
Minersville	Brian Head
Hinckley	
County	
Beaver County	Millard County
Iron County	
Tribal	
Paiute Indian Tribe of Utah	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

TABLE 13.3.19.1-9 School District Data in 2007 for the ROI Surrounding the Proposed Wah Wah Valley SEZ

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Beaver County	1,568	70	22.3	11.6
Iron County	8,522	402	21.2	9.3
Millard County	3,067	156	19.6	13.1
ROI	13,157	629	20.9	10.3

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Beaver County schools (22.3) is slightly higher than for schools in Iron County (21.2) and Millard County (19.6). The level of service is slightly higher in Millard County (13.1) than in Beaver County (11.6) and Iron County (9.3).

Health Care

Although Iron County has a much larger number of physicians (55), the number of doctors per 1,000 population in Iron County (1.3) is only slightly higher than in Beaver County (1.2) and Millard County (0.8) (Table 13.3.19.1-10). The smaller numbers of healthcare professionals in Beaver and Millard Counties may mean that residents of those counties have poorer access to specialized health care; a substantial number of county residents might also travel to Iron County for their medical care.

TABLE 13.3.19.1-10 Physicians in 2007 in the ROI Surrounding the Proposed Wah Wah Valley SEZ

Location	Number of Primary Care Physicians	Level of Service[a]
Beaver County	7	1.2
Iron County	55	1.3
Millard County	9	0.8
ROI	71	1.2

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 13.3.19.1-11). Beaver County has 16 officers and would provide law enforcement services to the SEZ, while Iron County and Millard County have 31 and 39 officers, respectively. Levels of service in police protection in Iron County (0.7) are significantly lower than for the other two counties. Iron County currently has eight professional firefighters, while Beaver and Millard Counties have only volunteers (Table 13.3.19.1-11).

13.3.19.1.10 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

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, 1983b, 1996, 2007). Data on violent crime and property crime rates and on alcoholism and illicit drug use, mental health, and divorce, which might be used as indicators of social change, are presented in Tables 13.3.19.1-12 and 13.3.19-1.13.

TABLE 13.3.19.1-11 Public Safety Employment in the ROI Surrounding the Proposed Wah Wah Valley SEZ

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Beaver County	16	2.6	0	0.0
Iron County	31	0.7	8	0.2
Millard County	39	3.3	0	0.0
ROI	86	1.4	8	0.1

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: Fire Departments Network (2009); U.S. Department of Justice (2008).

TABLE 13.3.19.1-12 County and ROI Crime Rates for the Proposed Wah Wah Valley SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
Beaver County	9	1.2	74	10.2	83	11.4
Iron County	56	1.2	1,085	23.7	1,141	24.9
Millard County	20	1.4	265	19.1	285	20.6
ROI	85	1.3	1,424	21.3	1,509	22.6

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 13.3.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Wah Wah Valley SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Utah Southwest Region (includes Beaver County, Iron County, and Millard County)	5.6	2.5	11.3	–[d]
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 or illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] A dash indicates not applicable.

Sources: SAMHSA (2009); CDC (2009).

There is some variation in the level of crime across the ROI, with slightly higher rates of violent crime in Millard County (1.4 crimes per 1,000 population) than in the other two counties, and higher rates of property crime in Iron County (23.7) than elsewhere in the ROI (Table 13.3.19.1-12). The overall crime rate in the ROI was 22.6 offenses per 1,000 population.

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located (Table 13.3.19.1-13).

13.3.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes. Natural, ecological, and cultural resources in the ROI attract visitors for such activities as hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 13.3.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method of assessing recreational value is to estimate the economic impact of the various recreational activities supported by natural resources on public land (by identifying sectors in the economy in which expenditures on recreational activities occur). Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 3,033 people were employed in the ROI in the various sectors identified as recreation, constituting 10.3% of total ROI employment (Table 13.3.19.1-14). The primary

TABLE 13.3.19.1-14 Recreation Sector Activity in the Proposed Wah Wah Valley SEZ ROI, 2007

Activity	Employment	Income ($ million)
Amusement and recreation services	383	5.5
Automotive rental	7	0.3
Eating and drinking places	2,061	26.8
Hotels and lodging places	340	6.4
Museums and historic sites	–[a]	–
Recreational vehicle parks and campsites	49	2.0
Scenic tours	33	1.7
Sporting goods retailers	160	2.4
Total ROI	3,033	45.1

[a] A dash indicates not applicable.

Source: MIG, Inc. (2010).

sources of recreation-related employment were eating and drinking places. Recreation spending produced an estimated $45.1 million in income in the ROI in 2007.

13.3.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of developments employing various solar energy technologies are analyzed in detail in subsequent sections.

13.3.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Wah Wah Valley SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of the area, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy developments are discussed in detail in Section 5.17. Those impacts would be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar development in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy 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 impacted, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983a,b).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 1.9% in ROI population during construction of the trough technology (with smaller increases for the power tower, dish engine, and photovoltaic technologies) and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the lack of available housing to accommodate all in-migrating workers and families in smaller rural communities in the ROI, and an insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, 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 region of influence 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 251 jobs, and $3.2 million in income in the ROI in 2007 (MIG, Inc. 2010). The construction and operation of solar facilities in the Wah Wah Valley SEZ could result in a decline in the amount of land available for livestock grazing, resulting in total (direct plus indirect) impacts of the loss of two 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 $298 annually on land dedicated to solar facilities in the SEZ.

Transmission Line Impacts

The impacts of transmission line construction could include the addition of 183 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 13.3.19.2-1). Construction activities in the peak year would constitute less than 1% of total ROI employment. A transmission line would also produce $7.4 million in ROI income. Direct sales taxes would be $0.1 million and direct sales taxes would be $0.2 million in the peak year.

Given the likelihood of local worker availability in the required occupational categories, construction of a transmission line would mean that some in-migration of workers and their families from outside the ROI would be required, with 222 persons in-migrating into the Wah Wah Valley ROI during the peak construction year. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 111 rental units expected to be occupied in the Wah Wah Valley ROI. This occupancy rate would represent less than 1% of the vacant rental units expected to be available in the ROI in the peak year.

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, two new teachers would be required in the ROI.

Total operations employment impacts in the ROI (including direct and indirect impacts) of a transmission line would be one job during the first year of operation (Table 13.3.19.2-1) and would produce less than $0.1 million in income. Direct sales taxes would be less than $0.1 million in the first year, with direct income taxes of less than $0.1 million.

Operation of a transmission line would not require the in-migration of workers and their families from outside the ROI; consequently, no impacts on housing markets in the ROI would be expected, and no new community service employment would be required to meet existing levels of service in the ROI.

13.3.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are provided in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed, with one solar project assumed to be constructed within a given year, and assumed to disturb up to 3,000 acres

TABLE 13.3.19.2-1 Proposed Wah Wah Valley SEZ ROI Socioeconomic Impacts of a 230-kV Transmission Line[a]

	Wah Wah Valley	
Parameter	Construction	Operations
Employment (no.)		
Direct	87	<1
Total	183	1
Income[b]		
Total	7.4	<0.1
Direct state taxes[b]		
Sales	0.1	<0.1
Income	0.2	<0.1
In-migrants (no.)	222	0
Vacant housing[c] (no.)	111	0
Local community service employment		
Teachers (no.)	2	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts assume 42 mi (67 km) of transmission line are required for the Wah Wah Valley SEZ. Construction impacts are assessed for the peak year of construction.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

(12 km^2) of land. To capture a range of possible impacts, solar facility size was assessed according to the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower; 2022 was assumed for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 2,817 jobs (Table 13.3.19.2-2). Construction activities would constitute 6.6% of total ROI employment. Construction of a solar facility would also produce $148.0 million in income. Direct sales taxes would be $0.1 million, and direct income taxes, $5.9 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 1,827 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 914 rental units expected to be occupied in the ROI. This occupancy rate would represent 32.4% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 19 new teachers, two physicians, and three public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 1.9% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 328 jobs (Table 13.3.19.2-2). Such a solar facility would also produce $10.0 million in income. Direct sales taxes would be $0.1 million, and direct income taxes, $0.3 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.8 million, and solar generating capacity payments would total at least $6.4 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 135 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 122 owner-occupied units expected to be occupied in the ROI.

TABLE 13.3.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Wah Wah Valley SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	1,641	213
Total	2,817	328
Income[b]		
Total	148.0	10.0
Direct state taxes[b]		
Sales	0.1	0.1
Income	5.9	0.3
BLM Payments ($ million 2008)		
Rental	NA[d]	0.8
Capacity[c]	NA	6.4
In-migrants (no.)	1,827	135
Vacant housing[e] (no.)	914	122
Local community service employment		
Teachers (no.)	19	1
Physicians (no.)	2	0
Public safety (no.)	3	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 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 976 MW. Construction impacts were assessed for a single representative year, 2021.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[d] NA = not applicable.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 1,137 jobs (Table 13.3.19.2-3). Construction activities would constitute 2.6% of total ROI employment. Such a solar facility would also produce $58.9 million in income. Direct sales taxes would be less than $0.1 million, with direct income taxes of $2.4 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 728 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 364 rental units expected to be occupied in the ROI. This occupancy rate would represent 12.9% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, seven new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.7% of total ROI employment that is 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 153 jobs (Table 13.3.19.2-3). Such a solar facility would also produce $4.6 million in income. Direct sales taxes would be less than $0.1 million, and direct income taxes $0.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.8 million, and solar generating capacity payments would total at least $3.6 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 70 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

TABLE 13.3.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Wah Wah Valley SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	654	110
Total	1,137	153
Income[b]		
Total	58.9	4.6
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	2.4	0.2
BLM Payments ($ million 2008)		
Rental	NA[d]	0.8
Capacity[c]	NA	3.6
In-migrants (no.)	728	70
Vacant housing[e] (no.)	364	63
Local community service employment		
Teachers (no.)	7	1
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 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 542 MW. Construction impacts were assessed for a single representative year, 2021.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[d] NA = not applicable.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 63 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to maintain existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 456 jobs (Table 13.3.19.2-4). Construction activities would constitute 1.1% of total ROI employment. Such a solar facility would also produce $24.0 million in income. Direct sales taxes would be less than $1.0 million, and direct income taxes, $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 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 5.2% 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 maintain existing levels of service in the ROI. Accordingly, three new teachers would be required in the ROI. This increase would represent 0.3% 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 dish engine technologies would be 149 jobs (Table 13.3.19.2-4). Such a solar facility would also produce $4.5 million in income. Direct sales taxes would be less than $0.1 million, and direct income taxes, $0.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $0.8 million, and solar generating capacity payments would total at least $3.6 million.

