13.2 MILFORD FLATS SOUTH

13.2.1 Background and Summary of Impacts

13.2.1.1 General Information

The proposed Milford Flats South SEZ is located in Beaver County in southwestern Utah about 21 mi (34 km) northeast of the Escalante Valley SEZ (Figure 13.2.1.1-1). The SEZ has a total area of 6,480 acres (26 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 city is Cedar City, about 30 mi (48 km) south–southeast in Iron County. Several small towns are located closer to the SEZ; Minersville is about 5 mi (8 km) east, and Milford is about 13 mi (21 km) north–northeast. Salt Lake City is about 200 mi (322 km) to the north–northeast.

The nearest major road is State Route 21/130, about 5 mi (8 km) east in Minersville. A smaller spur of State Route 129 is about 3 mi (5 km) northwest of the SEZ. Access to the Milford Flats South SEZ is by county and local roads. Access to the interior of the SEZ is by dirt roads. The UP Railroad passes 2 mi (3 km) to the west of the SEZ and has a rail stop in Lund, 20 mi (32 km) southwest, and in Milford. The nearest public airports are near Milford and Beaver, about 17 mi (28 km) and 23 mi (37 km) north–northeast and east, respectively. The area does not have good access to transmission. The nearest transmission line is a 345-kV line that runs north to south about 19 mi (31 km) southeast of the eastern boundary of the SEZ.

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

The proposed Milford Flats South SEZ is undeveloped, and the SEZ and surrounding lands are rural in character. Numerous large buildings that are part of a commercial confined hog-rearing operation are located on private land adjacent to the northern border of the SEZ. There are irrigated farms to the east of the area. The SEZ is located in the northeastern section of the Escalante Desert, a large, southwest–northeast trending valley. The Escalante Desert is bounded by the Mineral Mountains to the northeast, Black Mountains to the south and southeast, Shauntie Hills to the northwest, and the Wah Wah Mountains to the west. Land within the SEZ is undeveloped scrubland characteristic of a high-elevation, semiarid basin.

The proposed Milford Flats South SEZ and other relevant information are shown in Figure 13.2.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar energy development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being 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 Milford Flats South SEZ, other restrictions might be appropriate. The analyses in the following sections address the affected

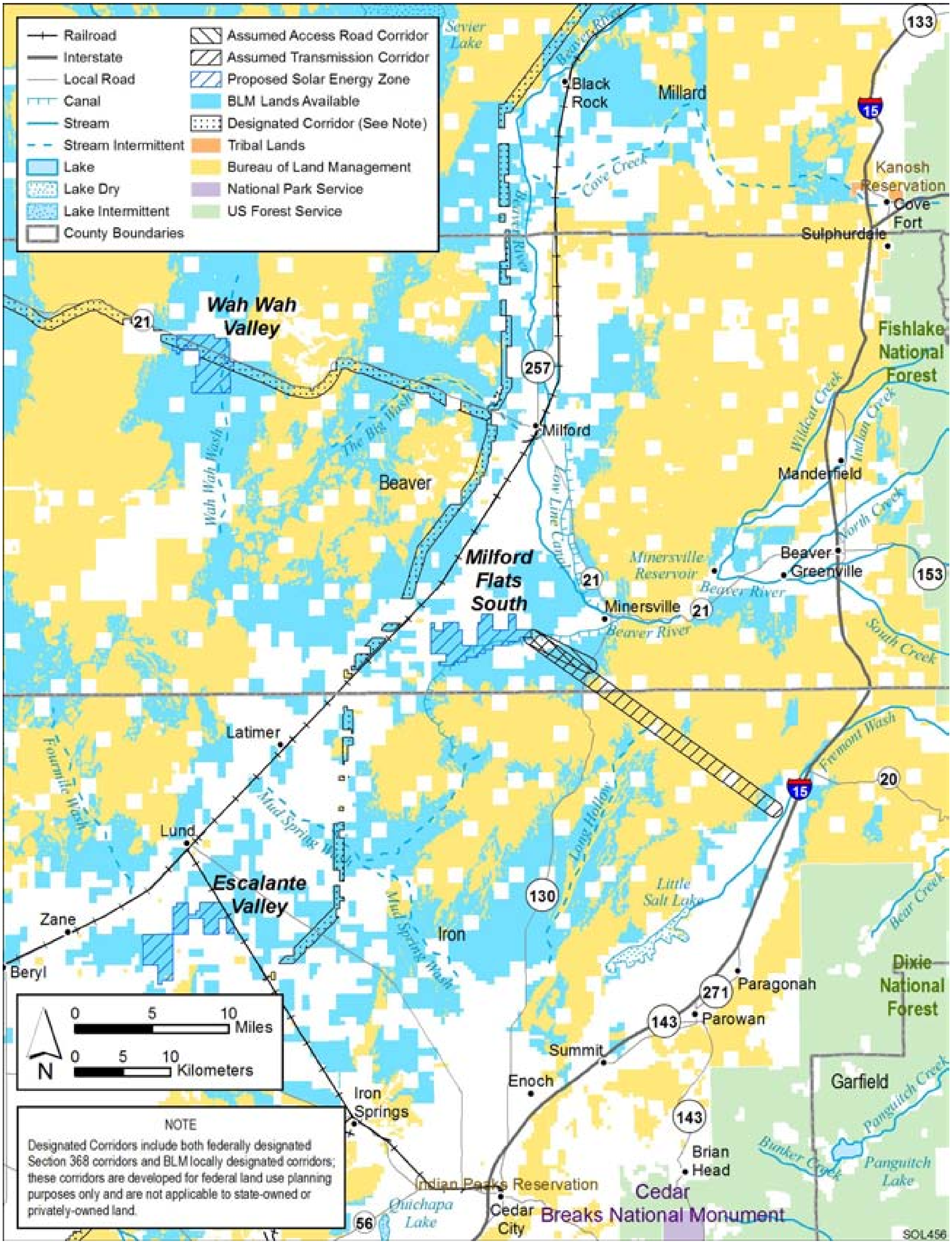


FIGURE 13.2.1.1-1 Proposed Milford Flats South SEZ

environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Milford Flats South SEZ encompassed 6,440 acres (26 km^2). Subsequent to the study area scoping period, the Milford Flats South boundaries were altered somewhat to facilitate the BLM's administration of the SEZ area. The revised SEZ is approximately 40 acres (0.16 km^2) larger than the original SEZ as published in June 2009.

13.2.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the proposed Milford Flats South SEZ was assumed to be 80% of the SEZ area over a period of 20 years, a maximum of 5,184 acres (21 km^2). These values are shown in Table 13.2.1.2-1, along with other development assumptions. Full development of the proposed Milford Flats South SEZ would allow development of facilities with an estimated total of 576 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, based on the assumption of 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 1,037 MW of power if solar trough technologies were used, based on the assumption of 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 345-kV line 19 mi (31 km) southeast of the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 345-kV capacity of that line may be inadequate for 576 to 1,037 MW of new capacity (note: a 500-kV line can approximately accommodate the load of one 700-MW facility). At full build-out capacity, it is likely that new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Milford Flats South 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 projects proposed within the SEZ.

To evaluate the locations and the amount of disturbed acreage for new transmission lines, it was assumed that a transmission line segment would be constructed from the proposed Milford Flats South 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. Establishing a connection to the line closest to the SEZ would involve the construction of about 19 mi (31 km) of new transmission line outside of the SEZ. The ROW for this transmission line would occupy approximately 576 acres (2.3 km^2) of land, assuming a 250-ft (76-m) wide ROW. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different off-site grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they are needed.

TABLE 13.2.1.2-1 Proposed Milford Flats South SEZ—Assumed Development Acreages, Maximum Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Development Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line and Road ROWs	Distance to Nearest Designated Corridor[e]
6,480 acres and 5,184 acres[a]	576 MW[b] and 1,037 MW[c]	State Route 21/130: 5 mi[d]	19 mi and 345 kV	576 acres and 36 acres	2 mi (3 km)

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

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

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

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

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

State Route 21/130 lies about 5 mi (8 km) to the east of the proposed Milford Flats South SEZ. Assuming construction of a new access road to reach State Route 21/130 would be needed to support construction and operation of solar facilities, approximately 36 acres (0.15 km^2) of land disturbance would occur (a 60-ft [18-m] wide ROW is assumed).

13.2.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 13.2.2 through 13.2.21 for the proposed Milford Flats South SEZ are summarized in tabular form. Table 13.2.1.3-1 is a comprehensive list of the impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 13.2.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Milford Flats South SEZ are included in Sections 13.2.2 through 13.2.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 13.2.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Milford Flats South SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Milford Flats South SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ (80% of the total area) could disturb up to 5,184 acres (21 km^2), which would exclude many existing and potential uses of the land, perhaps in perpetuity.	None.
	Establishing connection to the existing transmission line located about 19 mi (31 km) to the southeast would disturb as much as 576 acres (2.3 km^2) of private and BLM-administered land. New road construction would disturb as much as 36 acres (0.15 km^2) of private and BLM-administered land.	Priority consideration should be given to utilizing upgraded existing county roads to provide construction and operational access to the SEZ.
	Solar development would require coordination with existing ROWs for two energy pipelines, one power line, two roads, and one telecommunications line crossing the SEZ.	
Specially Designated Areas and Lands with Wilderness Characteristics	None.	None.
Rangeland Resources: Livestock Grazing	Up to 6,440 acres (26 km^2), in three grazing allotments could be removed from grazing. Approximately 10 to 13% of two allotments could be lost with potential impacts on six permittees.	Consideration should be given to the feasibility of replacing all or part of the 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 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South 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)	Existing oil and gas leases represent prior existing rights that could affect solar development of the SEZ.	Coordination with existing oil and gas lessees should be required in the earliest project planning stages of consideration for a solar development project to determine the feasibility of protecting lessees' development rights.
Water Resources	Ground-disturbing activities (affecting up to 47% 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 1,244 ac-ft (1.5 million m^3). Potential impacts on water resources related to land disturbance activities associated with utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Runoff of water and sediments from the proposed SEZ could potentially affect natural drainage patterns and natural groundwater recharge and discharge properties. Up to 74 ac-ft (91,000 m^3) of sanitary wastewater could be generated during the peak construction year.	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 within a 100-year floodplain; Land disturbance and operations activities should prevent erosion and sedimentation in the vicinity of the ephemeral washes present on the site; Groundwater rights must be obtained from the Utah Division of Water;

TABLE 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South SEZ	SEZ-Specific Design Features
Water Resources (*Cont.*)	Assuming full development of the SEZ, the following amounts of water would be used during operations: • For parabolic trough facilities (1,037-MW capacity), 740 to 1,570 ac-ft/yr (0.5 to 1.9 million m^3/yr) for dry-cooled systems; and 5,199 to 15,567 ac-ft/yr (6.4 to 19 million m^3/yr) for wet-cooled systems; • For power tower facilities (576-MW capacity), 410 to 870 ac-ft/yr (0.5 to 1.1 million m^3/yr) for dry-cooled systems; and 2,886 to 8,646 ac-ft/yr (3.6 to 11 million m^3/yr) for wet-cooled systems; • For dish engine facilities (576-MW capacity), 294 ac-ft/yr (0.36 million m^3/yr); and • For PV facilities (576-MW capacity), 29 ac-ft/yr (0.036 million m^3/yr). Assuming full development of the SEZ, operations would generate up to 15 ac-ft/yr (18,000 m^3/yr) of sanitary wastewater and up to 295 ac-ft/yr (0.36 million m^3/yr) of blowdown water.	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.
Vegetation[b]	Up to 80% (5,184 acres [21 km^2]) of the SEZ would be cleared of vegetation. Additional clearing would result from any transmission line and access road construction outside the SEZ. Re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult because of the arid conditions. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats; thus, reducing restoration success and potentially resulting in widespread habitat degradation.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as those occurring in Beaver County, that could be introduced as a result of solar energy

TABLE 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South SEZ	SEZ-Specific Design Features
Vegetation[b] (*Cont.*)	The deposition of fugitive dust from disturbed soil areas in habitats outside the SEZ and transmission line and access road ROWs could result in reduced productivity or changes in plant community composition. Communities associated with playa habitats, greasewood flats communities, or other intermittently flooded areas downgradient from solar projects in the SEZ could be affected by ground-disturbing activities. Project-related groundwater use resulting in reductions in groundwater discharges at springs in the vicinity of the SEZ that support wetland or riparian habitats could result in degradation of those habitats.	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 to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. All dry wash habitats within the SEZ and all dry wash and riparian habitats within the assumed transmission line corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around dry washes and riparian habitats to reduce the potential for impacts. Transmission line towers should be sited and constructed to minimize impacts on dry washes and riparian areas; towers should span such areas whenever practicable.
Wildlife: Amphibians and Reptiles[b]	Direct impacts on amphibians and reptiles from development on the SEZ would be small (loss of $\leq$1.0% of potentially suitable habitats identified for the species in the SEZ region). With implementation of programmatic design features, indirect impacts would be expected to be negligible.	Minersville Canal, which could provide potential breeding sites for the Great Basin spadefoot and Great Plains toad, should be avoided.

TABLE 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South SEZ	SEZ-Specific Design Features
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* should be followed. Minersville Canal, which could provide an occasional watering and feeding site for some bird species, should be avoided.
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 contained 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 about 0.03% of crucial American black bear habitat, 0.04% of preferred cougar habitat, and 0.01% 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. Development near Minersville Canal should be avoided.

TABLE 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South SEZ	SEZ-Specific Design Features
Aquatic Biota[b]	No permanent water bodies, streams, or wetlands occur within the boundaries of either the Milford Flats South SEZ or the presumed new access road and transmission line corridors. Consequently, there would be no direct impacts on aquatic habitats from solar energy development. The man-made Minersville Canal is within the area of direct and indirect effects for the SEZ and the transmission line and access road. Although it may contain aquatic biota when water is present, Minersville Canal is an irrigation channel and does not support significant aquatic habitat or communities. Indirect effects on water quality could result from inputs of dust, sediment, and contaminants from the SEZ.	None.
Special Status Species[b]	Potentially suitable habitat for 20 special status species occurs in the affected area of the Milford Flats South 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 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 for some species, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Avoidance of woodland habitats, rocky cliffs, and outcrops in the area of direct effects could reduce impacts on six special status species.

TABLE 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		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. Coordination with the USFWS and the UDWR should be conducted to address the potential for impacts on the greater sage-grouse—a candidate species for listing under the ESA. Coordination would identify an appropriate pre-disturbance survey protocol, avoidance measures, and any potential compensatory mitigation actions. 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.
Air Quality and Climate	*Construction*: Predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels would temporarily exceed AAQS at the SEZ boundaries and in the immediate surrounding areas but would decrease quickly with distance. Construction emissions from the engine exhaust from heavy equipment and vehicles could cause some impacts, which would be temporary in nature, 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 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South 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: from 2.7 to 4.9% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Utah avoided (up to 1,808 tons/yr SO_2, 3,457 tons/yr NO_x, 0.007 tons/yr Hg, and 1,960,000 tons/yr CO_2).	
Visual Resources	The SEZ is in an area of low scenic quality, with numerous cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ. 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. Utility-scale solar energy development within the proposed Milford Flats South SEZ is unlikely to cause even moderate visual impacts on highly sensitive visual resource areas, the closest of which is more than 25 mi (40 km) from the SEZ. The closest community is about 5 mi (8 km) from the SEZ and is likely to experience weak visual contrasts from solar development within the SEZ. The communities of Minersville and Milford are located within the 25-mi (40-km) viewshed of the SEZ; slight variations in topography and vegetation provide some screening. Visual contrasts visible from Minersville would be expected to be weak; contrasts visible from Milford would be expected to be minimal. Travelers on State Routes 21 and 129 might observe moderate levels of visual contrast associated with solar development within the SEZ.	None.

TABLE 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction*. For construction activities occurring near the eastern SEZ boundary, estimated noise levels at the nearest residence (located about 1.1 mi [1.8 km] southeast of the SEZ boundary) would be about 41 dBA, which is below the Iron County regulation of 50 dBA for a solar facility and comparable to typical daytime mean rural background level of 40 dBA. In addition, an estimated 42 dBA L_{dn} at this residence is well below the EPA guideline of 55 dBA L_{dn} for residential areas. *Operations*. For a parabolic trough or power tower facility located near the eastern corner of the SEZ, the predicted noise level at the nearest residence would be about 40 dBA, which is lower than the Iron County regulation of 50 dBA and the same as the typical daytime mean rural background level of 40 dBA. For 12-hour daytime operation, the estimated 42 dBA L_{dn} falls well below the EPA guideline of 55 dBA for residential areas. In the case of 6-hour TES at night, the estimated nighttime noise level at the nearest residence would be 50 dBA, which is the same as Iron County regulation of 50 dBA, but higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 52 dBA L_{dn}, which is lower 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 at the nearest residence would be about 44 dBA, which is 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. If assuming 12-hour daytime operation, the estimated 44 dBA L_{dn} at this residence would be well below the EPA guideline of 55 dBA L_{dn} for residential areas.	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearest residence to the southeast of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers. Dish engine facilities within the Milford Flats South SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residence around the SEZ (i.e., the facilities should be located in the central or western area 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.

TABLE 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South SEZ	SEZ-Specific Design Features
Paleontological Resources	Few, if any, impacts on significant paleontological resources are likely to occur in the proposed SEZ or along the additional ROWs for the associated access road and transmission line. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted.	None.
Cultural Resources	No adverse impacts are currently anticipated at the proposed Milford Flats South SEZ or along associated ROWS, but such 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, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties.	SEZ-specific design features would be determined 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 Milford Flats South 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:* 216 to 2,856 total jobs; $11.2 million to $148.1 million income in ROI. *Operations of solar facilities within the SEZ:* 15 to 337 annual total jobs; $0.5 million to $10.2 million annual income in the ROI. *Construction of new transmission line:* 84 total jobs; $3.4 million income. *Construction of access road:* 100 total jobs; $2.8 million income.	None.

TABLE 13.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Milford Flats South SEZ	SEZ-Specific Design Features
Environmental Justice	Low-income populations, as defined by CEQ guidelines, occur within the 50-mi (80-km) radius around the boundary of the SEZ; therefore, any adverse impacts that occur (although likely to be small) could disproportionately affect low-income populations. Because there are no minority populations within the 50-mi (80-km) radius, according to CEQ guidelines, there would be no impacts on minority populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The volumes of traffic on regional corridors would be more than double the current values in most cases. Beryl Milford Road and State Routes 21, 129, and 130 provide regional traffic corridors near the Milford Flats South SEZ.	None.

Abbreviations: AAQS = ambient air quality standards; AQRV = air quality-related value; AUM = animal unit month; BMP = best management practice; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; dBA = A-weighted decibel; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; L_{dn} = day-night average sound level; 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; PV = photovoltaic; ROI = region of influence; ROW = right-of-way; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; TES = thermal energy storage; UDWR = Utah Division of Wildlife Resources; USFWS = U.S. Fish and Wildlife Service.

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

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 13.2.10 through 13.2.12.

This page intentionally left blank.

13.2.2 Lands and Realty

13.2.2.1 Affected Environment

The area around the proposed Milford Flats South SEZ is rural and is located on the north end of a well-blocked unit of BLM-administered public lands. There are private lands adjacent to the north and southeast of the SEZ and a substantial number of large buildings used for commercial, confined, hog-rearing operations. There are also several parcels of state land both adjacent to and southwest of the SEZ. A geothermal steam-generating station is being constructed about 2 mi (3 km) southwest of the SEZ.

In the proposed Milford Flats South SEZ, there are ROWs for two energy pipelines, one transmission line, two roads, and one telecommunications line. There is a Section 368 designated energy corridor 2 mi (3 km) west of the SEZ and a county road passing along the northern edge of the SEZ that connects to State Highway 21 at Minersville, about 5 mi (8 km) east of the SEZ. In addition, Beaver County has asserted Revised Statute 2477 Class B and D road ROWs within the Milford Flats South SEZ. As of February 2010, there were no applications for solar facility ROWs on BLM-administered lands in the vicinity of the proposed Milford Flats South SEZ or in the state of Utah.

13.2.2.2 Impacts

13.2.2.2.1 Construction and Operations

Full development of the proposed Milford Flats South SEZ could disturb 5,184 acres (21 km^2) (Table 13.2.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the setting of the SEZ is rural, utility-scale solar energy development would substantially dominate the area, but because of the presence of a large number of enclosed hog-rearing facilities, the development would not be completely out of place. It also is possible that with landowner agreement, the state and private lands adjacent to the SEZ could 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 rights. Should the proposed SEZ be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development.

13.2.2.2.2 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 345-kV transmission line located about 19 mi (31 km) southeast of the SEZ, as this line might be available to transport the power produced in this SEZ (See Section 13.2.1.2 for a description of analysis assumptions). This line would likely cross private, state, and BLM-administered lands and could disturb as much as 576 acres (2.3 km^2) of land.

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 Milford Flats South 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 solar projects requiring additional transmission capacity.

Because the SEZ is 5 mi (8 km) from the nearest state highway, it is assumed that a new road would need to be constructed to State Route 21/131 east of the SEZ, disturbing approximately 36 acres (0.15 km^2) of private and BLM-administered land. Existing county roads may also be able to provide access to the SEZ; upgrades to these roads may be required to support construction and operation. Roads and transmission lines would also be constructed within the SEZ to facilitate development of the area.

13.2.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions may be impacts related to the exclusion of many existing and potential uses of the public land, perhaps in perpetuity; the visual impact of an industrialized-looking solar facility within an otherwise rural area; and, any induced changes in land use on private and state lands.

A proposed design feature specific to the proposed SEZ is:

- Priority consideration should be given to utilizing upgraded existing county roads to provide construction and operational access to the SEZ.

13.2.3 Specially Designated Areas and Lands with Wilderness Characteristics

13.2.3.1 Affected Environment

The latest revision to the 1999 Utah inventory for wilderness characteristics within BLM's Cedar City district office was completed in January 2005. The Granite Peak wilderness inventory unit, which includes a total of 18,300 acres (74 km^2), is located about 12 mi (19 km) from the eastern boundary of the proposed Milford Flats South SEZ. This is one of the units having wilderness characteristics that has been identified and refined through various BLM inventory efforts since 1980.[1] These lands do not receive the same protection as designated wilderness and WSAs. The BLM has the authority through its land use planning system to manage these lands to protect their wilderness characteristics, but as of this time no such decision has been made. The viewshed of the inventory unit includes highways, roads, agricultural development, and residential development in Minersville and Milford. See Figure 13.2.3.1-1 for the location of this area.

The route of the Old Spanish National Historic Trail is located about 25 mi (40 km) southeast of the SEZ.

13.2.3.2 Impacts

13.2.3.2.1 Construction and Operations

Visitors in about 1,835 acres (7 km^2) (which is about 10%) of the Granite Peak wilderness inventory unit would have a distant and elevated view of development within the SEZ. However, because of the distance to the SEZ and the development currently within the viewshed between the unit and the SEZ, development of the SEZ would not be expected to have a significant additional impact on the wilderness characteristics of the Granite Peak unit.

Depending on the solar technology employed, development within the SEZ might be visible from the route of the Old Spanish Trail, but because of the distance from the SEZ, it is anticipated that there would be no impact on future designation or management of the trail.

13.2.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Construction of a new transmission line would add about 576 acres (2.3 km^2) of surface disturbance on private, state, and BLM-administered lands. Construction of an access road to State Route 130 would add about 36 acres (0.15 km^2) of surface disturbance to private and

---

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

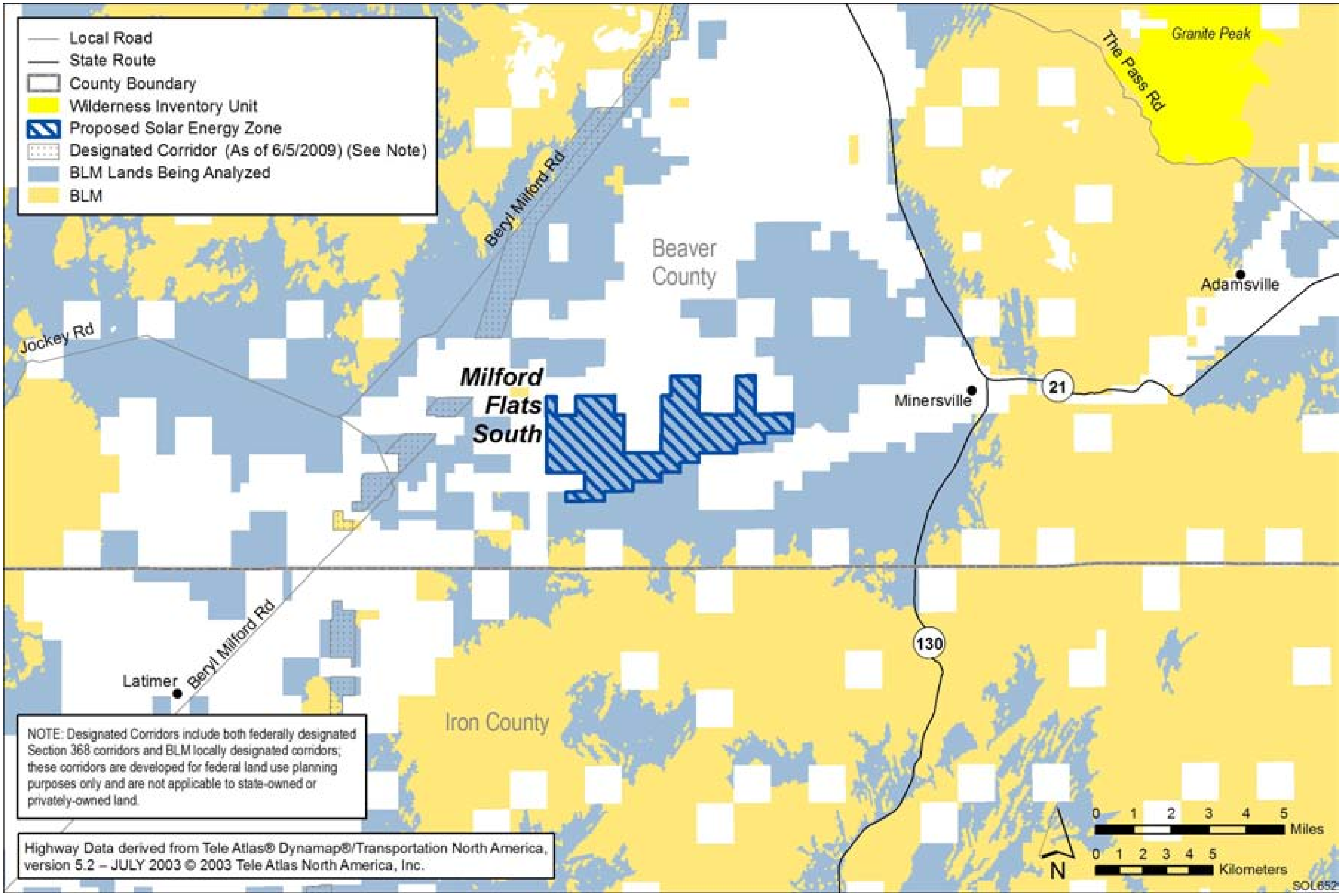


FIGURE 13.2.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Milford Flats South SEZ

BLM-administered land to the impact associated with the SEZ facilities. These disturbances would not likely cause additional adverse impacts on specially designated areas.

13.2.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be required. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for specially designated areas.

This page intentionally left blank.

13.2.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros; both are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Milford Flats South SEZ are discussed in Sections 13.2.4.1 and 13.2.4.2.

13.2.4.1 Livestock Grazing

13.2.4.1.1 Affected Environment

Grazing is currently authorized on the proposed Milford Flats South SEZ. Table 13.2.4.1-1 summarizes the grazing allotments, along with the percentages of the allotments that lie within the SEZ. The SEZ encompasses portions of three perennial grazing allotments. These allotments are used by nine permittees and support the production of 4,986 AUMs of forage per year.

13.2.4.1.2 Impacts

Construction and Operations

Should utility-scale solar development occur in this SEZ, grazing would be excluded from the areas that would be developed, as provided for in the BLM grazing regulations (43 CFR Part 4100). This would include reimbursement of permittees for their portion of the value for any range improvements in the area removed from the grazing allotment. There would be little to no impact on the Minersville No. 5 allotment and small impacts on the Minersville No. 4 and No. 6 allotments. The impact of this change in the grazing permits would depend on several factors, including (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. Based on the assumption of a loss of AUMs comparable to the percentages of the allotments included in the SEZ, a total of 360 AUMs could be lost among the three allotments.

Defining the specific 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 360 AUMs as described above, there would be no significant impact on livestock use from the designation and development of the SEZ. This conclusion is derived from comparing the loss of the 360 AUMs with the total BLM-authorized AUMs in the Cedar City Field Office for grazing year 2008, which totaled 139,998 AUMs. While small from an overall perspective, the loss of 10 to 13% of the AUMs from a relatively small livestock operation could have a significant impact on specific permittees, depending how important the public lands in the allotment are to their overall livestock operations and whether

TABLE 13.2.4.1-1 Grazing Allotments within the Proposed Milford Flats South SEZ

Allotment	Total Acres[a]	Percentage of the Total in the SEZ[b]	Active BLM AUMs	Number of Permittees in the Allotment
Minersville No. 4	29,956	13	1,488	4
Minersville No. 5	24,289	2	2,301	3
Minersville No. 6	20,618	10	1,197	2

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

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

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

or not any mitigation of the loss (e.g., change in livestock management or provision of new range improvements) could be accomplished on the remaining public lands in the allotment. The anticipated 2% loss for the Minersville No. 5 allotment would result in a minor impact on the permittees.

Although the degree of impact on the permittees in this allotment would vary with their individual situations, there would be an adverse economic impact on each of them from the loss of use of a portion of the allotment. It is possible that solar energy development proponents could pay livestock operators for the loss of all or portions of the existing grazing permits and range improvements for the allotment to facilitate solar operations and to minimize the impact on existing permittees; however, that is not required as part of BLM regulations.

Transmission Facilities and Other Off-Site Infrastructure

Construction of a new transmission line would add about 576 acres (2.3 km^2) of surface disturbance and would cross portions of four additional grazing allotments. Construction of an access road to State Route 130 would cross one additional grazing allotment and would add about 36 acres (0.15 km^2) of surface disturbance to the impact associated with the SEZ facilities. These disturbances would not add a significant impact on grazing operations.

13.2.4.1.3 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.

A proposed design feature specific to the Milford Flats South SEZ is:

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

13.2.4.2 Wild Horses and Burros

13.2.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nineteen wild horse and burro HMAs occur within Utah. Figure 13.2.4.2-1 shows the location of the HMAs within the proposed Milford Flats South SEZ region The SEZ is located about 16 mi (26 km) east of the Four Mile HMA. The Four Mile HMA contains an estimated 90 horses (30 over the appropriate management level of 60 horses) (BLM 2009b).

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 Milford Flats South SEZ is the North Hills Territory within Dixie National Forest. This territory is adjacent to the North Hills HMA managed by the BLM and is located southwest of the SEZ (Figure 13.2.4.2-1). The proposed Escalante Valley SEZ is about 51 mi (82 km) from the North Hills Territory.

13.2.4.2.2 Impacts

Because the proposed Milford Flats South SEZ is 16 mi (26 km) or more from any wild horse and burro HMA managed by the BLM and about 51 mi (82 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not affect any wild horses and burros managed by these agencies.

13.2.4.2.3 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 Milford Flats South SEZ.