TABLE 13.3.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Wah Wah Valley SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	266	107
Total	456	149
Income[b]		
Total	24.0	4.5
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	1.0	0.2
BLM Payments ($ million 2008)		
Rental	NA[d]	0.8
Capacity[c]	NA	3.6
In-migrants (no.)	296	68
Vacant housing[e] (no.)	148	61
Local community service employment		
Teachers (no.)	3	1
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 542 MW. Construction impacts were assessed for a single representative year, 2021.

b Unless indicated otherwise, values are reported in $ million 2008.

c The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

d NA = not applicable.

e Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 68 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 61 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to maintain existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 213 jobs (Table 13.3.19.2-5). Construction activities would constitute 0.5 % of total ROI employment. Such a solar development would also produce $11.2 million in income. Direct sales taxes would be less than $0.1 million, and direct income taxes $0.5 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 138 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 69 rental units expected to be occupied in the ROI. This occupancy rate would represent 2.4% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to maintain 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 15 jobs (Table 13.3.19.2-5). Such a solar facility would also produce $0.4 million in income. Direct sales taxes and direct income taxes each 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 $0.8 million, and solar generating capacity payments would total at least $3.0 million.

TABLE 13.3.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Wah Wah Valley SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	124	11
Total	213	15
Income[b]		
Total	11.2	0.4
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	0.5	<0.1
BLM Payments ($ million 2008)		
Rental	NA[d]	0.8
Capacity[c]	NA	3.0
In-migrants (no.)	138	7
Vacant housing[e] (no.)	69	6
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 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 542 MW. Construction impacts were assessed for a single representative year, 2021.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

d NA = not applicable.

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.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with seven persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with six owner-occupied units expected to be required in the ROI.

No new community service employment would be required to maintain existing levels of service in the ROI.

13.3.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Wah Wah Valley SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

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13.3.20 Environmental Justice

13.3.20.1 Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (*Federal Register*, Vol. 59, page 7629, Feb. 11, 1994) formally requires federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the Council on Environmental Quality's (CEQ's) *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment to determine whether construction and operation would produce impacts that are high and adverse is conducted; and (3) if impacts are high and adverse, a determination as to whether these impacts disproportionately affect minority and low-income populations is made.

Construction and operation of solar energy projects in the proposed Wah Wah Valley SEZ could affect environmental justice if any adverse health and environmental impacts resulting from any phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and in 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 are included in the minority category if they identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origins. In addition, persons who classify themselves as being of multiple racial origin may choose up to six racial groups as the basis of their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations 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.

The PEIS applies both criteria in using the Census Bureau 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 are included in the low-income category if they 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).

Table 13.3.20.1-1 shows the minority and low-income composition of the total population located in the proposed Wah Wah Valley 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 also identifying themselves as being part of one or more of the population groups listed in the table.

A relatively small number of minority and low-income individuals are located in the 50-mi (80-km) radius surrounding the boundary of the SEZ. When census data are averaged across all the block groups within the 50-mi (80-km) radius, 23.2% of the population is classified as minority within the Nevada portion, and 7.9% of the population is classified as minority within the Utah portion. Because the minority population does not exceed 50% of the total population in either portion of the 50-mi (80-km) radius, and because the minority population does not exceed the state average by 20 percentage points in either portion of the 50-mi (80-km) radius, these states do not have minority populations within the 50-mi (80-km) radius according to 2000 Census data and CEQ guidelines. In addition, there are no minority populations within individual census block groups in this area based on CEQ guidelines.

When census data are averaged across all the block groups within the 50-mi (80-km) radius, 10.7% of the population is classified as low-income within the Nevada portion, and, 13.5% is classified as low-income within the Utah portion. Because the number of low-income individuals does not exceed the state average by 20 percentage points or more, and because it

TABLE 13.3.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Wah Wah Valley SEZ

Parameter	Nevada	Utah
Total population	3,555	24,405
White, non-Hispanic	2,732	22,483
Hispanic or Latino	353	1,118
Non-Hispanic or Latino minorities	470	804
One race	435	571
Black or African American	357	57
American Indian or Alaskan Native	56	383
Asian	16	83
Native Hawaiian or other Pacific Islander	3	29
Some other race	3	19
Two or more races	35	233
Total minority	823	1,922
Total low-income	382	3,295
Percent minority	23.2	7.9
Percent low-income	10.7	13.5
State percent minority	34.8	14.7
State percent low-income	10.5	9.4

Source: U.S. Bureau of the Census (2009k,l).

does not exceed 50% of the total population in either state, there are no low-income populations within the 50-mi (80-km) radius of the proposed Wah Wah Valley SEZ.

Figure 13.3.20.1-1 shows the locations of low-income population groups within the 50-mi (80-km) area around the boundary of the SEZ. At the individual block group level, there are low-income populations in one census block group within the 50-mi (80-km) radius. This block group is located in Iron County, to the west of Cedar City. It includes the towns of Newcastle and Modena and has a low-income population that is more than 20 percentage points higher than the state average.

13.3.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy developments are described in detail in Section 5.18. These impacts would be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2, which

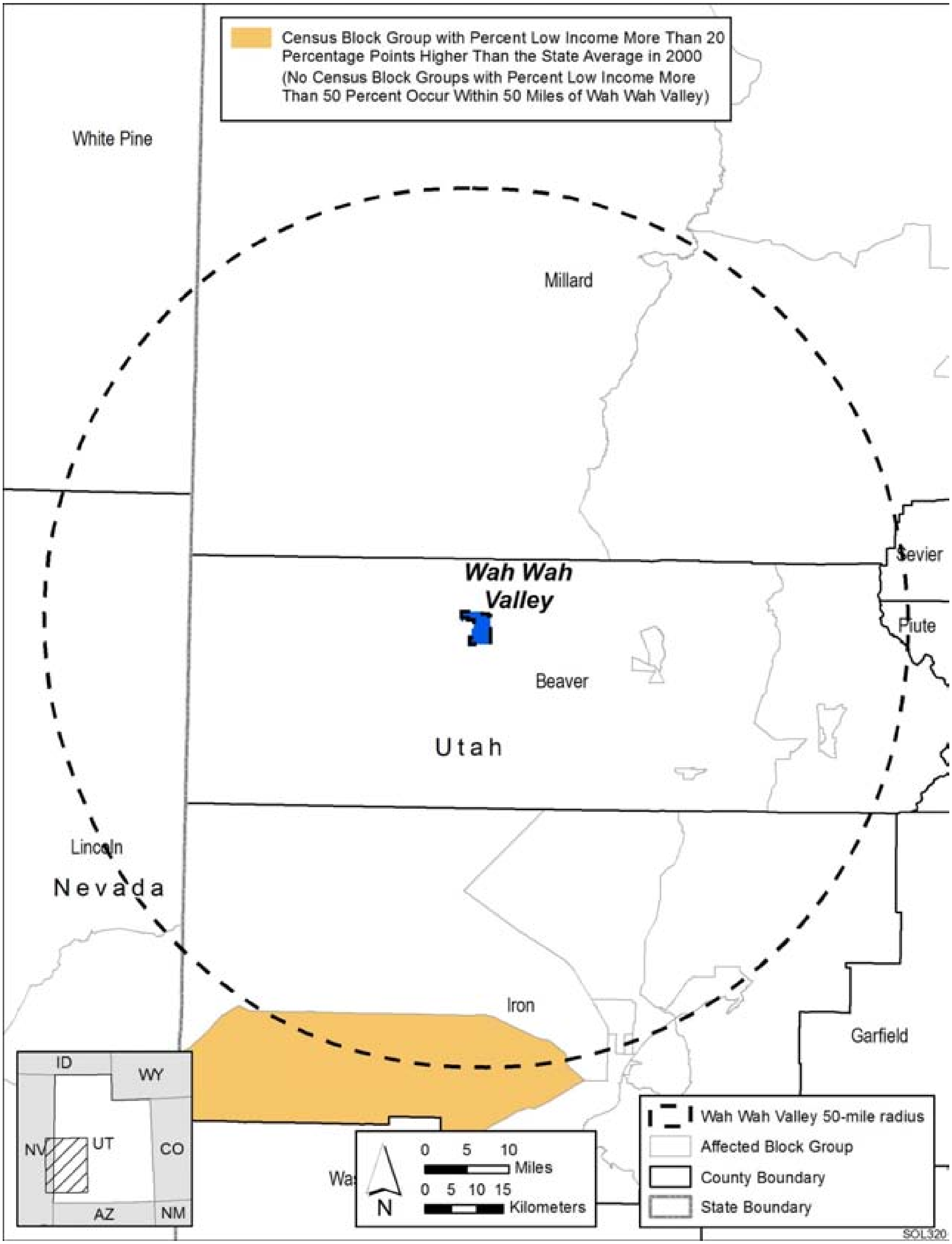

FIGURE 13.3.20.1-1 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Wah Wah Valley SEZ

address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar development within the proposed Wah Wah Valley SEZ include noise and dust emissions during the construction of solar facilities; noise and EMF effects associated with solar project operations; the 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. These are 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 development involving each of the four technologies. Although impacts are likely to be small, and therefore unlikely to produce disproportionate impacts, there are low-income populations defined by CEQ guidelines (see Section 13.3.20.1.1) in one census block group within the 50-mi (80-km) radius of the SEZ, meaning that any adverse impacts of solar projects would disproportionately affect low-income populations. There would be no impacts on minority populations, however, because there are no minority populations within the 50-mi (80-km) radius of the SEZ, according to CEQ guidelines.