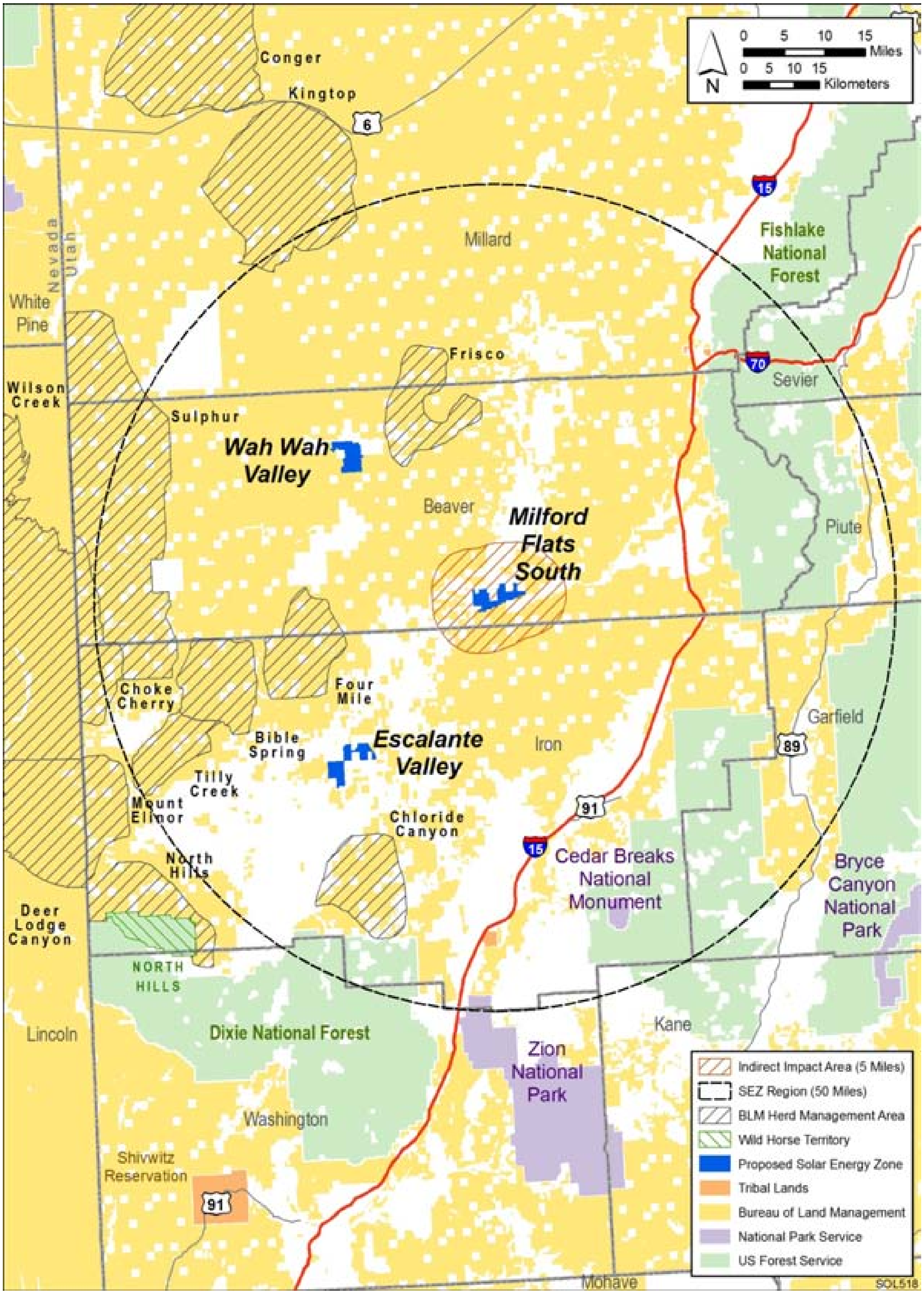


FIGURE 13.2.4.2-1 Wild Horse Herd Management Areas within the Proposed Milford Flats South SEZ Region

13.2.5 Recreation

13.2.5.1 Affected Environment

The area of the proposed Milford Flats South SEZ is flat, and its unremarkable nature offers little potential for recreation use. The presence of hog-rearing operations, along with the odor from those operations, also detracts from the potential recreation value of the area. The area would not be expected to attract recreational visitors from outside the area; however, the area may receive limited use 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.

13.2.5.2 Impacts

Recreational users would be excluded from any portion 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. Roads through any solar development area remaining open for public use would likely be improved as part of the access provided to construct and operate the solar facilities. It is not anticipated that 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. There may be routes designated as open within the proposed SEZ. Such open routes crossing areas granted ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

13.2.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

This page intentionally left blank.

13.2.6 Military and Civilian Aviation

13.2.6.1 Affected Environment

The SEZ is not located under any MTRs or SUAs, and the closest military installation to the proposed Milford Flats South SEZ is the Deseret Test Center, about 118 mi (190 km) north of the SEZ. More distant are the Tooele Army Depot, Dugway Proving Ground, the Wendover Test Range, the Nevada Test Site, and Camp Williams. Hill Air Force Base is located in Salt Lake City.

The closest civilian municipal airports to the Milford Flats South SEZ are the Milford and Beaver Municipal Airports, about 17 mi (28 km) and 23 mi (37 km) north and east, respectively, of the SEZ.

13.2.6.2 Impacts

On the basis of comments received from the military there are no concerns with respect to military aviation for the SEZ.

Because all municipal airports are located 17 mi (28 km) or more from the SEZ, no impacts on civilian aviation from solar development within the area are expected.

13.2.6.3 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.

This page intentionally left blank.

13.2.7 Geologic Setting and Soil Resources

13.2.7.1 Affected Environment

13.2.7.1.1 Geologic Setting

Regional Setting

The proposed Milford Flats South SEZ is located in the Escalante Desert region of the Basin and Range physiographic province in southwestern Utah. The SEZ sits at the southern end of a north-trending valley, just to the north of the Black Mountains. The northern part of the valley lies between the San Francisco Mountains to the west and the Mineral Mountains to the east (Figure 13.2.7.1-1).

The Milford area has a long depositional history, with thick sequences of marine miogeosynclinal sediments (carbonates, sandstone, siltstone, and shale) deposited throughout the Late Precambrian and Paleozoic followed by several orogenic episodes (from the Early Triassic to Oligocene). Volcanic activity in southwestern Utah during the Oligocene and Miocene produced extensive deposits of ignimbrites, lava flows, and volcanic breccias in the region. Block faulting associated with crustal extension in the Basin and Range province began in the Miocene, about 20 million years ago (Mason 1998).

Basin fill is composed predominantly of Sevier River Formation and Salt Lake Formation sediments interlayered with volcanic rocks (basalts and rhyolites) of Quaternary and Tertiary age (Hintze 1980). Sediments are estimated to be up to 4,900 ft (1,490 m) thick, with the uppermost layer consisting of lacustrine deposits of fine-grained clay, silt, and marl in the valley center, intertongued with deltaic and alluvial deposits of clay, silt, sand and gravel along the valley margins (Mason 1998; Lund et al. 2005). Gerston and Smith (1979) estimate that the thickness of the upper layer ranges from 300 ft (90 m) near the valley margins to as much as 3,900 ft (1,190 m) along the valley axis. The lacustrine and deltaic sediments are 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). Shoreline deposits of Lake Bonneville occur at elevations up to about 5,200 ft (1,585 m) (White 1932; Mason 1998). The upper 200 to 300 ft (60 to 90 m) of unconsolidated basin fill compose the principal aquifer system in the Milford area. The composition of deeper sediments (greater than 3,900 ft [1,190 m]) is unknown, but seismic refraction profiles indicate that they are more consolidated (i.e., cemented and compacted) than sediments of the upper layer. These sediments overlie Tertiary (Oligocene) volcanics and basement rocks composed of Cambrian quartzite and Precambrian gneiss (Hintze 1980; Mason 1998).

Exposed sediments in the Milford area are predominantly modern alluvial fan deposits (Figure 13.2.7.1-2). The surrounding mountains are capped with volcanic rocks of Tertiary and Quaternary age (Hintze, 1980; Mason 1998).

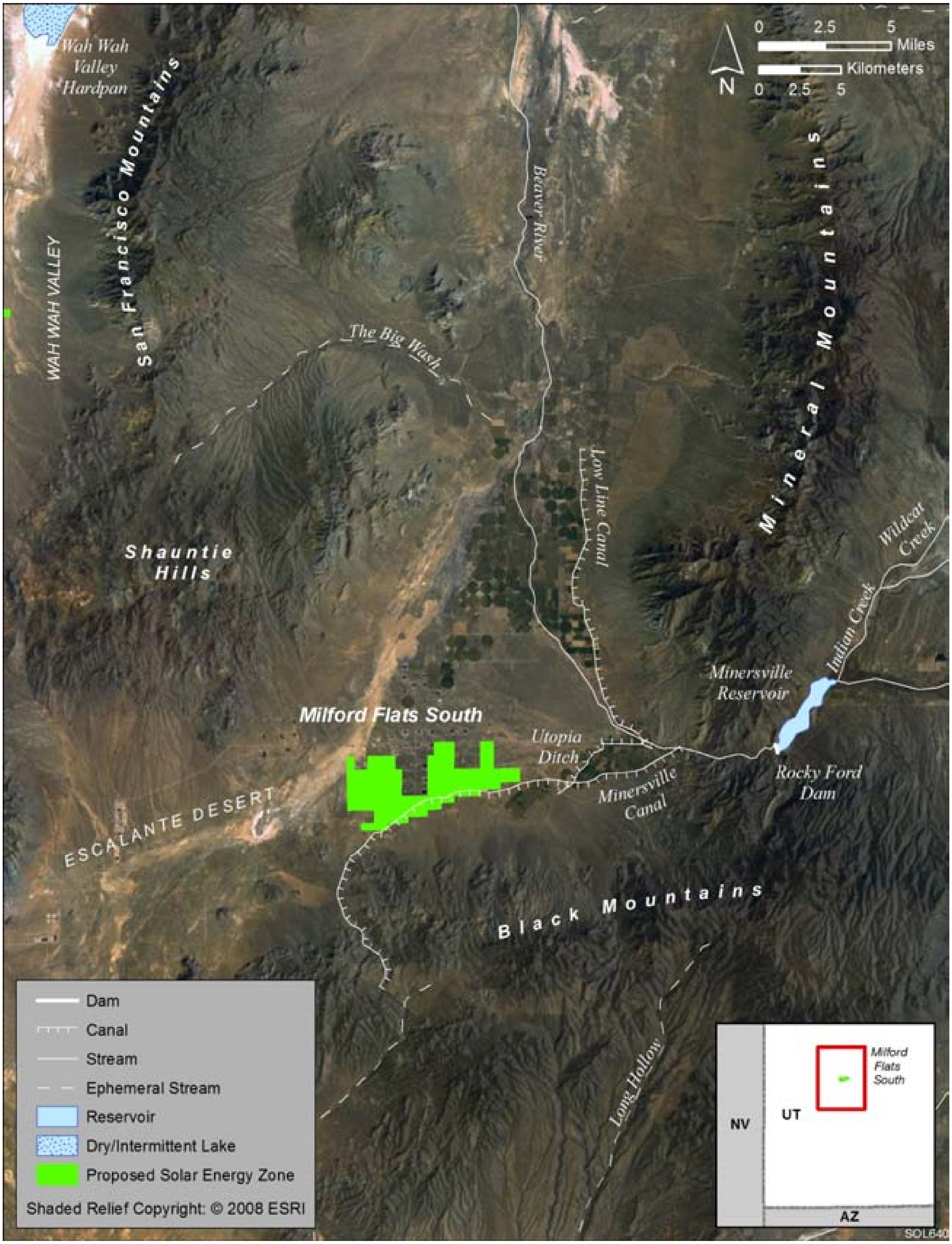


FIGURE 13.2.7.1-1 Physiographic Features of the Escalante Desert Region

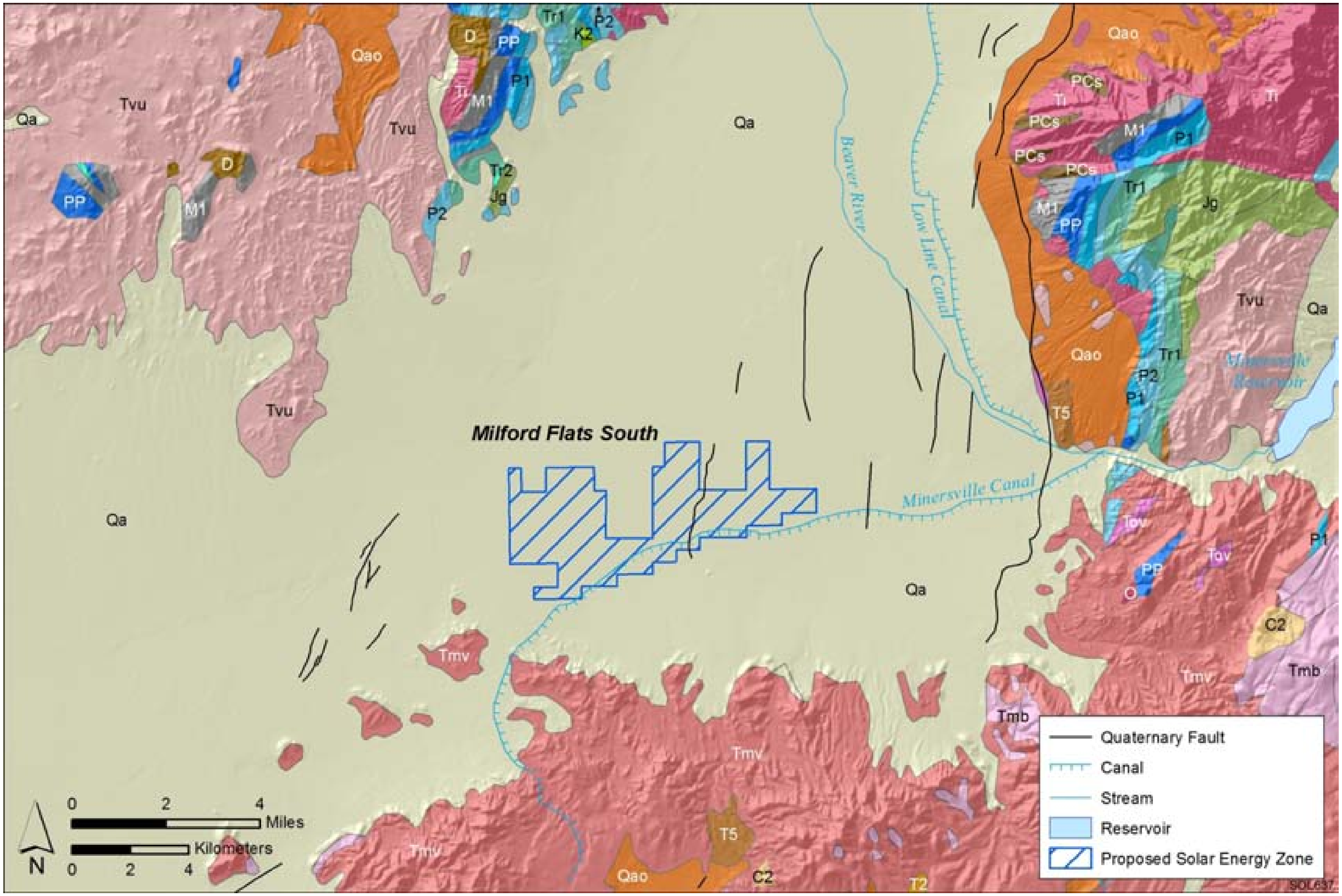


FIGURE 13.2.7.1-2 Geologic Map of the Milford Flats South Region (adapted from Ludington et al. 2007 and Hintze 1980)