13.3.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Wah Wah Valley SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

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13.3.21 Transportation

The proposed Wah Wah Valley SEZ is accessible by road and rail. One major railroad and one state highway serve the immediate area. Three small airports serve the region. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

13.3.21.1 Affected Environment

The proposed Wah Wah Valley SEZ is bisected by State Route 21, which connects Milford, 23 mi (37 km) to the southeast, with Garrison, about 50 mi (80 km) to the northwest. Two unimproved dirt roads cross the SEZ and intersect State Route 21, as seen in Figure 13.3.21.1-1. The average number of vehicles traveling along State Route 21 just west of the SEZ was 245 per day in 2008, down to 85 vehicles per day closer to Garrison (UDOT 2009). To the east of the SEZ, traffic counts reach up to approximately 2,485 vehicles per day on average on the western edge of Milford and 2,590 per day at the junction with State Route 257 in Milford. Farther east on State Route 21, AADT values range between 1,400 and 1,900 vehicles per day out to I-15. State Route 130 south of Milford averages about 900 vehicles per day. The SEZ area has not been designated for vehicle travel in a BLM land use plan but will be considered in the upcoming revision of the land use plans in the Cedar City Field Office. Table 13.3.21.1-1 shows the annual coverage day traffic on major roads near the proposed Wah Wah Valley SEZ.

The UP Railroad serves the area. The main line connecting Las Vegas and Salt Lake City passes through Milford, where the nearest rail access is located.

The nearest public airport is the Milford Municipal Airport, located 5 mi (8 km) north of Milford, about a 25-mi (40-km) drive from the SEZ. The airport has a 5,000-ft (1,524-m) asphalt runway in good condition that is equipped with landing lights (FAA 2009). There is no control tower, but the airport is staffed during daylight hours. An average of approximately 125 aircraft operations (takeoffs/landings) occur on a weekly basis (Milford 2009).

The other public airports in the area are in Beaver and Cedar City, about 50 mi (80 km) and 75 mi (120 km) to the east–southeast and south–southeast, respectively. The Beaver Municipal Airport has two runways—a 4,984-ft (1,519-m) asphalt runway in fair condition with landing lights and a 2,150-ft (655-m) dirt runway in fair condition without landing lights (FAA 2009). This latter airport is unattended (Beaver 2009). Cedar City Regional Airport has two runways, one in good condition with a length of 4,822 ft (1,470 m), and the other in fair condition with a length of 8,653 ft (2,637 m) (FAA 2009). The airport is served by one regional carrier, Skywest Airlines, with scheduled service between Cedar City and Salt Lake City (Cedar City 2009). In 2008, approximately 7,800 passengers departed from Cedar City and 1,900 passengers arrived at Cedar City. About 133,000 lb (60,300 kg) of freight departed and 159,000 lb (72,100 kg) arrived at the airport in 2008 (BTS 2008).

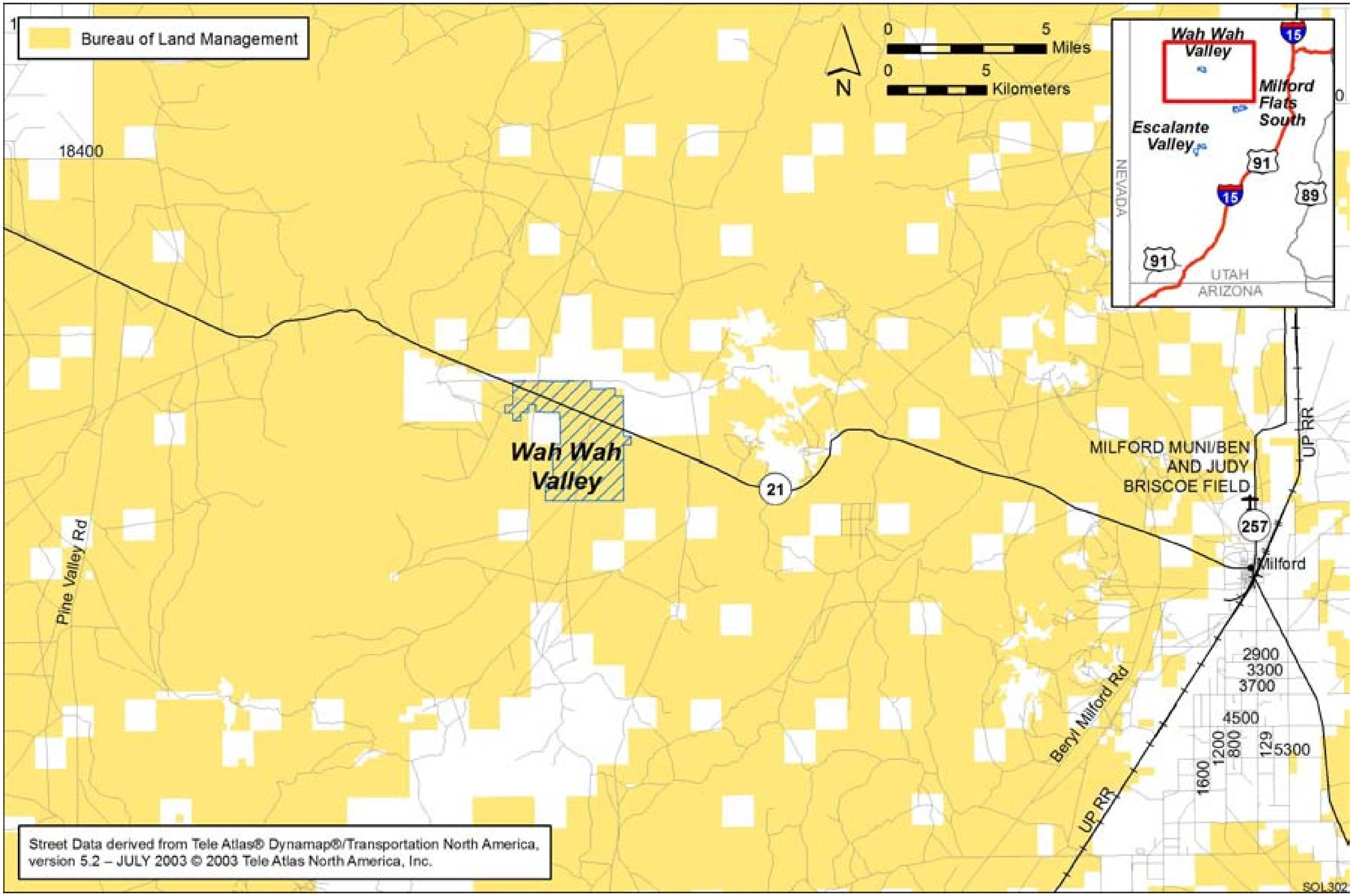

FIGURE 13.3.21.1-1 Local Transportation Network Serving the Proposed Wah Wah Valley SEZ

TABLE 13.3.21.1-1 AADT on Major Roads near the Proposed Wah Wah Valley SEZ for 2008

Road	General Direction	Location	AADT (Vehicles)
I-15	North–south	Junction with I-70	11,885
		South of Beaver	15,395
State Route 21	North–south/east–west	South of Garrison	85
		West of Wah Wah Valley SEZ	245
		West side of Milford	2,485
		Junction with State Route 257	2,590
		South of Milford	1,760
		North of Minersville	1,440
		East of Minersville	1,435
State Route 129	North–South	South of Milford	515
		West of junction with State Route 130	690
State Route 130	North–South	Between Minersville and Cedar City	900

Source: UDOT (2009).

13.3.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The volume of traffic on State Route 21 and other regional corridors would be more than double the current values near the SEZ. Local road improvements would be necessary on any portion of State Route 21 that might be developed so as not to overwhelm the local access roads near any site access point(s). Dependent on the locations of the worker population, upgrades to roads connecting to State Route 21 may also require upgrades (e.g., State Route 130). Potential existing site access roads would require improvements, including asphalt pavement.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any routes designated as open within the proposed SEZ, such routes crossing areas granted ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated.

13.3.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed Wah Wah Valley SEZ. The programmatic design features described in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

13.3.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Wah Wah Valley SEZ in Beaver County in southwestern Utah. 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 five to 10 years in the future.

The largest nearby town is Cedar City, located about 50 mi (80 km) to the southeast in Iron County. The town of Milford is located about 23 mi (37 km) to the east. The surrounding land is rural. There is a ranch with some land under irrigation on the northern boundary of the site. Farther away, the Fishlake National Forest is located 40 mi (64 km) to the east, and the Great Basin NP is 45 mi (72 km) to the northwest. In addition, the proposed Wah Wah Valley SEZ is located close to both the Milford Flats South and Escalante Valley proposed SEZs, and in some areas, impacts from the three SEZs overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the Wah Wah Valley SEZ is identified in Section 13.3.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 13.3.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 13.31.22.3. Cumulative impacts for each resource area are discussed in Section 13.3.22.4.

13.3.22.1 Geographic Extent of the Cumulative Impacts Analysis

Table 13.3.22.1-1 presents the geographic extent of the cumulative impacts analysis for potentially affected resources near the Wah Wah Valley SEZ. These geographic areas define the boundaries encompassing potentially affected resources. Their extent varies on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than visual resources). Lands around the SEZ are State or privately owned, administered by the USFS, or administered by the BLM. The BLM administers approximately 75% of the lands within a 50-mi (80-km) radius of the SEZ.

13.3.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are “reasonably foreseeable”; that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

TABLE 13.3.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Wah Wah Valley SEZ

Resource Area	Geographic Extent
Lands and Realty	Wah Wah Valley
Specially Designated Areas and Lands with Wilderness Characteristics	Wah Wah Valley
Rangeland Resources	Wah Wah Valley
Recreation	Wah Wah Valley
Military and Civilian Aviation	Wah Wah Valley
Soil Resources	Areas within and adjacent to the Wah Wah Valley SEZ
Minerals	Wah Wah Valley
Water Resources	
Surface Water	Wah Wah Wash, Wah Wah Valley Hardpan, Sevier Lake
Groundwater	Wah Wah Valley, regional carbonate-rock aquifer
Vegetation, Wildlife and Aquatic Biota, Special Status Species	Known or potential occurrences within a 50-mi (80-km) radius of the Wah Wah Valley SEZ
Air Quality and Climate	Wah Wah Valley and beyond
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Wah Wah Valley SEZ
Acoustic Environment (noise)	Areas adjacent to the Wah Wah Valley SEZ
Paleontological Resources	Areas within and adjacent to the Wah Wah Valley SEZ
Cultural Resources	Areas within and adjacent to the Wah Wah Valley SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Wah Wah Valley SEZ for other properties, such as historic trails and traditional cultural properties
Native American Concerns	Wah Wah Valley and surrounding mountains; viewshed within a 25-mi (40-km) radius of the Wah Wah Valley SEZ
Socioeconomics	Beaver, Iron, and Millard Counties
Environmental Justice	Beaver, Iron, and Millard Counties
Transportation	State Route 21

- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the Federal Register or state publications;
- Proposals for which enabling legislation has been passed; and
- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase, or that have been put on hold, were not included in the cumulative impacts analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 13.3.22.2.1), and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 13.3.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

13.3.22.2.1 Energy Production and Distribution

Recent developments in the state of Utah have emphasized more future reliance on renewable sources for energy production. In 2008, Utah enacted the Energy Resource and Carbon Emission Reduction Initiative (Senate Bill 202), which established a voluntary RPG of 20% by 2025. This bill is similar to those in states that have adopted RPSs; however, this bill requires that utilities pursue renewable energy only to the extent that it is “cost-effective” to do so. The voluntary renewable goals are being addressed by companies that intend to be energy producers, possibly resulting in several projects being sited in the same geographic areas of southwestern Utah during the same time frame.