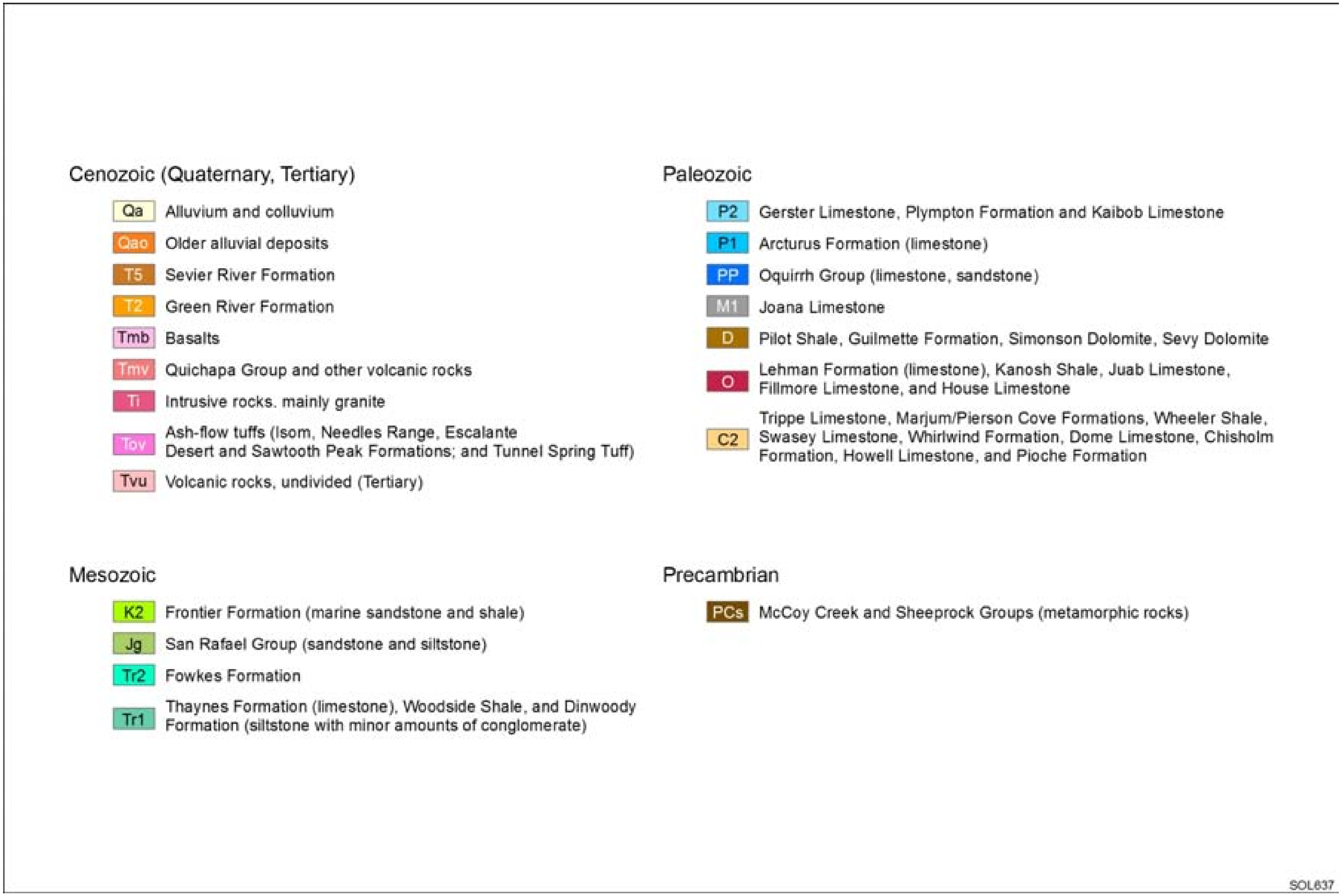


FIGURE 13.2.7.1-2 (Cont.)

Topography

Elevations along the Milford area valley axis range from about 5,500 ft (1,700 m) near the south end and along the valley sides to less than 4,900 ft (1,500 m) along the Beaver River north of Milford in the valley center. Gently sloping alluvial fan deposits occur along the valley margins. The surrounding mountains range in elevation from 5,500 to 9,000 ft (1,700 to 2,700 m), with the highest peak, 9,660 ft (2,940 m), in the San Francisco Mountains. The valley is drained by the Beaver River (which flows into the valley from the east through a narrow gap between the Black and Mineral Mountains) and numerous ephemeral tributaries that are part of the Sevier River drainage system terminating in Sevier Lake. The Beaver River was a perennial river until the Rocky Ford Dam was built in the early 1900s to impound water in a reservoir to the east of Minersville (Figure 13.2.7.1-3). Currently, flow in the Beaver River below the reservoir is small (except in wet years), and most of its water is diverted for irrigation (Mason 1998).

The proposed Milford Flats South SEZ is located just north of the Black Mountains in the Escalante Desert, about 4.5 mi (7.2 km) to the west of Minersville. Its surface is relatively flat, with a gentle slope to the west-northwest (Figure 13.2.7.1-3). Elevations range from 5,120 ft (1,560 m) along the site's eastern border to 5,020 ft (1,530 m) at its northwest corner. The highest point in the area is Ninemile Knoll, just to the south of the SEZ, with a maximum elevation of 5,176 ft (1,578 m). Several irrigation ditches run along the site's southern boundary.

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 5.7.4.2. The following sections provide a preliminary assessment of these hazards at the proposed Milford Flats South 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 proposed Milford Flats South SEZ lies within the 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 2009; 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 80 mi (130 km) to the southwest of the Milford Flats South SEZ, caused little damage to local buildings but triggered the largest landslide known for an earthquake of its magnitude (University of Utah 2009; Christensen 1995).

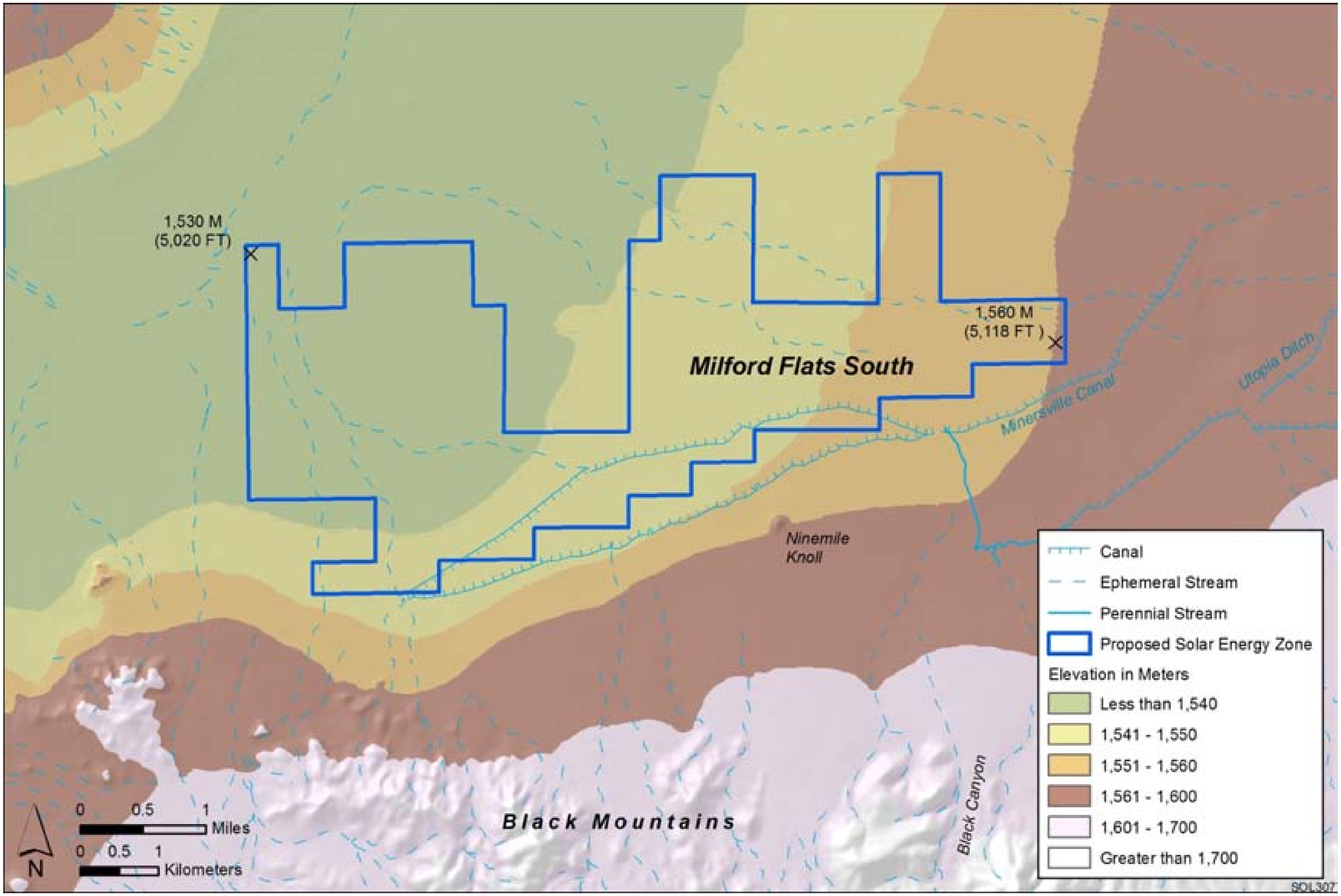


FIGURE 13.2.7.1-3 General Terrain of the Proposed Milford Flats South SEZ

A segment of the Mineral Mountains fault system runs through the center of the Milford Flats South SEZ (Figure 13.2.7.1-4). The Mineral Mountains fault is a normal northeast-striking fault that runs along the western side of the Mineral Mountains. Highly dissected scarps along this fault system and displacement of sediments associated with post-Lake Bonneville drainage development in the valley suggest that movement occurred less than 15,000 years ago (Black and Hecker 1999).

From June 1, 2000, to May 31, 2010, 80 earthquakes were recorded within a 61-mi (100-km) radius of the proposed Milford Flats South SEZ. The largest earthquakes during that period occurred on February 23, 2001, and August 18, 2007. The 2001 earthquake was located about 44 mi (70 km) to the northeast of the SEZ near White Sage Flat and registered a Richter scale magnitude[2] (ML) of 4.1; the 2007 earthquake was located about 13 mi (20 km) to the southwest of the SEZ near Mud Spring Wash and registered a moment magnitude[3] (Mw) of 4.1 (Figure 13.1.7.1-4). During this period, 27 (34%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0 (USGS 2010c); none was greater than 4.1.

Liquefaction. The proposed Milford Flats South SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.09 and 0.10 g. Shaking associated with this level of acceleration is generally perceived as moderate to strong; however, the potential damage to structures is light (USGS 2008). Given the low intensity of ground shaking estimated for the Milford Valley, the potential for liquefaction in Milford Flats sediments is also likely to be low. The UGS has published liquefaction susceptibility maps for several counties within Utah (mainly those counties encompassing portions of the Great Salt Lake shoreline and other lakes and rivers); however, none have been prepared for Beaver County.

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).

---

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

3 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 2010d).

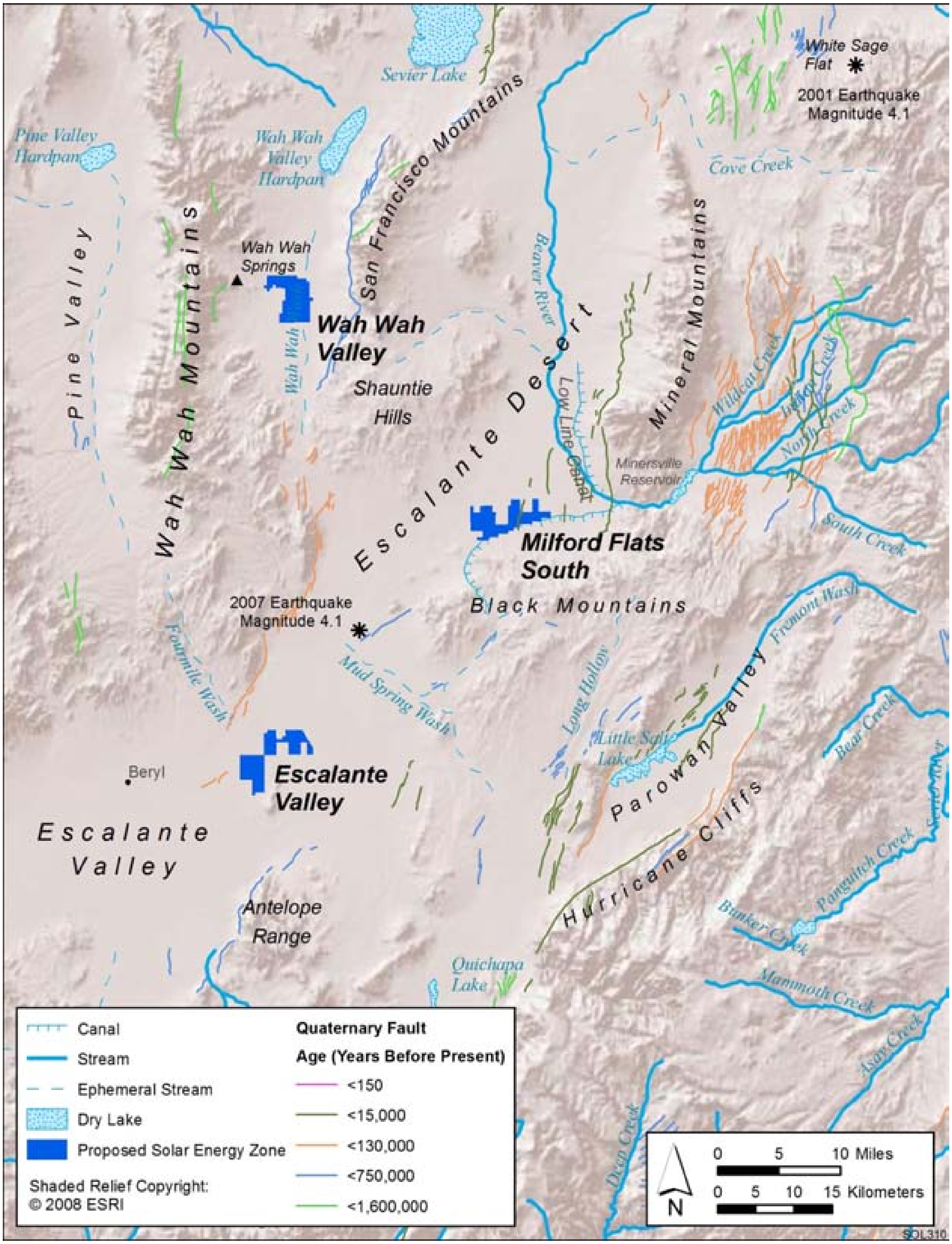


FIGURE 13.2.7.1-4 Quaternary Faults in the Escalante Desert Region (Sources: USGS and UGS 2009; USGS 2010c)

The nearest active volcano is Mount St. Helens in the Cascade Range (Washington), located about 720 mi (1,155 km) to the northwest of the Milford Flats South SEZ, 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 315 mi (510 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 Milford Flats 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 to the southwest of the Milford Flats South SEZ). 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). Subsidence has also been reported for the Milford area, but to a lesser degree than that observed in the Escalante Valley (Forster 2006).

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

Alluvial fan surfaces, such as those found in parts of the Milford area, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) will depend on the specific morphology of the fan (National Research Council 1996).

13.2.7.1.2 Soil Resources

The dominant soil orders in southwestern Utah are Aridisols, Entisols, and Molisols (see Table 4.2.1-1), which are generally very deep, loamy soils that are well drained to somewhat excessively drained. Soils in the regions 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 2009a). Although mechanical and microbiotic crusts are common on Utah soils (Milligan 2009), none have been reported for soils covering the Milford Flats South SEZ, and none were observed in the field.

Soils within the proposed Milford Flats South SEZ are predominantly the silt loams of the Thermosprings-Taylorsflat, moderately saline Kunzler complex, and the Thermosprings-Sevy complex, which together make up about 76% of the soil coverage (Figure 13.2.7.1-5). These soils are very deep and well drained, with slow infiltration (due to a shallow hardpan) and moderately high permeability. 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 most soils. The susceptibility to wind erosion is also moderate, with as much as 86 tons of soil eroded by wind per acre each year (NRCS 2010). Soil map units are described in Table 13.2.7.1-1. Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

With the exception of soils in the Uvada-Playas complex and Arents-Miscellaneous water, sewage complex (covering less than 2% of the SEZ), none of the soils within the SEZ is rated as hydric.[4] Flooding is not likely for soils at the site (occurring less than once in 500 years) (NRCS 2010).

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).