Reasonably foreseeable future actions related to energy development and distribution in the vicinity of the proposed Wah Wah Valley SEZ are identified in Table 13.3.22.2-1 and are described in the following sections. Renewable energy projects identified include wind and geothermal projects, but no foreseeable solar energy projects have been identified.

Wind Energy Development

The Milford Wind Corridor Project, Phases I–V, which are either planned, under way, or ongoing, is currently the only reasonably foreseeable wind energy development within a 50-mi (80-km) radius of the proposed Wah Wah Valley SEZ. This development is administered under three BLM ROW applications, as listed in Table 13.3.22.2-1. The footprints of these and numerous other renewable energy ROW applications in various stages of authorization are

TABLE 13.3.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Wah Wah Valley SEZ

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Development			
Milford Wind (UTU 82972)	Ongoing	Land use, ecological resources, visual	About 25 mi (40 km) east-northeast of Wah Wah Valley SEZ (Beaver and Millard Counties)
Milford Wind Phase II (UTU 83073)	Underway	Land use, ecological resources, visual	About 25 mi (40 km) east-northeast of Wah Wah Valley SEZ (Beaver and Millard Counties)
Milford Wind Phases III–V (UTU 8307301)	Planned	Land use, ecological resources, visual	About 25 mi (40 km) east-northeast of Wah Wah Valley SEZ (Beaver and Millard Counties)
Geothermal Energy Project UTU 66583O	Authorized	Land use, groundwater, terrestrial habitats, visual	About 30 mi (50 km) east of Wah Wah Valley SEZ (Beaver County)
Geothermal Energy Project UTU 66583X	Authorized	Land use, groundwater terrestrial habitats, visual	About 30 mi (50 km) east of Wah Wah Valley SEZ (Beaver County)
Blundell Geothermal Power Station	Ongoing	Land use, groundwater, terrestrial habitats, visual	About 30 mi (50 km) northeast of Wah Wah Valley SEZ (Beaver County)
Transmission and Distribution System			
Sigurd to Red Butte No. 2 345-kV Transmission Line Project	Planned	Land use, ecological resources, visual	About 17 mi (27 km) east of Wah Wah SEZ
Energy Gateway South 500 kV AC Transmission Line Project	Planned	Land use, ecological resources, visual	About 17 mi (27 km) east of Wah Wah SEZ
TransWest Express 600 kV DC Transmission Line Project	Planned	Land use, ecological resources, visual	About 17 mi (27 km) east of Wah Wah SEZ
UNEV liquid Fuel Pipeline (UTU-79766)	FEIS April 2010	Disturbed areas, terrestrial habitats along pipeline ROW	About 17 mi (27 km) east of Wah Wah SEZ

shown in Figure 13.3.22.2-1. The identified reasonably foreseeable energy development and distribution projects are discussed in the following subsections, followed by a brief discussion of pending wind applications, also shown in Figure 13.3.22.2-1, which are considered to represent potential, if not foreseeable, projects at this time.

- *Milford Wind Phase I (UTU 82972)*. Phase I of the Milford Wind Corridor Project, a 203.5-MW facility, began operations in October 2009. At least four more phases will follow. The facility is located about 10 mi (16 km) northeast of Milford, east of State Route 287 and on 25,000 acres (103 km^2), covering land in both Beaver and Millard Counties. The facility has 97 wind turbines, including 58 Clipper Liberty 2.5-MW wind turbines and 39 GE 1.5-MW wind turbines. Power from this facility is being purchased by the Southern California Public Power Authority. The project also includes a new transmission line connecting the facility to the existing Intermountain Power Project substation near Delta, Utah. Milford Wind is the first wind energy facility permitted under the BLM Wind Energy Programmatic Environmental Impact Statement for western states (First Wind 2009).

- *Milford Wind Phases II, II, IV, and V.* Four additional phases of the Milford Wind Corridor Project, adjacent to Milford Wind Phase I, are in development. Construction of Milford Wind II (UTU 83073) is under way. Each of the four projects will be a 200-MW wind energy facility (First Wind 2009).

As discussed in Section 13.3.1.2, there is a designated but unoccupied transmission corridor that passes through the proposed Wah Wah Valley SEZ. It is likely that there would be development on this corridor or elsewhere on or near the SEZ to transmit the electricity generated by the potential future solar facilities on the SEZ. The land use conflicts and other cumulative impacts associated with such development would have to be considered when these facilities are proposed and constructed.

Pending Wind ROW Applications on BLM-Administered Lands. Applications for right-of-way grants that have been submitted to the BLM include six pending authorizations for wind site testing, eight authorized for wind testing, and three pending authorizations for development of wind facilities that would be located within 50 mi (80 km) of the SEZ as of May 14, 2010 (BLM and USFS 2010). Table 13.3.22.2-2 lists these applications and Figure 13.3.22.2-1 shows their locations.

The likelihood of any of the pending wind ROW application projects actually being developed is uncertain, but it is generally assumed that applications authorized for wind testing are closer to fruition. However, wind testing alone is not considered a sufficient basis to classify these as reasonably foreseeable projects. The pending applications are listed in Table 13.3.22.2-2 for completeness and as an indication of the level of interest in development of wind energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

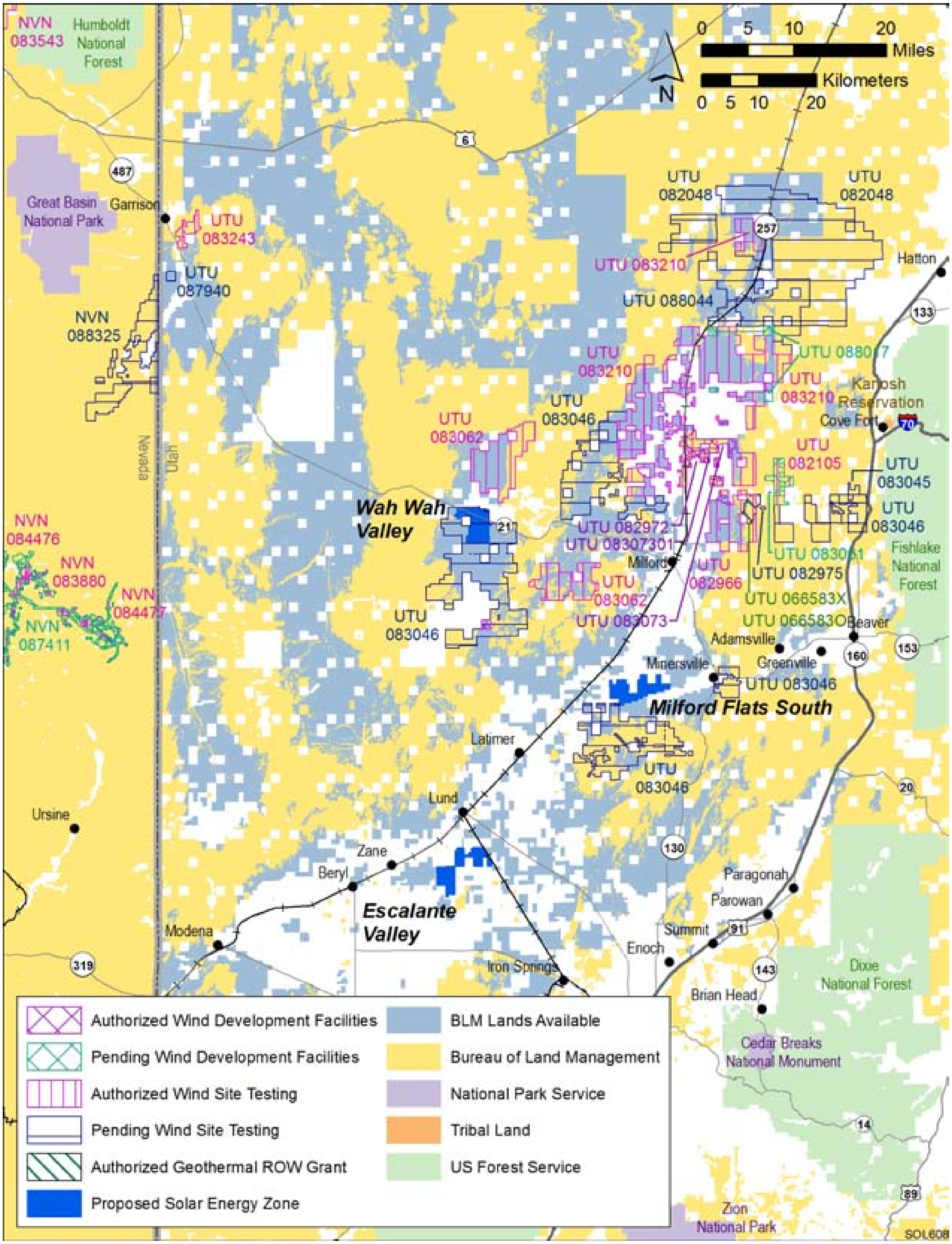

FIGURE 13.3.22.2-1 Locations of Renewable Energy Proposals within a 50-mi (80-km) Radius of the Proposed Wah Wah Valley SEZ

TABLE 13.3.22.2-2 Pending Wind Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Wah Wah Valley SEZ[a]

Serial No	Technology	Status	Field Office
Pending Wind Site Testing			
UTU 082048	Wind	Pending	Fillmore
UTU 082975	Wind	Pending	Cedar City
UTU 083045	Wind	Pending	Cedar City
UTU 083046	Wind	Pending	Cedar City
UTU 085819	Wind	Pending	Cedar City
UTU 088044	Wind	Pending	Cedar City
Authorized for Wind Site Testing			
UTU 082105	Wind	Site Testing	Cedar City
UTU 082966	Wind	Site Testing	Cedar City/Filmore
UTU 083062	Wind	Site Testing	Cedar City/Filmore
UTU 083210	Wind	Site Testing	Cedar City/Filmore
UTU 083243	Wind	Site Testing	Filmore
NVN 083380	Wind	Site Testing	Ely
NVN 084476	Wind	Site Testing	Ely
NVN 084477	Wind	Site Testing	Ely
Pending Wind Development Facilities			
UTU 083061	Wind	Pending	Cedar City
UTU 088017	Wind	Pending	Cedar City
NVN 087411	Wind	Pending	Cedar City

[a] Pending wind applications information downloaded from *GeoCommunicator* (BLM and USFS 2010).

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.

Geothermal Energy Development

Two applications for the development of geothermal energy facilities within 50 mi (80 km) of the proposed SEZ have geothermal agreements authorized by the BLM, as listed in Table 13.3.22.2-1 and shown in Figure 13.3.22.2-1. The two applications are located in close proximity to each other and are located about 30 mi (50 km) east of the SEZ and about 10 mi (16 km) northeast of Milford. These projects are considered only minimally reasonably foreseeable because applications have received only authorized geothermal agreements (BLM and USFS 2010). One operating facility, the Blundell Geothermal Power Station, lies about 30 mi (50 km) northeast of the SEZ and has been in operation since 1984.

Blundell Geothermal Power Station. Utah Power has operated the power station since 1984, which is located 9 mi (14 km) north of Milford in Beaver County. The plant produces geothermal brine from wells that tap a geothermal resource in fractured, crystalline rock at depths generally between 2,100 and 6,000 ft (640 and 1,830 m) and temperatures typically between 520 and 600°F (271 and 316°C). Spent geothermal brine is sent back into the reservoir through gravity-fed injection wells, while the steam fraction is directed into the power plant at temperatures between 350 and 400°F (177 and 204°C) with steam pressure approaching 109 psi (7.66 kg/cm^2).

Transmission and Distribution Systems

Existing and proposed electric transmission lines are considered in the cumulative impact analysis related to solar energy project development in the proposed Utah SEZs. Several transmission line projects and a petroleum pipeline project occur or are planned within the geographic extent of effects for the proposed Wah Wah SEZ.

- *Sigurd to Red Butte No. 2, 345-kV Transmission Line.* Rocky Mountain Power submitted a preliminary ROW application form to the BLM (i.e., Form 299) along with a Plan of Development for the project in December 2008. The project would traverse public lands administered by the BLM and the USFS and private lands over a distance of 150 to 160 mi (241 to 258 km) from the Sigurd Substation in Sevier County near Richfield, Utah, to the Red Butte Substation in southwestern Utah near the town of Central in Washington County. Transmission towers would be steel H-frame design spaced about 1,000 to 1,200 ft (305 to 366 m) apart. The transmission line would need to be operating by 2012 to meet the expected energy demands of southwestern Utah because of population growth in the St. George area and surrounding communities. The proposed route and alternative segments under consideration by Rocky Mountain Power would pass near Milford (BLM 2009a).

- *Energy Gateway South 500-kV AC Line.* PacifiCorp, as part of its Energy Gateway Transmission Expansion Project, is planning to build a high-voltage transmission line, known as the Gateway South segment, from the Aeolus substation in southeastern Wyoming into the new Clover substation near Mona, Utah. An additional segment would continue from the new Clover substation to the existing Crystal substation north of Las Vegas. The larger Gateway Transmission Expansion Project would provide a broad regional expansion of transmission capacity in the West, in part to connect new renewable energy sources to load centers. The Gateway South portion is in the early planning, siting, and permitting stages. Rights of way and an EIS are expected to be completed by 2015, while PacifiCorp projects an in-service date of 2017 to 2019 (PacifiCorp 2010).

- *TransWest Express 600-kV DC Line.* The TransWest Express LLC is proposing a 600-kV DC transmission line that would deliver 3,000 MW of wind energy from Wyoming to the desert southwest by way of Las Vegas. The proposed route would cover 725 mi (1160 km) and pass through southwestern Utah, about 20 mi (32 km) northwest of Cedar City in the vicinity of the three proposed Utah SEZs and within or adjacent to federally designated or proposed utility corridors, or parallel to existing transmission lines or pipelines. The project is in the planning, permitting, and design stages. Project proponents entered the project into the Western Electricity Coordinating Council's rating process for grid integration in January 2008 jointly with PacifiCorp's Gateway South project and anticipate a path rating by 2011. An EIS to be prepared by BLM and the Western Area Power Administration is expected to be completed by 2013 and the line is expected to be in service in 2015 (TransWest 2010).

- *UNEV Pipeline Project.* Holly Energy Partners proposes to construct and operate a 399-mi (640-km) long, 12-in (0.3-m) petroleum products (gasoline and diesel fuel) pipeline that will originate at the Holly Corporation's Woods Cross, Utah, refinery near Salt Lake City and terminate near the Apex Industrial Park northeast of Las Vegas, Nevada. The pipeline would run along the same route as the proposed TransWest Express transmission line described above, passing about 20 mi (32 km) northwest of Cedar City, Utah, and would include a lateral pipeline from the main line to a pressure reduction station at a terminal about 10 mi (16 km) northwest of Cedar City. Access roads would be built to all aboveground infrastructures. BLM issued a Final EIS for the project in April 2010 (BLM 2010b).

13.3.22.2.2 Other Actions

Grazing Allotments

Grazing is a common use of the lands in the vicinity of the proposed Wah Wah Valley SEZ. The management authority for grazing allotments on these lands rests with BLM's Cedar City Field Office. Some of the allotments currently in effect or under review by the BLM in the area include Wah Wah Lawson, Beaver Lake, and Smithson (BLM 2009a). While many factors could influence the level of authorized use, including livestock market conditions, natural drought cycles, increasing nonagricultural land development, and long-term climate change, it is anticipated that the current level of use will continue in the near term. A long-term reduction in federal authorized grazing use would affect the value of the private grazing lands.

Other Projects

Many projects requesting ROW grant approvals on BLM and USFS lands are under review or have received recent BLM approval for locations in Beaver, Iron, and Millard Counties. These projects include initiatives such as minerals mining, communication tower construction or modification, habitat improvement, and vegetation removal for fire control. The following is a summary of larger projects in the vicinity of the three proposed SEZs in Utah (because of the close proximity of the three proposed SEZs in Utah and overlapping geographic extent of boundaries for various resource areas, the projects described in this section apply to all three SEZs in Utah). A list of projects is included in Table 13.3.22.2-3. The list was derived from the BLM Web site for the State of Utah on projects recently approved or under review for ROW permits (BLM 2009a).

- *Blawn Mountain Stewardship.* The BLM implemented a project in January 2009 to improve wildlife habitat in the south end of the Wah Wah Mountains, about 33 mi (53.1 km) southwest of Milford. The largest part of the project area is dominated by pinyon-juniper stands, where understory species are in decline. The objectives are to improve forage for wild horses and provide good deer habitat. An estimated 1,065 acres (4.3 km^2) was to be improved by cutting, lopping, and scattering juniper while retaining most of the pinyon pine. Riparian habitat improvement includes removing the danger of crown fire in ponderosa pine, which can threaten survival of pinyon pine, and improving habitat around springs and where perennial water occurs. The desired condition is to have a patchy density of shrublands, forbs, and grasses to support wildlife. The project also plans to thin up to 3,180 acres (12.9 km^2) of pinyon-juniper stands that surround the Blawn Mountain Chainings. All other actions would be to improve the overall forest health and suitability for wildlife.

- *Paradise Mountain Stewardship.* The BLM initiated a NEPA review in January 2009 on 8,850 acres (35.8 km^2) of montane vegetation in the Paradise Mountains near the Utah–Nevada border to evaluate the impacts of vegetation removal and selective thinning to improve wildlife habitat and reduce fire hazards in the area. The project objectives are to improve forest health; improve wildlife habitat; improve and maintain shrub, grass, and forb habitats in meadow and riparian areas; and decrease the probability of crown fires, which would eliminate individual stands. The Paradise Mountains are located 10 mi (16.1 km) northwest of the town of Modena, about 50 mi (80.5 km) southwest of the proposed Wah Wah Valley SEZ.

  Sevier Lake Potash Competitive Potash Leasing (DOI-BLM-UT-W020-2010-014-EA). BLM's Fillmore Field Office is considering leasing Sevier Dry Lake in Millard County, about 20 mi (32 km) northeast of the Wah Wah SEZ, for solid leasable minerals, specifically, the extraction of potassium-rich brines from the surface and subsurface of the Sevier Lake Playa. Extraction techniques could include surface ditches to extract shallow brines and wells to

TABLE 13.3.22.2-3 Other Projects in the Vicinity of the Proposed Wah Wah Valley SEZ

Project Name	Description	Status	County	Location
AirCell, LLC, Communication Site	Communication tower	Approved Nov. 2009	Beaver	Frisco Peak, San Francisco Mountains
Utah Alunite, LLC, Potassium Prospecting Permit Applications	Request to conduct prospect mining for potassium minerals	Applications received Sept. 2009; scoping Dec. 2008	Iron	Vicinity of Bible, Typhoid, and Mountain Springs
Utah Copper Company Hidden Treasure Mine	Amendment to change some mine facilities, haul road change, and perimeter disturbances on BLM and private lands	Approved Jan. 2009	Beaver	5 to 10 mi (8 to 16 km) northwest of Milford, south end of Rocky Range and Beaver Lake Mountains
Copper Ranch Knoll Exploration Plan of Operation	Authorization requested to initiate a copper reserve delineation project on the Marguerite No. 15 and Jewel Mine patented claims	EA completed Jan. 2009, signed Jan. 28, 2009	Beaver	About 7 mi (11.3 km) northwest of Milford on and around Copper Ranch Knoll, about halfway between west side of Rocky Range and the southeast edge of Beaver Lake Mountains
Clark Livestock Pipeline ROW Renewal	Renewal of permit to transport water to livestock along a 17,253-ft (5,258.7–m) long ROW across about 3,950 acres (16 km^2) of BLM lands	Approved Aug. 7, 2008	Iron	Iron Springs/Big Hollow Wash about 10 mi (16.1 km) northwest of Cedar City, Utah
Highway 56 Fuels Reduction	Decrease fire hazard by removal of up to 1,000 acres (4 km^2) of standing pinyon-juniper; project would involve controlled burning, seeding, controlled grazing	Categorical Exclusion prepared in 2008	Iron	Adjacent to residential and outlying properties near Newcastle in southwestern Iron County
Bible Spring Complex Wild Horse Gather and Removal	Removal of about 380 wild horses through capture; information gained used to update Herd Management Area Plans	EA approved June 30, 2009	Beaver, Iron	Wah Wah and Peak Mountain Ranges
Kern River Gas Transportation Co. Apex Expansion Temporary Use Permit	Request to conduct four geotechnical borings for a proposed compressor site; borings to be conducted early June 2009	No information found	Beaver	Northwest of Minersville

TABLE 13.3.22.2-3 (Cont.)