13.2.7.2 Impacts

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

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

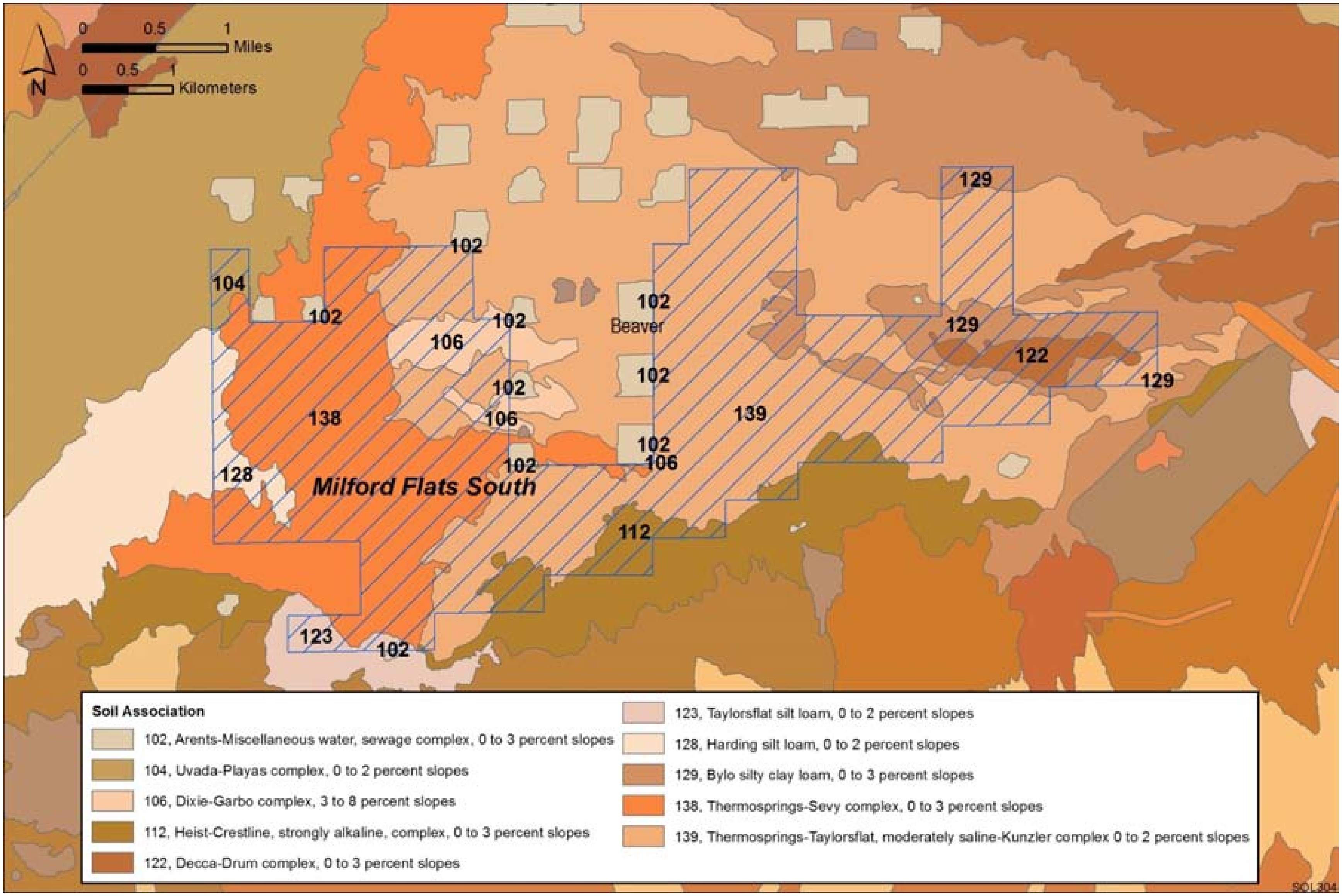


FIGURE 13.2.7.1-5 Soil Map for the Proposed Milford Flats South SEZ (NRCS 2008)

TABLE 13.2.7.1-1 Summary of Soil Map Units within the Proposed Milford Flats South SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (%t of SEZ)
139	Thermosprings-Taylorsflat, moderately saline Kunzler complex (0 to 2% slopes)	Moderate	Moderate (WEG 4)[d]	Level to nearly level soils (silt loams) on lake plains. Parent material consists of alluvium from igneous and sedimentary rocks and/or lacustrine deposits. Soils are well drained, with slow infiltration (due to shallow impeding layer) and moderately high permeability. Slightly to strongly saline. Available water capacity is high. Severe rutting hazard. Used for rangeland, irrigated cropland, and wildlife habitat.	3,165 (49)
138	Thermosprings-Sevy complex (0 to 3% slopes)	Moderate	Moderate (WEG 3)	Level to nearly level soils (silt loams) on lake plains. Parent material consists of alluvium from igneous and sedimentary rocks. Soils are well drained, with slow infiltration (due to shallow impeding layer) and moderately high permeability. Available water capacity is high. Moderate rutting hazard. Used as rangeland and irrigated cropland.	1,766 (27)
129	Bylo silty clay loam (0 to 3% slopes)	Moderate	Moderate (WEG 4)	Level to nearly level soils on alluvial flats. Parent material consists of alluvium from igneous and sedimentary rocks. Soils are very deep and well drained, with slow infiltration (due to shallow impeding layer) and moderately high permeability. Available water capacity is high. Severe rutting hazard. Used for livestock grazing and wildlife habitat.	548 (9)
112	Heist-Crestline strongly alkaline complex (0 to 3% slopes)	Slight	Moderate (WEG 3)	Level to nearly level soils (fine sandy loams) on alluvial fan skirts, beach plains, and stream terraces. 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 moderate. Moderate rutting hazard. Used for livestock grazing, irrigated cropland, and wildlife habitat.	317 (5)

TABLE 13.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (%t of SEZ)
106	Dixie-Garbo complex (3 to 8% slopes)	Moderate	Low (WEG 7)	Nearly level to gently sloping soils (gravelly loams) on alluvial fan remnants. Parent material consists of alluvium from igneous and sedimentary rocks. Soils are very deep and well drained, with slow infiltration (due to shallow impeding layer) and moderately high permeability. Available water capacity is moderate. Severe rutting hazard. Used for rangeland, wildlife habitat, and recreation.	206 (3)
122	Decca-Drum complex (0 to 3% slopes)	Moderate	Low (WEG 7)	Level to nearly level soils (gravelly loams) on stream terraces. Parent material consists of alluvium from igneous rock. Soils are very deep and well drained, with slow infiltration (due to shallow impeding layer) and very high permeability. Available water capacity is low. Moderate rutting hazard. Used for rangeland and irrigated cropland.	169 (3)
128	Harding silt loam (0 to 2% slopes)	Severe	Moderate (WEG 4)	Level to nearly level soils on lake plains. Parent material consists of Lake Bonneville lacustrine deposits from igneous and sedimentary rocks. Soils are very deep and well drained, with slow infiltration (due to shallow impeding layer) and moderately low permeability. Available water capacity is moderate. Severe rutting hazard. Used mainly as winter rangeland.	154 (2)
123	Taylorsflat silt loam (0 to 2% slopes)	Moderate	Moderate (WEG 6)	Level to nearly level soils on alluvial flats. Parent material consists of alluvium from igneous and sedimentary rocks. Soils are very deep and well drained, with slow infiltration (due to shallow impeding layer) and moderately high permeability. Available water capacity is high. Severe rutting hazard. Used for rangeland, irrigated cropland, and wildlife habitat.	80 (1)

TABLE 13.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (%t of SEZ)
104	Uvada-Playas complex (0 to 2% slopes)	Moderate	Moderate (WEG 4)	Level to nearly level soils (silt loams) on lake plains. Parent material consists of Lake Bonneville lacustrine deposits from igneous and sedimentary rocks. Soils are very deep and well drained, with high surface runoff potential (very slow infiltration rate) and moderately high permeability. Available water capacity is moderate. Severe rutting hazard. Used for rangeland (Uvada).	71 (1)
102	Arents-Miscellaneous water, sewage complex (0 to 3% slopes)	Not rated	Not rated	Level to nearly level variable mixed (disturbed) soils. Soils are well drained, with low surface runoff potential (high infiltration rate) and high permeability. Slight rutting hazard. Used mainly as cropland, urban land, pasture, or wildlife habitat.	4 (<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; does not 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.

[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 (4,000 m^2) 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 6, 48 tons (44 metric tons) per acre (4,000 m^2) per year; and WEG 7, 38 tons (34 metric tons) per acre (4,000 m^2) per year.

Source: NRCS (2010).

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

13.2.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Milford Flats South 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.

This page intentionally left blank.

13.2.8 Minerals (Fluids, Solids, and Geothermal Resources)

13.2.8.1 Affected Environment

There are no mining operations within the proposed Milford Flats South SEZ, and no active mining claims or leases are on record (BLM and USFS 2010a). In June 2009, public land in the SEZ was closed to locatable mineral entry pending the outcome of this PEIS. Four existing oil and gas leases cover the entire SEZ and are classified as nonproducing (BLM and USFS 2010b). The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals and for disposal of salable minerals.

The area around the Milford SEZ is considered an area of prospective geothermal resources, and there have been previous geothermal leases within the SEZ. There are currently no active leases in the SEZ, but a geothermal plant is being constructed about 3 mi (5 km) southwest of the SEZ.

13.2.8.2 Impacts

The oil and gas leases within the Milford Flats South SEZ are prior existing rights and represent a conflict with future solar development. As long as these leases remain in effect, solar development would require the cooperation of the oil and gas lessees. Such cooperation might be possible, since oil and gas development generally requires fewer than 5 acres (0.02 km^2) per well, but it would depend on accommodating the oil and gas lease holders' needs for continued access to develop, maintain, and service their wells.

If the area is identified as a SEZ, it would continue to be closed to all incompatible forms of mineral development. It is assumed that future development of oil and gas resources would continue to be possible, since such development could occur under the existing leases or from directional drilling outside the lease area. Since the SEZ does not contain existing mining claims, it is also assumed that there would be no future loss of locatable mineral production. The production of common minerals, such as sand and gravel and mineral materials used for road construction, might take place in areas not directly developed for solar energy production.

Solar development is not expected to significantly affect future geothermal development in the area of the SEZ, although the surface of the SEZ would not be available for such development. It might be possible to develop geothermal resources under the SEZ, should any be identified, by using directional drilling techniques to access hot water sources.

13.2.8.3 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.

A proposed design features specific to the Milford Flats South SEZ is:

- Coordination with existing oil and gas lessees should be required in the earliest stages of consideration for a solar development project to determine the feasibility of protecting lessees' development rights.

13.2.9 Water Resources

13.2.9.1 Affected Environment

The proposed Milford Flats South SEZ is within the Escalante Desert–Sevier Lake subregion of the Great Basin hydrologic region (USGS 2010a). The proposed Milford Flats South SEZ is located in the Milford area of the Escalante Desert Valley, which covers an area of approximately 742,000 acres (3,000 km^2). The Escalante Desert Valley is within the Basin and Range physiographic province, which is characterized by intermittent mountain ranges and desert valleys (Robson and Banta 1995). The region consists of semiarid desert valleys where surface waters are typically limited to ephemeral washes and dry lakebeds, and the primary water resource is groundwater. The SEZ sits at the southern end of a north-trending valley, just to the north of the Black Mountains. The northern part of the valley lies between the San Francisco Mountains to the west and the Mineral Mountains to the east (Figure 13.2.9.1-1). Elevations range from 5,120 ft (1,560 m) along the site's eastern border to 5,020 ft (1,530 m) at its northwest corner. The highest point in the area is Ninemile Knoll, just to the south of the SEZ, with a maximum elevation of 5,176 ft (1,578 m). Average precipitation in the valley is estimated to be 9 in./yr (20 cm/yr) (WRCC 2010a). The average annual pan evaporation rate is estimated to be 70 in./yr (178 cm/yr) (Cowherd et al. 1988; WRCC 2010b).

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

The proposed Milford Flats South SEZ is located within Utah's Cedar/Beaver River Basin planning area (UBWR 1995). The primary surface water feature near the proposed SEZ is the Beaver River, approximately 6 mi (10 km) west of the proposed Milford Flats South SEZ, which flows into the valley from the east through a narrow gap between the Black and Mineral Mountains (Figure 13.2.9.1-1). The Beaver River was a perennial river until the Rocky Ford Dam was built in the early 1900s to impound water in a reservoir to the east of Minersville. Currently, flow in the Beaver River below the reservoir is small (except in wet years), and most of its water is diverted for irrigation (Mason 1998). The Minersville Canal flows through the southern portion of the proposed Milford Flats South SEZ, and the Utopia Ditch is located between the SEZ and the Beaver River. These irrigation canals are diverted from the Beaver River in Minersville. Several unnamed, small ephemeral washes cross the proposed SEZ. Ephemeral washes in the vicinity of the SEZ only flow in response to intense precipitation and/or snowmelt (Mower and Cordova 1974).

The proposed Milford Flats South SEZ is located in an area that has not been examined for flood risk (Zone D) by FEMA (FEMA 2009). Flooding caused by large rainfall events would be limited to localized ponding and erosion, since there are no permanent surface water features near the proposed SEZ. In addition, no wetlands have been identified within or near the proposed SEZ according to the NWI (USFWS 2009).

Many springs are located in the mountains surrounding the SEZ; however, the majority of the springs are sourced from igneous rock formations in the mountains. In 1971 and 1972,

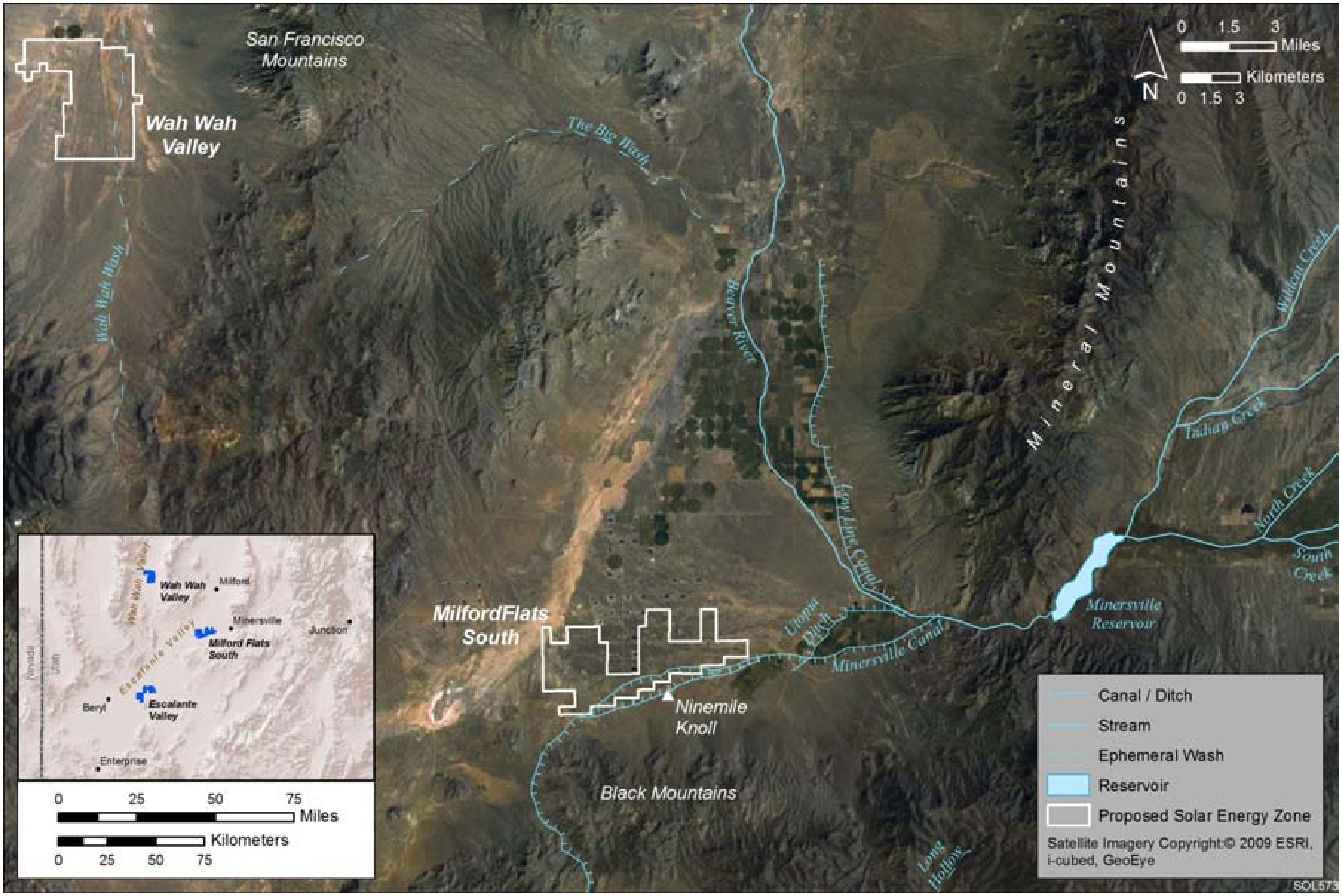


FIGURE 13.2.9.1-1 Surface Water Features near the Proposed Milford Flats South SEZ

10 springs were identified to be fed by the main basin-fill groundwater reservoir beneath the SEZ. However, only three of the springs were observed to be flowing (Mower and Sandberg 1982). It is unknown whether these springs continue to flow within the basin.