Project Name	Description	Status	County	Location
Sunrise Exploration Project	Exploration to evaluate grade, depth, and thickness of in-place copper to allow delineation of mineable reserves; 100 to 200 rotary drill holes would occur over about 160 acres (0.67 km^2)	Finding of No Significant Impact (FONSI) and Decision Record approved Sept. 24, 2009	Beaver	Located about 4 mi (6.4 km) northwest of the City of Milford at the southern extent of the Rocky Range
Mineral Mountain Communication Site	Upgrade requested for existing communication site; upgrades expand existing site from 45 ft × 35 ft (14 m × 11 m) to 80 ft × 35 ft (24 m × 11 m); internal building modifications; new 70-ft (21-m) tall steel lattice tower	Application to the BLM received in June 2009; EA checklist received in Sept. 2009	Beaver	Township 26S, Range 8W, Section 30
Hamlin Valley Habitat Improvement	Improve vegetation conditions in Hamlin Valley Project Area; goals include habitat improvements in sagebrush-steppe, pinyon-juniper woodlands, and riparian areas; techniques include harrowing of sagebrush and seeding, thinning of pinyon juniper	EA started in Nov. 2005	Beaver, Iron	Project involves parts of Modena, Spanish George, Rosebud, Butcher, Stateline, Indian Peak, Atchison, South Pine Valley, North Pine Valley, and Indian Peak Grazing Allotments

extract deeper brines. Brines would be concentrated using solar evaporation to precipitate marketable minerals. The process would evaporate an estimated 120,000 ac-ft/yr (148 million m^3/yr) of brine and consume 900 ac-ft/yr (1.11 million m^3/yr) of fresh water over the life of the project. Leases would stipulate that lessees replace water consumed. In addition, up to 300 mi (483 km) of ditches, 250 mi (402 km) of berms, and 47,000 acres (190 km^2) of ponds could be constructed within the floodplain of the dry lakebed. A NEPA Environmental Assessment was issued in September 2010 (BLM 2010b).

- *Clark, Lincoln, and White Pine Counties Groundwater Development Project.* The Southern Nevada Water Authority (SNWA) proposes to construct a groundwater development project that will be capable of transporting as much as 200,000 ac-ft/yr (247 million m^3/yr) of groundwater, including 11,584 ac-ft/yr (14 million m^3/yr) of water rights in the Dry Lake Valley groundwater basin. The proposed facilities include production wells, water pipelines, pumping stations, water treatment, power, and other appurtenant facilities. The project would draw groundwater from the Snake Valley aquifer in western Millard County and the adjacent Spring Valley aquifer in Nevada, as well as the Cave Valley and Dry Lake Valley basins to the southwest. A DEIS is expected in 2010 (SNWA 2010).

13.3.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change are similar for all three SEZs in Utah and are presented together in this section. Table 13.3.22.3-1 lists the relevant impacting factors for the trends.

13.3.22.3.1 Population Growth

Over the period 2000 to 2008, the population grew annually by 3.2% in the ROI for the Wah Wah Valley SEZ (see Section 13.3.10.1). The annual population growth rates for the Escalante Valley and Milford Flats proposed SEZs in the same period were 5.7 and 3.7%, respectively. The annual growth rate for the state of Utah as a whole was 2.5% and for Beaver County was 2.4%. Populations are expected to continue to increase over the period 2010 to 2023 (Governor's Office of Planning and Budget 2009).

TABLE 13.3.22.3-1 General Trends Relevant to the Proposed SEZs in Utah

General Trend	Impacting Factors
Population growth	Urbanization Increased use of roads and traffic Land use modification Employment Education and training Increased resource use (e.g., water and energy) Tax revenue
Energy demand	Increased resource use Energy development (including alternative energy sources) Energy transmission and distribution
Water availability	Drought conditions and water loss Conservation practices Changes in water distribution
Climate change	Water cycle changes Increased wildland fires Habitat changes Changes in farming production and costs

13.3.22.3.2 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 the three-SEZ area in Utah (by as much as 19% 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).

13.3.22.3.3 Water Availability

As described in Section 13.3.9.1.2, groundwater beneath the proposed Wah Wah SEZ lies in the Wah Wah Valley basin-fill aquifer. In 2005, water withdrawals from surface waters and groundwater in Beaver County were 102,350 ac-ft/yr (126 million m^3/yr), of which 52% came from surface waters and 48% came from groundwater. The largest water use category was for agricultural irrigation, at 89,000 ac-ft/yr (110 million m^3/yr). The remaining water use categories were for thermoelectric energy production (6%), livestock (3%), public supply and domestic uses (2%), and industrial purposes (2%) (Kenny et al. 2009). Little is known about the groundwater resources in the Wah Wah Valley SEZ. The Wah Wah Valley contains only one ranch supporting agriculture, and its water is supplied via an aqueduct from Wah Wah Spring. The rest of the Wah Wah Valley is used primarily for livestock grazing (Stephens 1974). A total of 66 water rights have been approved for the Wah Wah Valley and Sevier Lake Area in western Beaver and south-central Millard Counties. Most are for applications less than 2 ac-ft/yr (2,500 m^3) for a single-family home with a few livestock (Utah DWR 2004b). There are currently two pending water right applications that are seeking substantial amounts of groundwater. The Central Iron County Water Conservancy District (CICWCD) has applied for the use of 12,000 ac-ft/yr (14.8 million m^3/yr) to be extracted from 20 wells within the Wah Wah Valley that would range from 100 to 2,000 ft (31 to 610 m) in depth (Utah DWR 2010; application number A76677). Beaver County has applied for the use of 6,650 ac-ft/yr (8.2 million m^3/yr) to be extracted from 17 wells within the Wah Wah Valley that range from 500 to 1,000 ft (152 to 305 m) in proposed depths (Utah DWR 2010; application number A78814). Both of these groundwater applications are under review by the Utah DWR, and together have the potential to withdraw groundwater quantities that exceed the estimated value of groundwater recharge for the basin.

Groundwater use in the Milford area of the Escalante Valley about 20 mi (32 km) east of the SEZ has increased in recent years. The total of estimated withdrawals in the Milford area in 2008 was about 51,000 ac-ft (62.9 million m^3), which is 2,000 ac-ft (2.5 million m^3) more than was reported for 2007 and 6,000 ac-ft (7.4 million m^3) more than the average annual withdrawal for 1998 to 2007. The increase was due mainly to increased industrial water use. Groundwater use was primarily for agriculture (79%) in 2008 (Burden et al. 2009). The majority of the agricultural water use occurs between the towns of Milford and Minersville. The Utah DWR reports that 4,009 water rights have been approved in the Milford area of the Escalante Valley. Almost all of the area is closed to new water appropriations (Utah DWR 2004a).

13.3.22.3.4 Climate Change

The Governor's Blue Ribbon Advisory Council on Climate Change conducted a study of climate change and its effects on Utah (BRAC 2007). The report, generated by scientists from the three major universities in Utah, summarized present scientific understanding of climate change and its potential impacts on Utah and the western United States. Excerpts of researchers' findings and conclusions from the report follow:

- *Temperature Change.* In Utah, the average temperature during the past decade was higher than observed during any comparable period of the past century and roughly 2°F (1°C) higher than the 100-year average. Precipitation in Utah during the twentieth century was unusually high; droughts during other centuries have been more severe, prolonged, and widespread. Declines in low-elevation mountain snowpack have been observed over the past several decades in the Pacific Northwest and California. However, clear trends in snowpack levels in Utah's mountains from temperature increases cannot be developed at this time based on recent historic data. Climate models suggest that the earth's average surface temperature will increase between 3 and 7°F (2 and 4°C). GHG emissions at current rates will continue to exacerbate climate change and associated impacts. For Utah, the projected change in annual mean temperature under the 2.5 times increase in CO_2 concentrations by the end of this century is about 8°F (5°C), which is comparable to the present difference in annual mean temperature between Park City (44°F [24°C]) and Salt Lake City (52°F [29°C]).

- *Impacts of Climate Change in Utah*. Utah is projected to warm more than the average for the entire globe and more than coastal regions of the contiguous United States. The expected consequences of this warming are fewer frost days, longer growing seasons, and more heat waves. Agricultural impacts anticipated include (1) an increase in crop productivity, assuming that water use for irrigation remains relatively constant and more precipitation falls as rain than as snow; (2) grazing use decreases on nonirrigated lands because there is less forage for livestock; and (3) changes in insect and other animal populations which, in turn, affect pollination and crop damage.

Snowpack, water supply, and drought potential are predicted to be affected by GHG emissions holding at current levels or increasing. Year-to-year variations in snowfall will continue to dominate mountain snowpack, streamflow, and water supply during the next couple of decades. As temperature increases, it is likely that a greater fraction of precipitation will fall as rain rather than as snow, and the length of the snow accumulation season will decrease. Projected trends likely to occur in the twenty-first century are as follows:

- A reduction in natural snowpack and snowfall in the early and late winter for the winter recreation industry, particularly in low- to mid-elevation mountain areas (trends in high-elevation areas are unclear);

- An earlier and less intense average spring runoff for reservoir recharge;

- Increased demand for agricultural and residential irrigation due to more rapid drying of soils; and

- Warming of lakes and rivers with associated changes on aquatic life, including increased algal abundance and upstream shifts of fish.

Increasing temperatures will cause soils to dry more rapidly and likely increase soil vulnerability to wind erosion. Increased dust transport during high wind events would likely occur, particularly from salt flats and dry lakebeds such as Sevier Lake. Dust deposited on mountain snowpack would also accelerate spring snowmelt.

Forests, desert communities, and wildlife will likely be affected by increasing temperatures and associated climate change. Drier conditions would result in changes in plant distribution, quality of wildlife habitat, and increased potential for and intensity of wildfires. Plant distribution may change such that species occupy higher elevations.

The three proposed SEZs in Utah are in dry areas that experience drought conditions that will become worse with temperature increases and climate-induced changes on rainfall amounts and patterns. Groundwater availability for agriculture and livestock grazing on BLM-administered and private lands in southwestern Utah will likely be adversely affected by climate change.

13.3.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Wah Wah Valley SEZ on the basis of the following assumptions: (1) because of the relatively small size of the proposed SEZ (less than 10,000 acres [40.5 km^2]), only one project would be constructed at a time, and (2) maximum total disturbance over 20 years would be about 4,878 acres (19.7 km^2) (80% of the entire proposed SEZ). For purposes of analysis, it was 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. In addition, because the closest transmission line is about 42 mi (68 km) away, either a connection of that length would have be established to the existing transmission line or a new transmission line closer to the SEZ would be required to connect the solar facilities on the proposed SEZ to the grid. If a connecting line to the existing transmission line were to be constructed, approximately 1,273 acres (5.2 km^2) of land would be affected. Regarding site access, State Route 21 runs through the northern half of the proposed SEZ. Therefore, other than certain improvements at intersections of State Route 21 and access roads to the SEZ and local roads on the SEZ, no new road construction would be necessary.

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 location within the proposed SEZ, size, number, 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.

13.3.22.4.1 Lands and Realty

The area covered by the proposed Wah Wah Valley SEZ is largely undeveloped. In general, the areas surrounding the SEZ are rural in nature. Numerous dirt/ranch roads provide access throughout the SEZ.

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. Utility-scale solar energy development would be a new and discordant land use in the area. It also is possible that similar development of state and private lands located adjacent to the SEZ would be induced by development on public lands and might include additional industrial or support facilities and activities.

In addition, numerous wind energy projects are proposed within a 50-mi (80-km) radius of the proposed Wah Wah Valley SEZ. As shown in Table 13.3.22.2-1 and Figure 13.3.22.2-1, in addition to the ongoing Milford Wind Corridor Project 25 mi (40 km) to the northeast, there are six pending authorization for wind site testing, eight authorized for wind testing, and three pending authorization for development of wind facilities within this distance. The majority of these wind applications are within 50 mi (80 km) of the SEZ to the east-northeast; the nearest authorized for wind site testing is about 3 mi (5 km) north, while the nearest pending wind testing application overlaps the proposed SEZ. An operating geothermal facility and two adjacent geothermal authorized geothermal leases are located about 30 mi (48 km) to the northeast and east, respectively. There are currently no solar applications within 50 mi (80 km) of the SEZ (Figure 13.2.22.2-1), but the proposed Milford Flats South SEZ is about 42 mi (68 km) to the east, and the proposed Escalante Valley SEZ is about 33 mi (53 km) to the south.

The cumulative effects on land use of development of utility-scale solar projects on public lands on the proposed Wah Wah Valley SEZ in combination with ongoing and foreseeable actions within the geographic extent of effects, nominally 50 mi (80 km), would be small to moderate. Most other actions outside of the proposed SEZ are wind energy projects, which would allow many current land uses to continue, including farming. However, the number and sizes of such projects could result in cumulative effects, especially if the SEZ is fully developed, or all three Utah SEZs are fully developed, with solar projects.

13.3.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

There are two WSAs (Wah Wah Mountains and King Top) and other areas with wilderness characteristics near the proposed Wah Wah Valley SEZ. The potential exists for cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and the construction of transmissions lines outside the SEZ. The exact nature of cumulative visual impacts on the users of these areas would depend on the specific solar technologies employed in the SEZ and the locations selected within the SEZ for solar facilities and outside the SEZ for transmission lines. Other identified reasonably foreseeable energy projects identified within 50 mi (80 km) of the proposed SEZ—Milford Wind, Blundell Geothermal, and two authorized geothermal applications—located about 25 to 30 mi (40 to 50 km) to the east-northeast, are likely too far away to be seen from the visually sensitive areas near the SEZ.

13.3.22.4.3 Rangeland Resources

Currently, there is one grazing allotment in the proposed Wah Wah Valley SEZ. If utility-scale solar facilities were constructed on the SEZ, those areas occupied by the solar projects would be excluded from grazing. Depending on the number and size of potential projects, the impact on the ranger(s) who currently utilize the same lands could be significant. Construction of transmission lines would not have a significant effect on the rangers. The effects of other renewable energy projects within the geographic extent of effects, including Milford Wind, Blundell Geothermal, and two authorized geothermal applications within 50 mi (80 km) of the SEZ, would not likely result in cumulative impacts on grazing due to their distance from the proposed SEZ. Any impacts from pending wind applications, if developed, would be small, as wind facilities are generally compatible with grazing.

Because the proposed SEZ is more than 3 mi (5 km) 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 contribute to cumulative impacts on wild horses and burros managed by the BLM or the USFS.

13.3.22.4.4 Recreation

Limited outdoor recreation (e.g., backcountry driving, OHV use, and hunting for both small and big game) 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. However, improvements to or additional access roads could increase the amount of recreational use in unaffected areas of the SEZ or in the immediate vicinity. There would be a potential for visual impacts on recreational users of the two WSAs and areas with wilderness characteristics near the SEZ (Section 13.3.22.3.2). Since the area of the proposed SEZ has low current recreational use, while major foreseeable actions, primarily wind and geothermal projects located 25 to 30 mi (40 to 50 km) to the east, would similarly affect areas of low recreational use, cumulative impacts on recreation within the geographic extent of effects, would be small.

13.3.22.4.5 Military and Civilian Aviation

The proposed Wah Wah Valley SEZ is located about 100 mi (161 km) away from the closest military installation. The closest civilian municipal aviation facility is the Milford Municipal Airport, located 23 mi (37 km) east of the SEZ. Recent information from the DoD indicates that there are no concerns about solar development in the SEZ. Thus, solar energy development in the proposed SEZ would not contribute to cumulative impacts on military or civilian aviation.

13.3.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from construction of other renewable energy facilities, recreational uses, and agricultural. Overall, the cumulative impacts on soil resources would be small, however, because of the generally low level of soil disturbance associated with wind and geothermal facilities, the main foreseeable development within the geographic extent of effects, and the distance to the authorized projects.

Landscaping of solar energy facility areas could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that from other development activities and agriculture. However, with the required programmatic design features in place, cumulative impacts would be small.

13.3.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 13.3.8, currently there are no oil and gas leases within or near the proposed Wah Wah Valley SEZ. There are no mining claims or proposals for geothermal energy development either. Because of the generally low level of mineral production in the proposed SEZ and surrounding area and the expected low impact on mineral accessibility of other foreseeable actions within the geographic extent of effects, mainly wind and geothermal facilities, cumulative impacts on mineral resources would be small.

13.3.22.4.8 Water Resources

The water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities are described in Section 13.3.9.2. It is stated that if the SEZ were to be fully developed over 80% of its available land area, the amount of water needed during the peak construction year for all evaluated solar technologies would be 885 to 1,261 ac-ft (1.1 million to 1.6 million m^3). During operations, the amount of water needed for all evaluated solar technologies would range from 28 to 14,647 ac-ft/yr (33,000 to 18 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 13.3.22.2.3, the amount of water used in Beaver County in 2005 was 102,350 ac-ft/yr (126 million m^3/yr), of which 52% came from surface waters and 48% came from groundwater. Therefore, cumulatively the additional water resource needed for solar facilities in the SEZ during operations would constitute from a relatively small (0.03%) to a relatively large (14%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Beaver County) depending on the solar technology used (PV technology at the low end and the wet-cooled parabolic technology at the high end). However, as discussed in Section 13.3.9.1.3, the water resources in the area are not fully appropriated, while depth to groundwater is typically greater than 600 ft (183 m) below the surface. New groundwater diversion applications are typically granted for small farming applications (less than 1 acre [0.004 km^2] of irrigation), and all other groundwater applications are considered on a case-by-case basis (Utah DWR 2004a). Solar development of the proposed SEZ with water-intensive wet-cooled technologies would present a major increase in water use in the Wah Wah Valley. Such an increase could draw down groundwater levels, which have been fairly constant since the mid-1970s (Section 13.3.9.1.2), and at the high end could affect the movement of groundwater within the regional groundwater system. While such use would represent a major impact to groundwater in the Wah Wah Valley, further cumulative impacts could occur as a result of current and new water rights being sought for municipal uses and other purposes.

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 9 to 74 ac-ft (11,000 to 91,000 m^3) during the peak construction year and would range from less than 1 to 14 ac-ft/yr (up to 17,000 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- or dry-cooling systems, there would also be from 154 to 277 ac-ft/yr (190,000 to 342,000 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.

13.3.22.4.9 Vegetation

The proposed Wah Wah Valley SEZ is located entirely within the Shadscale-dominated Saline Basins ecoregion, which primarily supports a sparse saltbush-greasewood shrub community. These plant community types generally have a wide distribution within the Wah Wah Valley area, and thus other ongoing and reasonably foreseeable future actions would have a cumulative effect on them. Because of the long history of livestock grazing, the plant communities present within the SEZ have likely been affected by grazing. 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. There are no known wetlands within the proposed SEZ; however, any wetland or riparian habitats outside of the SEZ that are supported by groundwater discharge could be affected by hydrologic changes resulting from project activities. The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other construction, 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. Mitigation measures would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats. Other ongoing and reasonably foreseeable future actions would affect the same plant species affected by development within the SEZ. However, cumulative effects would be small due to the abundance of the affected species and the relatively low impact on vegetation of other major actions, mainly wind and geothermal energy facilities, located 25 mi (40 km) or more away.

13.3.22.4.10 Wildlife and Aquatic Biota

Wildlife species that can 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, affected 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 mitigation measures would reduce the severity of impacts on wildlife. These mitigation measures may include pre-disturbance biological surveys to identify key habitat areas used by wildlife followed by avoidance or minimization of disturbance to those habitats (e.g., areas of crucial habitat for pronghorn).

Other ongoing and reasonably foreseeable future actions within 50 mi (80 km) of the proposed SEZ are dominated by wind and geothermal energy projects (Section 13.2.22.2). The majority of these projects are 9 to 50 mi (14 to 80 km) north (Figure 13.2.22.2-1). The Milford Flats and Escalante SEZs are also located within this distance. Since many of the wildlife species present within the proposed SEZ that could be affected by other actions have extensive available habitat within the affected counties (e.g., mule deer and pronghorn) and most of the major actions would be at some distance from the proposed SEZ and would have low to moderate impacts on most species, cumulative impacts on wildlife within the geographic extent of effects would be small to moderate.