13.2.9.1.2 Groundwater

The proposed Milford Flats South SEZ is located within the Milford area groundwater basin located in the northern Escalante Valley. The basin-fill aquifer in the Milford area ranges between 300 and 500 ft (91 to 152 m) in thickness. The aquifer consists of Quaternary age deposits of alternating layers of clay, sand, and gravel, with coarser material making up between 25 and 50% of the aquifer material. Reported transmissivity values for the aquifer range from 1,000 to 10,000 ft^2/day (93 to 930 m^2/day) (Mower and Cordova 1974). The natural groundwater flow direction is from the south to the north, with negligible groundwater discharge to the Lower Beaver basin to the north (Mason 1998; UBWR 1995). Approximately 1,000 ac-ft/yr (1.2 million m^3/yr) is estimated to enter the Milford area basin from the adjacent Beryl-Enterprise basin to the south, and 700 ac-ft/yr 860,000 m^3/yr) is estimated to enter the Milford area basin from the adjacent Beaver Valley to the east (UBWR 1995). Recharge in the basin takes place primarily at basin margins, where infiltration of precipitation and runoff occurs through course sediments.

Detailed information regarding groundwater processes in the northern Escalante Desert Valley was obtained from a study by Mower and Cordova (1974) that examined the groundwater conditions in 1970. Total groundwater storage was estimated to be 95,000,000 ac-ft (117 billion m^3) in 1970. The majority of the groundwater recharge (16,000 ac-ft [20 million m^3]) was in the form of runoff from higher elevations along the periphery of the valley, and seepage from agricultural irrigation (22,800 ac-ft [28 million m^3]) concentrated near the towns of Milford and Minersville. Other inputs to the basin were estimated to be the following: 7,200 ac-ft (8.9 million m^3) as seepage from streams/washes in the valley, 8,500 ac-ft (10 million m^3) as seepage from canals, 2,000 ac-ft (2.5 million m^3) as precipitation on the valley floor, and 1,700 ac-ft (2.1 million m^3) from subsurface inflow from adjacent basins. Seepage from other basins in 1970 was estimated to be approximately 1,000 ac-ft (1.2 million m^3) from the Beryl-Enterprise basin and 700 ac-ft (860,000 m^3) from the Beaver Valley. The total inputs in 1970 were estimated to be 58,200 ac-ft (71.8 million m^3) in the Milford area groundwater basin (Mower and Cordova 1974). Groundwater discharge in 1970 was primarily by groundwater withdrawals (56,000 ac-ft [69 million m^3]) and evapotranspiration (24,000 ac-ft [30 million m^3]), with very little subsurface discharge out of the valley (8 ac-ft [10,000 m^3]).

Groundwater levels dropped as much as 65 ft (20 m) in the Milford area basin between 1948 and 2009 because of excessive groundwater withdrawals in the basin (Burden et al 2009). Two active USGS monitoring wells that are located within 1.0 mi (1.6 km) of the SEZ indicate depths to groundwater of 90 ft (27 m) and 135 ft (41 m) (USGS 2010b; well numbers 381318113024801 and 381319113003501). The depth to groundwater records in these wells and others within the northern Escalante Desert Valley have shown a groundwater table falling at a rate of 0.4 to 2.5 ft/yr (0.1 to 0.8 m/yr); the larger rates are concentrated just to the south of the town of Milford, which is 10 mi (16 km) northwest of the proposed SEZ (Burden et al. 2009). Groundwater elevations have been observed to drop approximately 40 ft (15 m) between 1950 and 2009 in wells within 2 mi (3.2 km) of the proposed Milford Flats South SEZ (Burden et al. 2009; USGS 2010b). Fracturing and land subsidence due to aquifer overdraft has been observed in the area of the highest groundwater withdrawals at a rate of less than 0.6 in./yr (1.5 cm/yr) (Mower and Cordova 1974; Forster 2006).

The groundwater quality within the Milford area is generally good, with TDS concentrations ranging between 490 and 910 mg/L and the median TDS concentration estimated to be 580 mg/L (Burden et al. 2009).

13.2.9.1.3 Water Use and 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 was for agricultural irrigation (87%), at 89,000 ac-ft/yr (110 million m^3/yr). The remainder was for thermoelectric energy production (6%), livestock (3%), public supply and domestic uses (2%), and industrial purposes (2%) (Kenny et al. 2009). Usage of the total groundwater withdrawals in the northern Escalante Desert Valley 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, which are located east and northeast of the SEZ. In 2008, groundwater withdrawals in the Milford area groundwater basin were approximately 51,000 ac-ft (63 million m^3), and the average groundwater withdrawals between 1997 and 2007 were 45,000 ac-ft/yr (55 million m^3) (Burden et al. 2009).

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 is different and can vary by region in 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 will determine its ability to not affect more senior water rights in the region and whether it can meet project demands (Utah DWR 2005).

The northern Escalante Desert Valley is under the jurisdiction of the southwestern regional office of the Utah DWR and is located in Policy Area 71 (Escalante Valley) (Utah DWR 2010). Surface waters in this Policy Area are fully appropriated, so any new surface water diversions must be transferred from existing surface water rights (transfers between surface water and groundwater diversions are typically not allowed). The proposed Milford Flats South SEZ is located within the Milford groundwater administration district. New applications for groundwater rights in the Milford district are not being accepted, and transfer of groundwater rights from the adjacent Black Rock or Nada-Lund districts are usually not approved (Utah DWR 2010). Thus, the purchase of existing water rights is necessary for solar energy development. Currently, there is no groundwater management plan proposed for the Milford area basin. The Utah Legislature passed a bill (S.B. 20) in May 2010 that allows the creation of local districts to develop groundwater management plans under Statute 73-5-15 (Utah State Legislature 2010).

13.2.9.2 Impacts

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

13.2.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy developments, which Section 5.9.1 describes in more detail for the four phases of development; these impacts will 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 Milford Flats South SEZ could potentially impact natural drainage patterns and natural groundwater recharge and discharge properties. The alteration of natural drainage pathways during construction can lead to impacts related to flooding. Land-disturbance activities should be avoided to the extent possible in the vicinity of the ephemeral stream washes and irrigation canal present on the site. Alterations to these systems could enhance erosion processes, disrupt groundwater recharge, and negatively affect plant and animal habitats associated with the ephemeral channels.

13.2.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Milford Flats South 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 land disturbance for an individual solar facility during the peak construction year is 3,000 acres (12 km^2)
- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, result in the potential to disturb approximately 47% of the total SEZ 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 controlling fugitive dust and the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Because there are no significant surface water bodies on the proposed Milford Flats South SEZ, the water requirements for construction activities could be met by either trucking water to the sites or using on-site groundwater resources. Table 13.2.9.2-1 lists the estimated water use requirements during the peak construction year. The assumptions underlying these estimates for each solar energy technology are described in Appendix M. The total water requirements during the peak construction year could be as high as 1,244 ac-ft (1.1 to 1.5 million m^3). Groundwater wells would have to yield an estimated 540 to 770 gal/min (2,000 to 2,900 L/min) to meet the water use requirements, which are similar to average well yields of small- to medium-sized irrigated farms in Utah (USDA 2009a). 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 (91,000 m^3) of sanitary wastewater would be generated and would need to be either treated on-site or sent to an off-site facility.

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 the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 13.2.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

TABLE 13.2.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Milford Flats South SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements [a]				
Fugitive dust control (ac-ft)[b,c]	800	1,199	1,199	1,199
Potable supply for workforce (ac-ft)	74	45	19	9
Total water use requirements (ac-ft)	874	1,244	1,218	1,209
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 70 in./yr (180 cm/yr) (Cowherd et al. 1988; WRCC 2010b).

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

TABLE 13.2.9.2-2 Estimated Water Requirements during Operations at the Proposed Milford Flats South SEZ

	Solar Energy Technology			
Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	1,037	576	576	576
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	518	288	288	29
Potable supply for workforce (ac-ft/yr)	15	6	6	0.6
Dry cooling (ac-ft/yr)[e]	207–1,037	115–576	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	4,666–15,034	2,592–8,352	NA	NA
Total water use				
Non-cooled technologies (ac-ft/yr)	NA	NA	294	29
Dry-cooled (ac-ft/yr)	740–1,570	410–870	NA	NA
Wet-cooled (ac-ft/yr)	5,199–15,567	2,886–8,646	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	295	164	NA	NA
Sanitary wastewater (ac-ft/yr)	15	6	6	0.6

[a] Land area for the parabolic trough technology was estimated at 5 acres/MW (0.02 km^2/MW), and the 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] To convert ac-ft to m^3, multiply by 1,234.

[d] Value assumes a usage rate of 0.5 ac-ft/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 for panel washing for the PV technologies.

[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; these ranges correspond to an assumed 30% and 60% operating time (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 is relevant to wet cooling only.

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. Assuming that 80% of the SEZ's area would be used for solar energy production, the full build-out capacity would generate 576 to 1,037 MW for the proposed Milford Flats South SEZ. The estimated total water use requirements during operations range from 29 to 294 ac-ft/yr (0.04 million to 0.4 million m^3/yr) for the PV and dish engine technologies (no cooling required) and from 410 to 15,567 ac-ft/yr (0.5 million to 19 million m^3/yr) for the parabolic trough and power tower technologies (cooling required). Table 13.2.9.2-2 lists the amounts of water needed for mirror/panel washing, potable water supply, and cooling activities for each solar energy technology. In addition, operations of a solar energy development would generate 0.6 to 15 ac-ft/yr (740 to 18,500 m^3/yr) of sanitary wastewater, and for wet-cooled technologies, 164 to 295 ac-ft/yr (190,000 to 370,000 m^3/yr) of cooling system blowdown water that would need to be treated either on-site or sent to an off-site facility.

Water demands during operations would most likely be met by withdrawing groundwater from wells constructed on-site. The parabolic trough and power tower technologies would require an estimated well yield of 250 to 970 gal/min (960 to 3,700 L/min) for dry cooling and 1,800 to 9,600 gal/min (6,800 to 36,000 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 three times greater than the average well yields of large irrigated farms in Utah (USDA 2009a). For non-cooled technologies (dish engine and PV), wells would have to yield an estimated 18 to 180 gal/min (68 to 690 L/min), which is on the order of 2 to 25 times less than the average well yields of small irrigated farms in Utah (USDA 2009a).

The water demands for technologies that require wet cooling are significant in comparison to the overall water balance in the basin-fill aquifer. For the proposed Milford Flats South SEZ, estimated well yields for wet cooling are equivalent to 6 to 30% (northern Escalante Desert Valley) of the total groundwater withdrawals for the basin in 2009 (Burden et al. 2009). Annual recharge in the basin has been estimated to be 58,200 ac-ft/yr (71.8 million m^3) (Mower and Cordova 1974). The estimated water requirements for wet cooling are equivalent to 4 to 27% of the estimated annual recharge for the Beryl-Enterprise basin. The water use for wet cooling could exacerbate existing conditions of groundwater overdraft in the Milford area basin. In addition, obtaining water rights within the Milford area basin would be difficult, and water rights would have to be transferred from existing uses. Based on the information presented here, wet cooling for the full buildout scenario is not deemed feasible for the Milford Flats South 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 were 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 by using the 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. For the proposed Milford Flats South SEZ, groundwater elevations are currently declining at a rate of 0.3 to 2.5 ft/yr (0.06 to 0.8 m/yr) in the Milford area basin (Burden et al. 2009). The declining groundwater levels have been linked with land subsidence and surface fissures south of the town of Milford (Mower and Cordova 1974; Forster 2006). With these existing conditions, further groundwater withdrawals for solar energy development at the proposed SEZ could potentially cause further drawdown of groundwater elevations and land subsidence both on-site and more regionally in the Escalante Desert Valley. These indirect impacts can disturb regional groundwater flow patterns and recharge patterns, which have implications for ecological habitats (discussed in Section 13.2.10).

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 13.2.9.2-1) 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.

13.2.9.2.3 Off-Site Impacts: Roads and Transmission Lines

The proposed Milford Flats South SEZ is approximately 5 mi (8 km) east of State Route 130/21, and the nearest transmission lines are 19 mi (31 km) from the SEZ, as described in Section 13.2.1.2. Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. Water needed for road modification and transmission line construction activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. As a result, water use impacts would be negligible. Impacts on surface water and groundwater quality resulting from spills would be minimized by implementing the 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.

13.2.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy in the proposed Milford Flats South SEZ are associated with land disturbance effects on natural hydrology, water use requirements for the various solar energy technologies, and water quality concerns. Impacts related to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, hybrid) employed. Water requirements would be greatest for wet-cooled parabolic trough and power tower facilities. Water use requirements for technologies using wet cooling could use up to approximately 26% of the estimated annual groundwater recharge in the vicinity of the proposed Milford Flats South

SEZ. 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.

The alteration of natural drainage pathways during construction can lead to impacts related to flooding. Land-disturbance activities should be avoided to the extent possible in the vicinity of the ephemeral stream washes and the irrigation canal present on the site. Alterations to these systems could enhance erosion processes, disrupt groundwater recharge, and negatively affect plant and animal habitats associated with the ephemeral channels.

Water in the Milford area basin is currently over-appropriated and is closed to new surface water and groundwater appropriations (Utah DWR 2010). In order to obtain water for solar energy projects in the area, water rights would have to be transferred from existing water rights, most of which are currently used for agriculture (Utah DWR 2010; Kenny et al. 2009).

The groundwater levels in the Milford area basin have been declining steadily since 1955 (Burden et al. 2009). Large withdrawals of groundwater in the Milford area basin have led to ground subsidence and land fissures (Forster 2006). Based on the information presented here, wet cooling for the full build-out scenario is not deemed feasible for the Milford Flats South SEZ. To the extent possible, facilities using dry cooling should implement water conservation practices to limit water needs.

13.2.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would mitigate some impacts on water resources. Programmatic design features would focus on 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 Milford Flats South SEZ are as follows:

- 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 CWA Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as within a 100-year floodplain;

- Land-disturbance and operations activities should prevent erosion and sedimentation in the vicinity of the ephemeral washes present on the site;

- 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 best management practices (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.

13.2.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Milford Flats South SEZ. The affected area considered in this assessment includes the areas of direct and indirect effects. The area of direct effects is defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and includes the SEZ, a 250-ft (76-m) wide portion of an assumed transmission line corridor, and a 60-ft (18-m) wide portion of an assumed access road corridor. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary, within the 1-mi (1.6-km) wide assumed transmission line corridor, and within the 1-mi (1.6-km) wide assumed access road corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The 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.

13.2.10.1 Affected Environment

Most of the western and southern portions of the proposed Milford Flats South SEZ are 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 hillslopes. 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*). Most of the eastern portion of the SEZ is within the Sagebrush Basins and Slopes Level IV ecoregion, which 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. Annual precipitation in the vicinity of the SEZ is low, averaging 9.03 in. (22.9 cm) at Milford (see Section 13.2.13).

The region surrounding the SEZ consists of a mosaic of these ecoregions, as well as the Woodland- and Shrub-covered Low Mountains Level IV ecoregion. This 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 2005a), 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 Milford Flats South SEZ are shown in Figure 13.2.10.1-1. Table 13.2.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the proposed Milford Flats South SEZ are classified primarily as Inter-Mountain Basins Mixed Salt Desert Scrub, especially in the western portion of the SEZ; Inter-Mountain Basins Big Sagebrush Shrubland, especially in the western portion; and Inter-Mountain Basins Semi-Desert Shrub Steppe. Additional cover types within the SEZ are given in Table 13.2.10.1-1. During a September 2009 visit to the site, dominant species observed in the low scrub communities present over most of the SEZ included greasewood and sagebrush, with sagebrush generally lower in abundance, except in some northern portions of the SEZ. Grasses, such as galleta and Indian ricegrass, occur within these communities mostly in the eastern portion of the SEZ. Cryptogrammic soil crusts occur in some areas of the SEZ. Sensitive habitats on the SEZ include ephemeral dry washes.

The indirect impact area, including the area within 5 mi (8 km) around the SEZ and the access road and transmission line corridors, includes 26 cover types, which are listed in Table 13.2.10.1-1. The predominant cover types are Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub Steppe, and Inter-Mountain Basins Mixed Salt Desert Scrub.

No NWI data are available for the region that includes the Milford Flats South SEZ (USFWS 2009). Small ponds occur inside and outside the SEZ and are generally developed for livestock or other uses. Numerous dry washes occur within the SEZ, access road corridor, and transmission line corridor. These drainages typically do not support wetland or riparian habitats, and generally convey surface runoff to ponds, drainages, or canals outside the SEZ. Intermittently flooded areas were observed in the SEZ. These dry washes and intermittently flooded areas typically contain water for short periods during or after precipitation events. Several springs occur in the vicinity of the SEZ, however, they are unlikely to support riparian communities (see Section 13.2.9). The Beaver River, a perennial stream, passes about 4 mi (6 km) northeast of the Milford Flats South SEZ. Riparian habitats occur along the river near Minersville. Although the downstream portion of the river is often dry because of irrigation withdrawals, riparian habitats likely occur along some areas of the river channel nearest to the SEZ. Minersville Canal runs along the southern edge of the SEZ, but that canal is also dry when not being used for irrigation.

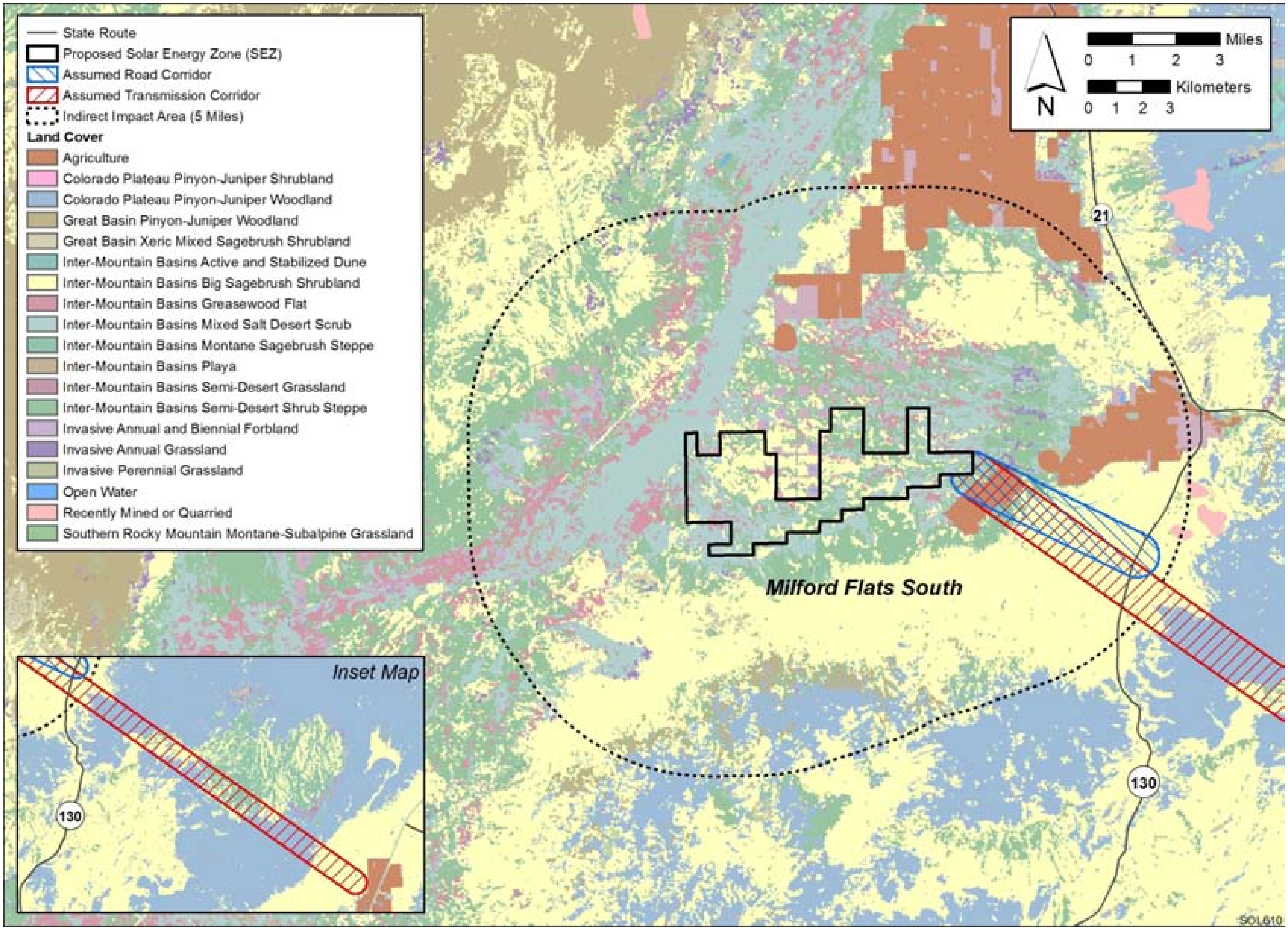


FIGURE 13.2.10.1-1 Land Cover Types within the Proposed Milford Flats South SEZ (Source: USGS 2004)

TABLE 13.2.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Milford Flats South SEZ and Potential Impacts

	Area of Cover Type Affected (acres)[b]				
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Assumed Access Road (Direct Effects)[d]	Assumed Transmission Line (Direct Effects)[e]	Corridors and Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g]
S065 Inter-Mountain Basins Mixed Salt Desert Scrub: Generally consists of open shrublands which include at least one species of *Atriplex* along with other shrubs. Perennial grasses dominate a sparse to moderately dense herbaceous layer.	2,051 acres[h] (0.5%, 0.8%)	2 acres (<0.1%)	6 acres (<0.1%)	17,649 acres (4.0%)	Small
S054 Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	1,966 acres (0.2%, 0.3%)	23 acres (<0.1 %)	285 acres (<0.1)	44,106 acres (4.1%),	Small
S079 Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	1,922 acres (0.4%, 0.6%)	5 acres (<0.1%)	17 acres (<0.1%)	20,706 acres (4.3%)	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 (USGS 2005a). 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.	525 acres (0.5%, 1.1%)	<1 acre (<0.1%)	1 acre (<0.1%)	6,542 acres (5.9%)	Small

TABLE 13.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]				
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Assumed Access Road (Direct Effects)[d]	Assumed Transmission Line (Direct Effects)[e]	Corridors and Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g]
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.	4 acres (<0.1%, 0.2%)	0 acres	0 acres	2,097 acres (6.6%)	Small
D09 Invasive Annual and Biennial Forbland: Areas dominated by annual and biennial non-native forb species.	3 acres (<0.1%, <0.1%)	<1 acre (<0.1%)	<1 acre (<0.1%)	329 acres (1.4%)	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.	<1 acre (<0.1%, <0.1%)	0 acres	0 acres	131 acres (0.3%)	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	<1 acre (<0.1%)	2 acres (<0.1%)	79 acres (0.1%)	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%)	<1 acre (<0.1%)	14 acres (0.2%)	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	<1 acre (<0.1%)	<1 acre (<0.1%)	1,561 acres (0.2%)	Small

TABLE 13.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]				
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Assumed Access Road (Direct Effects)[d]	Assumed Transmission Line (Direct Effects)[e]	Corridors and Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g]
S039 Colorado Plateau Pinyon-Juniper Woodland: Occurs on foothills, ridges, and low-elevation mountain slopes. Two-needle 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	<1 acre (<0.1%)	207 acres (<0.1%)	8,466 acres (1.2 %)	Small
N11 Open Water: Plant or soil cover is generally less than 25%.	0 acres	<1 acre (<0.1%)	<1 acre (<0.1%)	87 acres (0.9%)	Small
D06 Invasive Perennial Grassland: Dominated by non-native perennial grasses.	0 acres	<1 acre (<0.1%)	<1 acre (<0.1%)	428 acres (2.4%)	Small
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	0 acres	2 acres (<0.1%)	34 acres (0.1%)	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	0 acres	1 acre (<0.1%)	16 acre (<0.1%)	Small

TABLE 13.2.10.1-1 (Cont.)

Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Assumed Access Road (Direct Effects)[d]	Assumed Transmission Line (Direct Effects)[e]	Corridors and Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g]
	Area of Cover Type Affected (acres)[b]				
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	0 acres	<1 acre (<0.1%)	9 acres (0.1%)	Small
D08 Invasive Annual Grassland: Dominated by non-native annual grass species.	0 acres	0 acres	0 acres	762 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.	0 acres	0 acres	0 acres	250 acres (0.4%)	Small
D03 Recently Mined or Quarried: Includes open pit mines and quarries.	0 acres	0 acres	0 acres	72 acres (1.2%)	Small
N22 Developed, Medium–High Intensity: Includes housing and commercial/industrial development. Impervious surfaces comprise 50–100 percent of the total land cover.	0 acres	0 acres	0 acres	26 acres (0.2%)	Small
S056 Colorado Plateau Mixed Low Sagebrush Shrubland: Occurs in canyons, draws, hilltops, and dry flats. Consists of open shrubland and steppe habitats. Black sagebrush (*Artemisia nova*) or Bigelow sage (*A. bigelovii*) are the dominant species, with Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) co-dominant in some areas. Semiarid grasses are often present and may exceed 25% cover.	0 acres	0 acres	0 acres	23 acres (0.1%)	Small

TABLE 13.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]				
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Assumed Access Road (Direct Effects)[d]	Assumed Transmission Line (Direct Effects)[e]	Corridors and Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g]
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	0 acres	0 acres	20 acres (0.2%)	Small
S010 Colorado Plateau Mixed Bedrock Canyon and Tableland: Includes barren and sparsely vegetated (generally <10% plant cover) steep cliff faces, narrow canyons, and open tablelands. Composed of a very open coniferous tree canopy or scattered trees and shrubs. Herbaceous species are typically sparse.	0 acres	0 acres	0 acres	15 acres (0.3%)	Small
S024 Rocky Mountain Bigtooth Maple Ravine Woodland: Occurs in ravines, on toeslopes, and benches associated with riparian areas. It may also occur on steep north slopes at higher elevations. The dominant species is bigtooth maple (*Acer grandidentatum*), but gambel oak (*Quercus gambelii*) may be co-dominant in some areas. Other broadleaf trees or conifers may be present.	0 acres	0 acres	0 acres	2 acres (2.4%)	Small

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

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

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

Footnotes continued on next page.

TABLE 13.2.10.1-1 (Cont.)

---

[d] For access road development, direct effects were estimated within a 5-mi (24-km) long, 60-ft (18-m) wide road ROW from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of the cover type within the 1-mi (1.6-km) wide road corridor. Impacts are for the area of the cover type within the assumed ROW, and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] For transmission development, direct effects were estimated within a 19-mi (5-km) long, 250-ft (76-m) wide transmission ROW from the SEZ to the nearest existing line. Direct impacts within this area were determined from the proportion of the cover type within the 1-mi (1.6-km) wide transmission corridor. Impacts are for the area of the cover type within the assumed ROW, and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portions of the 1-mi (1.6-km) wide road and transmission corridors 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.

[g] 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.

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

Table 13.2.10.1-2 lists the designated noxious weeds of Utah that are recorded as occurring in Beaver County (UDA 2008, USDA 2010), which includes the proposed Milford Flats South SEZ, and additional noxious weed species declared by Beaver County (UDA 2009). UDA (2008) provides a list of all Utah State designated noxious weeds. Cheatgrass (*Bromus tectorum*) and halogeton (*Halogeton glomeratus*), invasive species known to occur within the SEZ, are not included in Table 13.2.10.1-2.

13.2.10.2 Impacts

The construction of solar energy facilities within the proposed Milford Flats South 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 (5,184 acres [21.0 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for the purposes of this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

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

TABLE 13.2.10.1-2 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).

Possible impacts from solar energy facilities on vegetation 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 mitigations applied. Section 13.2.10.2.3, below identifies design features of particular relevance to the proposed Milford Flats South SEZ.

13.2.10.2.1 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 Milford Flats South SEZ would primarily affect communities of the Inter-Mountain Basins Mixed Salt Desert Scrub, Inter-Mountain Basins Big Sagebrush Shrubland, and Inter-Mountain Basins Semi-Desert Shrub Steppe cover types. Additional cover types within the SEZ that would be affected include Inter-Mountain Basins Greasewood Flat; Developed, Open Space-Low Density; Invasive Annual and Biennial Forbland; and Inter-Mountain Basins Semi-Desert Grassland. The developed areas and Invasive Annual and Biennial Forbland likely support few native plant communities. The potential impacts on land cover types resulting from solar energy facilities in the proposed Milford Flats South SEZ are summarized in Table 13.2.10.1-1. 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 (0.8%); Developed, Open Space-Low Intensity (0.6%); and Invasive Annual and Biennial Forbland (0.5%). In addition, Rocky Mountain Lower Montane Riparian Woodland and Shrubland (0.1%), Open Water (0.2%), Invasive Perennial Grassland (0.4%), Rocky Mountain Cliff and Canyon (0.6%), Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland (0.8%), and Southern Rocky Mountain Montane-Subalpine Grassland (0.2%) would potentially be impacted by the access road and/or transmission line ROWs.

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

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. 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. Damage to cryptogrammic soil crusts that occur within the SEZ, such 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 disturbed soil areas in 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 13.2.10.1-1.

Communities associated with playa habitats, 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, 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, access road corridor, 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. Riparian communities occurring along Beaver River, northeast of the Milford Flats South SEZ, could be affected by solar projects within the SEZ.

The use of groundwater within the Milford Flats South SEZ for technologies with high water requirements, such as wet-cooling systems, could contribute to the depletion of the regional groundwater system (see Section 13.2.9). Groundwater withdrawal for solar technology cooling systems could result in reductions in inflows to riparian areas that are supported by groundwater discharge, such as occur along portions of Beaver River. Inflow reductions could alter riparian hydrologic characteristics and plant communities and could potentially reduce riparian surface area.

The construction of access roads or transmission lines in ROWs outside of the SEZ could potentially result in direct impacts on riparian habitat that may occur in or near the ROWs. Small areas of Rocky Mountain Lower Montane Riparian Woodland and Shrubland occur within the access road and transmission line corridors.

The construction of access roads or transmission lines could also result in impacts on woodland communities. Several woodland cover types occur within the transmission line corridor, and small areas occur within the access road corridor. Woodland habitat within the ROWs would likely be converted to shrub- or grass-dominated habitat. Clearing of woodland along the ROWs 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, woodland communities along the ROWs could be degraded. ROW management would maintain altered habitat conditions within and adjacent to the ROWs.

13.2.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

Executive Order (E.O.) 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Noxious weeds and invasive species could be inadvertently 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 Milford Flats South 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 cheat grass and 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 13.2.10.1-2. 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. Small areas of Developed, Open Space–Low Intensity totaling 4 acres (0.02 km^2) occur within the SEZ, and about 2,097 acres (8.5 km^2) occur within 5 mi (8 km) of the SEZ; small areas of Invasive Annual and Biennial Forbland, totaling 3 acres (0.01 km^2) occur within the SEZ, and approximately 329 acres (1.3 km^2) occur within 5 mi (8 km) of the SEZ and in the access road and transmission line corridors; 428 acres (1.7 km^2) of Invasive Perennial Grassland occur within 5 mi (8 km) of the SEZ and in the access road and transmission line corridor. About 26 acres (0.1 km^2) of Developed, Medium-High Intensity and 762 acres (3.1 km^2) of Invasive Annual Grassland 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.

13.2.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as those occurring in Beaver County, that could be introduced as a result of solar energy project activities (see Section 13.2.10.2.2). 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 habitats within the SEZ and all dry wash and riparian habitats within the assumed transmission line corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around dry washes and riparian habitats to reduce the potential for impacts. Transmission line towers should be sited and constructed to minimize impacts on dry washes and riparian areas; towers should span such areas whenever practicable.

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

13.2.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Milford Flats South 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 water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ, a 250-ft (76-m) wide portion of an assumed 19-mi (30.6-km) long transmission line corridor, and a 60-ft (18-m) wide portion of an assumed 5-mi (8-km) long access road corridor.