Surface water within the proposed Wah Wah Valley SEZ is typically limited to intermittent washes and dry lakebeds that contain water only for short periods during or following precipitation events; no perennial surface water bodies, seeps, or springs are present within the boundaries of the proposed SEZ. Similarly, wetlands are uncommon on the proposed SEZ (Section 13.3.11.1), and there are no perennial streams in close proximity. Thus, potential contributions to cumulative impacts on aquatic biota and habitats resulting from groundwater drawdown or soil transport to surface streams from solar facilities within the SEZ would be minimal. Further, foreseeable geothermal facilities, which are the major actions that would use groundwater for operations, are located more than 25 mi (40 km) away. Thus, cumulative impacts on aquatic species would be small.

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

As many as 22 special status species could occur within the Wah Wah Valley SEZ based on suitable habitat. Thirteen of these species have been recorded within or near the SEZ: bald eagle, ferruginous hawk, greater sage-grouse, long-billed curlew, northern goshawk, short-eared owl, western burrowing owl, dark kangaroo mouse, fringed myotis, kit fox, pygmy rabbit, spotted bat, and Townsend's big-eared bat. The Utah prairie dog, an ESA-listed species, has the potential to occur within the affected area of the proposed SEZ. Numerous additional species occurring on or in the vicinity of the SEZ are listed as threatened or endangered by the states of Utah and Nevada or listed as a sensitive species by the BLM (see Section 13.3.12.1). Potential mitigation measures that could be used to reduce or eliminate the potential for effects on these species from the construction and operation of utility-scale solar energy projects in the SEZs and related developments (e.g., access roads and transmission line connections) outside the SEZ include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. Ongoing effects on special status species include those from roads, transmission lines, grazing, mineral prospecting, agriculture, and recreational activities in the area, while foreseeable actions are dominated by proposed wind and geothermal projects 25 mi (40 km) or more to the east. A number of pending wind applications lie closer to the proposed SEZ but are not yet considered foreseeable. Many of the special status species present on the SEZ are also likely to be present at the locations of these other foreseeable or potential actions where the same habitats exist. Thus, depending on where other projects are actually built, small cumulative impacts on protected species could occur within the geographic extent of effects. Projects would employ mitigation measures to limit such effects.

13.3.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other projects near solar energy development or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. The dust generation from the construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment.

Because the area proposed for the SEZ is rural and undeveloped land, there are no significant industrial sources of air emissions in the area. The only type of air pollutant of concern is dust generated by winds. Other ongoing and reasonably foreseeable future activities in the general vicinity of the SEZ are described in Section 13.3.22.2. Because the major other foreseeable actions that could produce fugitive dust emissions are located 25 mi (40 km) or more away from the proposed SEZ, cumulative air quality effects due to dust emissions during any overlapping construction periods would be small.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as coal, oil, and natural gas. As discussed in Section 13.3.13, 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 Wah Wah Valley SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 4.6% of all emissions from the current electric power systems in Utah.

13.3.22.4.13 Visual Resources

The proposed Wah Wah Valley SEZ is within a relatively flat, treeless valley floor. The SEZ is visible from upper elevations of the Wah Wah Mountains to the west and south, and the San Francisco Mountains to the east. The area is sparsely inhabited, remote, and rural in character. Other than State Route 21, a few dirt roads and some livestock management–related modifications such as wire fences, normally dry livestock ponds, and cattle trails, there is little evidence of cultural modifications that detract from the area’s natural scenic quality. Construction of utility-scale solar facilities on the SEZ and associated transmission lines outside the SEZ would significantly alter the natural scenic quality of the area. If other reasonably foreseeable activities as described in Section 13.3.22.2 take place, they would cumulatively affect the visual resources in the area. Additional impacts would occur as a result of the construction, operation, and decommissioning/reclamation of related facilities, such as access roads and electric transmission line connections.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area, such as the Sigurd to Red

Butte, Energy Gateway South, and TransWest Express transmission line projects and Sevier Lake potash leasing operations. Milford Wind, an operating geothermal project, and two authorized geothermal applications lie within 50 mi (80 km), while six applications pending authorization for wind site testing, eight authorized for wind testing, and three pending authorization for development of wind facilities on public lands are within 50 mi (80 km) of the SEZ, most located to the east-northeast (Figure 13.2.22.2-1). The Milford Flats and Escalante SEZs are also located within 50 mi (80 km) of the Wah Wah Valley SEZ. While the contribution to cumulative impacts in the area of these potential projects would depend on the number and locations that are actually built, it may be concluded that the general visual character of the landscape within this distance could be altered by the presence of solar facilities and wind mills from what is currently rural desert. Because of the topography of the region, solar facilities within the SEZ and wind facilities located in basin flats would be visible at great distances from surrounding mountains, which include sensitive viewsheds. It is possible that two or more facilities might be viewable from a single location. Also, facilities would be located near major roads, and thus would be viewable by motorists, who would also be viewing transmission line corridors, towns, and other infrastructure, as well as the road system itself.

As additional facilities are added, several projects might become visible from one location, or in succession, as viewers move through the landscape, such as 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 all of the above, the overall cumulative visual impacts within the geographic extent of effects from solar, wind, and other developments could be in the range of small to moderate.

13.3.22.4.14 Acoustic Environment

The areas around the proposed Wah Wah Valley SEZ are relatively quiet. The existing noise sources around the SEZ include road traffic, aircraft flyover, and agricultural activities. Other noise sources associated with current land use around the SEZ include grazing, outdoor recreation, backcountry and OHV driving, and hunting. The construction of solar energy facilities could increase the noise levels periodically for up to three years per facility, but there would be little or minor noise impacts during operation of solar facilities. The exception is that noise from solar dish engine facilities and from parabolic trough or power tower facilities using TES could affect the nearest residences if solar facilities are located near the northern SEZ boundary.

Other ongoing and reasonably foreseeable future activities in the general vicinity of the SEZ are described in Section 13.3.22.2. Because proposed projects are far from the SEZ and the area is sparsely populated, cumulative noise effects during the construction or operation of solar facilities are unlikely.

13.3.22.4.15 Paleontological Resources

The proposed Wah Wah Valley SEZ has low potential for the occurrence of significant fossil material (Section 13.3.16.1). While impacts on significant paleontological resources are unlikely to occur in the SEZ, the specific sites selected for future projects would be investigated to determine if a paleontological survey is needed. Any paleontological resources encountered would be mitigated to the extent possible as determined through consultation with the BLM. No significant cumulative impacts on paleontological resources are expected.

13.3.22.4.16 Cultural Resources

The Wah Wah Valley is rich in cultural history with settlements dating as far back as 12,000 years. The area covered by the proposed Wah Wah Valley SEZ has the potential to contain significant cultural resources; however, this potential is relatively low. It is possible, but unlikely, that the development of utility-scale solar energy projects in the SEZ, when added to other potential projects likely to occur in the area, could contribute cumulatively to cultural resource impacts occurring in the region. However, only the Milford wind project and one operating geothermal facility lie within the 25-mi (40-km) geographic extent of effects, while several pending wind applications lie within this distance. The proposed Milford Flats South SEZ also lies about 20 mi (32 km) to the southwest and the proposed Escalante Valley SEZ lies about 33 mi (53 km) to the south, but neither currently has any solar applications pending. In addition, the specific sites selected for future projects would be surveyed, and historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Utah 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. In addition, given what is currently known archaeologically about the valley floors in this area of Utah, 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.

13.3.22.4.17 Native American Concerns

It is, however, possible that cumulative impacts of concern to Native Americans, such as visual and acoustic impacts on landscapes, could result from combined developments in the region, including solar and wind energy facilities. Government-to-government consultation is under way with federally recognized Native American Tribes with possible traditional ties to the Wah Wah Valley area. All federally recognized Tribes with Southern Paiute roots or possible associations with the Utah SEZs have been contacted and provided an opportunity to comment or consult regarding this PEIS. To date, no specific concerns regarding the proposed Wah Wah Valley SEZ have been raised to the BLM. Continued consultation with the affected Tribes is necessary to effectively consider and address the Tribes' concerns tied to solar energy development in the Wah Wah Valley.

13.3.22.4.18 Socioeconomics

Solar energy development projects in the proposed Wah Wah Valley SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and healthcare facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services in combination with temporary workers involved in other new developments in the area, including other renewable energy development. The number of workers involved in the construction of solar projects in the peak construction year (including the transmission lines) could range from about 120 to 1,600 depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 210 (solar PV) to as high as 3,000 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (890-km) radius of the SEZ occasionally over the 20-or-more year 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. The number of workers needed at the solar facilities would be in the range of 11 to 210, with approximately 15 to 330 total jobs created in the region. Population increases would contribute to the 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 be considered large enough to require specific mitigation measures.

13.3.22.4.19 Environmental Justice

Low-income populations have been identified within 50 mi (80 km) of the proposed SEZ in both Utah and Nevada; no minority populations are present. Any impacts from solar development could have cumulative impacts on low-income populations in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as visual impacts, noise, and exposure to fugitive dust. Actual impacts would depend on where low-income populations are located relative to solar and other proposed facilities and on the geographic range of effects. Overall, effects from facilities within the SEZ are expected to be small, while other major foreseeable actions are 25 mi (40 km) or more away from the proposed SEZ and would not likely combine with effects from the SEZ on low-income populations. If needed, mitigation measures can be employed to reduce the impacts on the population in the vicinity of the SEZ, including the low-income populations.

Thus, it is not expected that the proposed Wah Wah Valley SEZ would contribute to cumulative impacts on low-income populations.

13.3.22.4.20 Transportation

Utah State Route 21 runs through the northern part of the proposed Wah Wah Valley SEZ. The closest airport is the Milford Municipal Airport, located 23 mi (37 km) east of the SEZ. The closest railroad access is the UP Railroad stop also in Milford. The AADT on State Route 21 near the proposed SEZ is less than 300; however, near Milford, the AADT on State Route 21 increases to about 2,500. 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. This increase in highway traffic from construction workers could have moderate cumulative impacts in combination with existing traffic levels and increases from additional future developments in the area should construction schedules overlap. Local road improvements may be necessary on State Route 21, at turn-off points into 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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13.3.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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