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1.0-mi (1.6-km) wide assumed transmission and access road corridors where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the area of direct effect (e.g., surface runoff, dust, noise, lighting, and accidental spills in the SEZ or in the transmission line or road construction areas). Since the assumed access road is within the 5 mi (8 km) area of indirect effect for the SEZ, no additional area of indirect effect was considered for the access road. An additional area of indirect effect was considered for 14 mi (23 km) of the transmission corridor that would extend beyond the 5 mi (8 km) area of indirect effect for the SEZ. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. The area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. These areas of direct and indirect effect are defined and the impact assessment approach is described in Appendix M.

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 13.2.10). The only perennial stream in the affected area is Beaver River which occurs about 4 mi (6.5 km) east of the SEZ; Minersville Canal, an irrigation canal from the Beaver River intersects the southern portion of the SEZ (Figure 13.2.9.1-1).

13.2.11.1 Amphibians and Reptiles

13.2.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Milford Flats South 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 Milford Flats South 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 (UDWR 2009a; Stebbins 2003).

Twenty-five reptile species are known to occur within Beaver County (UDWR 2009a). About half of these species could occur within the proposed Milford Flats South SEZ (UDWR 2009a; Stebbins 2003). Species expected to be fairly common to abundant within the SEZ 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 13.2.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Milford Flats South SEZ.

13.2.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through and additional mitigation applied. Section 13.2.11.1.3 identifies SEZ-specific design features of particular relevance to the proposed Milford Flats South 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 13.2.11.1.1

1

TABLE 13.2.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Milford Flats South SEZ

		Maximum Area of Potential Habitat Affected[b]				
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 3,484,500 acres[i] of potentially suitable habitat occurs within the SEZ region.	4,017 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	81,812 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	25 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,142 acres in area of indirect effect	740 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 14,898 acres in area of indirect effect	Small overall impact. Avoid development in Minersville Canal.
Great Plains toad (*Bufo cognatus*)	Prefers desert, grassland, and agricultural habitats. Breeds in shallow temporary pools, quiet areas of streams, marshes, irrigation ditches, and flooded fields. In cold winter months, it burrows underground and becomes inactive. About 680,700 acres of potentially suitable habitat occurs within the SEZ region.	421 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	28,587 acres of potentially suitable habitat (4.2% of available potentially suitable habitat) and 416 acres in area of indirect effect	5 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 46 acres in area of indirect effect	51 acres of potentially suitable habitat lost (0.007% of available potentially suitable habitat) and 1,028 acres in area of indirect effect	Small overall impact. Avoid development within Minersville Canal.

TABLE 13.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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. It becomes inactive during the cold winter months, often using stone piles, shrubs, or rodent burrows for cover. About 4,109,700 acres of potentially suitable habitat occurs within the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	104,148 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,550 acres in area of indirect effect	788 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,848 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edges of dunes. Burrows in soil during periods of inactivity. About 2,325,200 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	99,261 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,551 acres in area of indirect effect	517 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 10,398 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.1-1 (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 Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 including montane forests, woodlands, semidesert shrubland, and various forbs and grasses. About 2,395,900 acres of potentially suitable habitat occurs in the SEZ region.	2,447 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	39,659 acres of potentially suitable habitat (1.7% of available potentially suitable habitat)	5 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 419 acres in area of indirect effect	260 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 5,234 acres in area of indirect effect	Small overall impact.
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 3,136,600 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	62,031 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	23 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,003 acres in area of indirect effect	658 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 13,230 acres in area of indirect effect	Small overall impact.

TABLE 13.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Lizards (Cont.)						
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs up to 6,000 ft (1,829 m). Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 1,657,100 acres of potentially suitable habitat occurs in the SEZ region.	4,017 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	70,353 acres of potentially suitable habitat (4,2% of available potentially suitable habitat)	25 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,135 acres in area of indirect effect	466 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 9,373 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
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 2,730,000 acres of potentially suitable habitat occurs within the SEZ region.	4,498 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	57,554 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	6 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 562 acres in area of indirect effect	278 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 5,589 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 3,269,900 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	73,547 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,480 acres in area of indirect effect	725 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 14,583 acres in area of indirect effect	Small overall impact.
Nightsnake (*Hypsiglena torquata*)	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, it seeks refuge underground, in crevices, or under rocks. About 2,589,200 acres of potentially suitable habitat occurs within the SEZ region.	3,973 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	50,713 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	6 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 542 acres in area of indirect effect	274 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 5,511 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.1-1 (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 Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Snakes (Cont.)						
Wandering gartersnake (*Thamnophis elegans vagrans*)	Most terrestrial or wetland habitats in the vicinity of any lotic or lentic body of water. However, it also occurs many miles from surface waters. About 2,031,100 acres of potentially suitable habitat occurs within the SEZ region.	3,888 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	74,130 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,399 acres in area of indirect effect	498 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 10,011 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

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

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

c Direct effects within the SEZ would consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 5,184 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 away from the SEZ.

e For access road development, direct effects were estimated within a 5-mi (8-km) long, 60-ft (18-m) wide ROW for an assumed access road from the SEZ to the nearest state highway. Indirect effects were estimated within a 1-mi (1.6-km) wide road corridor to the state highway, less the assumed area of direct effects.

Footnotes continued on next page.

1

TABLE 13.2.11.1-1 (Cont.)

[f] For transmission development, direct effects were estimated within a 19-mi (30.6-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.

[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 acres to km^2, multiply by 0.004047.

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

following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 13.2.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on amphibians and reptiles summarized in Table 13.2.11.1-1, direct impacts on amphibian and reptile species would be small, as 0.2% or less of potentially suitable habitats identified for the species in the SEZ region would be lost. Larger areas of potentially suitable habitats for most amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 4.3% of available habitat for the desert horned lizard). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

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

13.2.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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

If this SEZ-specific design feature is implemented in addition to other 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.

13.2.11.2 Birds

13.2.11.2.1 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 Milford Flats South 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 regularly occur within the proposed Milford Flats South 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. Around 80 waterfowl, wading bird, and shorebird species have been reported from Beaver County (Utah Ornithological Society 2007). However, within the proposed Milford Flats South SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. The Minersville Canal within the SEZ may attract some shorebird and waterfowl species, but the perennial stream, canal, lake, and reservoir habitats within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds.

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. Those species that are common or abundant within Beaver County, and that would be expected to occur within the proposed Milford Flats South 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 provided an overview of the birds of prey (raptors, owls, and vultures) within the six-state solar study area. Twenty-seven bird of prey species have been reported from Beaver County (Utah Ornithological Society 2007). Raptor species that could occur within the proposed Milford Flats South 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 provided an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed Milford Flats South 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 has been developed for the chukar in Utah (UDWR 2003). Preferred habitat for the chukar includes steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds found within 0.25 mi (0.4 km) of water during the brooding period (UDWR 2003, 2009a). Grasses and seeds of forbs are their main food, and insects are important to young chicks (UDWR 2003). 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 2003). The chukar is distributed throughout Utah, with nearly 20,400,000 acres (82,556 km^2) of potential high and substantial value habitats[5] occurring in the state (UDWR 2003). Figure 13.2.11.2-1 shows the location of the proposed Milford Flats South SEZ relative to substantial chukar habitat. No areas of this habitat type occur within the SEZ. The shortest distance from the SEZ to substantial chukar habitat is about 7 mi (11 km).

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, acorns, grasses, weed seeds, and green vegetation. Insects are also important in the diet of young poults (UDWR 2009a).

---

5 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.

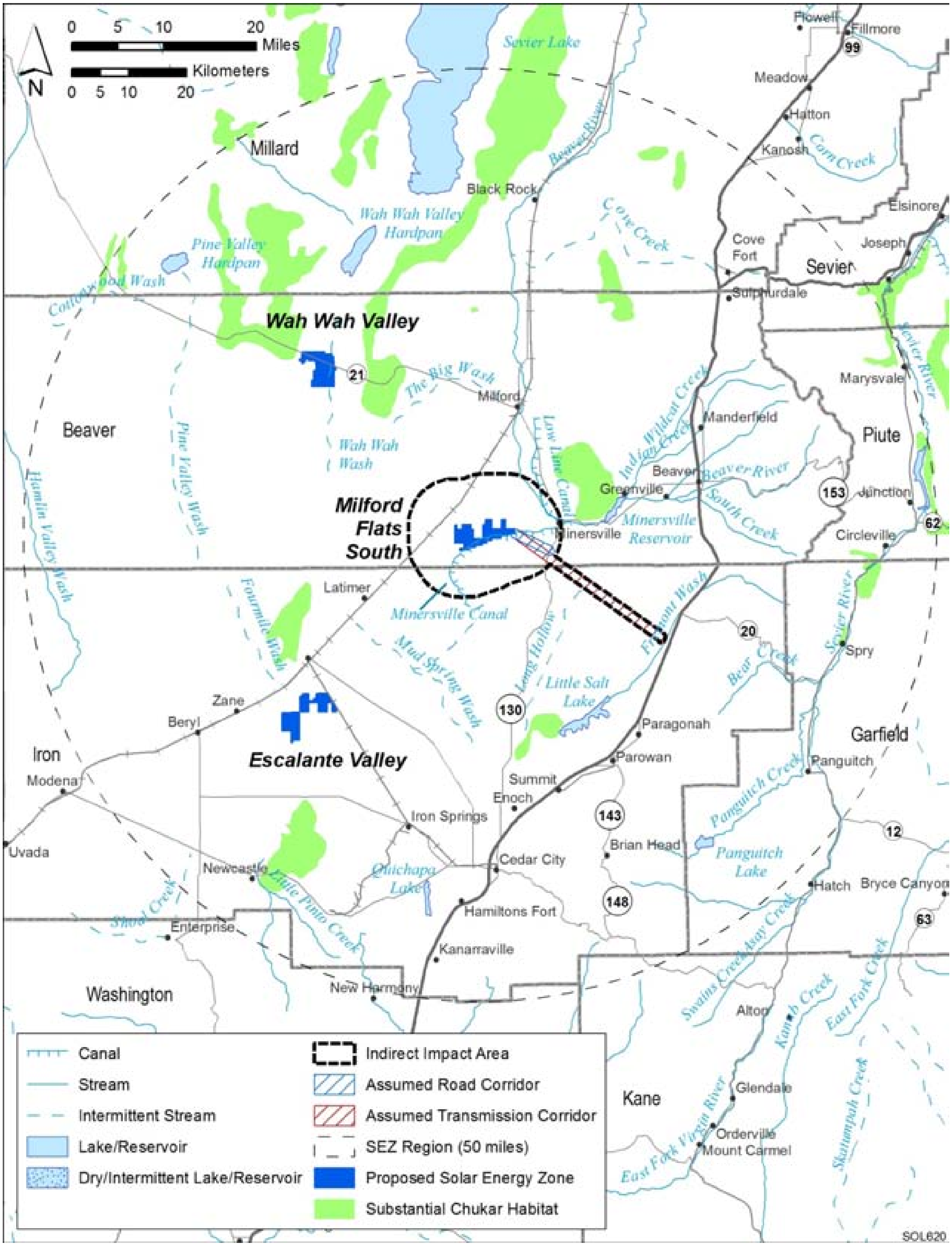


FIGURE 13.2.11.2-1 Location of the Proposed Milford Flats South SEZ Relative to Substantial Chukar Habitat (Source: UDWR 2006a)

Figure 13.2.11.2-2 shows the location of the proposed Milford Flats South SEZ relative to crucial wild turkey habitat.[6] The shortest distance from the SEZ to crucial wild turkey habitat is about 8 mi (13 km). Nearly 1,065,300 acres (4,311 km^2) of crucial wild turkey habitat occurs within the SEZ region.

Table 13.2.11.2-1 provides habitat information for representative bird species that could occur within the proposed Milford Flats South SEZ. Special status bird species are discussed in Section 13.2.12.

13.2.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 13.2.11.2.3, below, identifies design features of particular relevance to the proposed Milford Flats South 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 13.2.11.2.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 13.2.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), and from disturbance, injury, or mortality to individual birds. Table 13.2.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed Milford Flats South SEZ. Direct impacts on bird species would be small for all species, as only 0.5% or less of potentially suitable habitats for the bird species would be lost (Table 13.2.11.2-1). Larger areas of potentially suitable habitat for bird species occur within the area of potential indirect effects (e.g., up to 4.6% of potentially suitable habitat for the western kingbird). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (for example, impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

[6] 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.

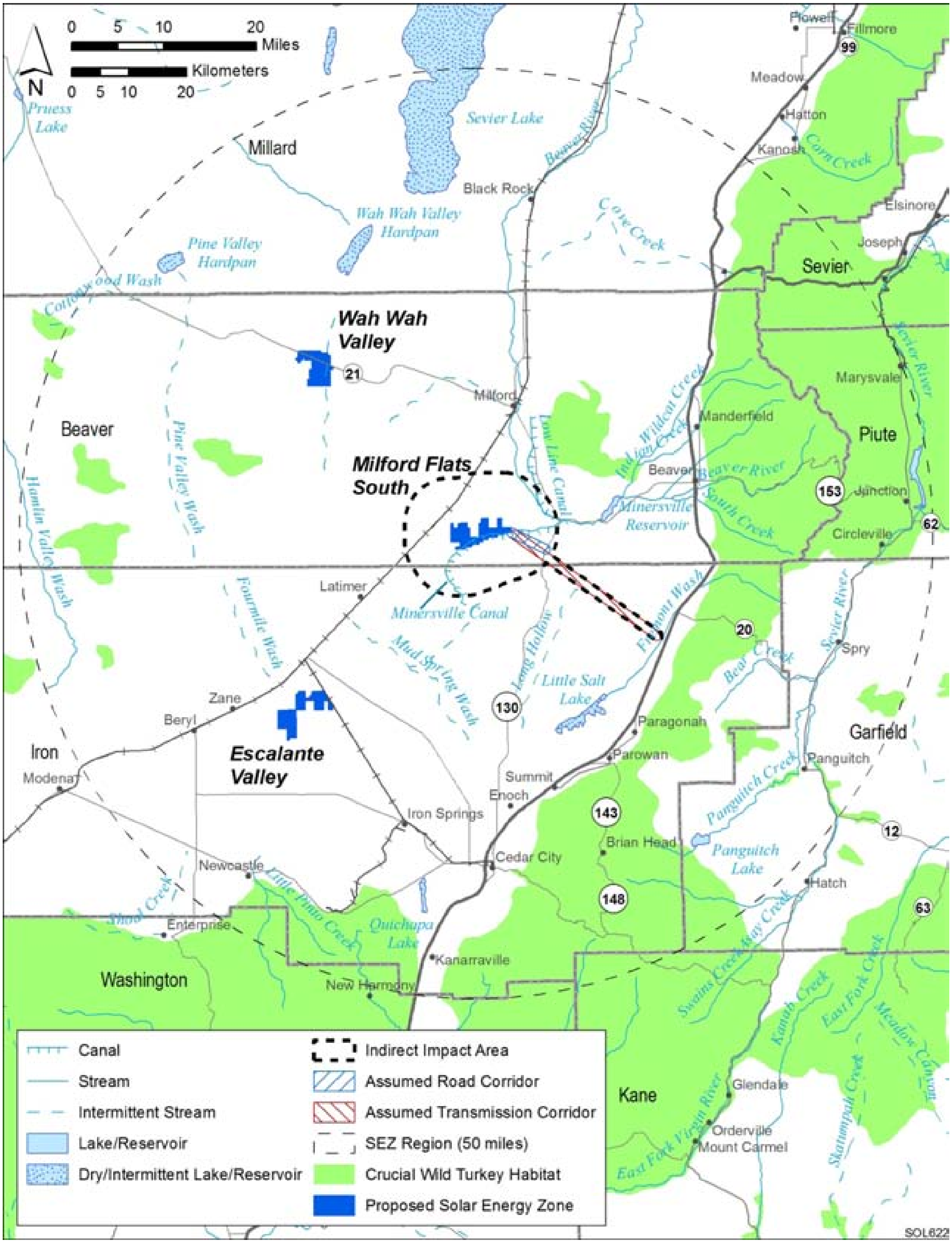


FIGURE 13.2.11.2-2 Location of the Proposed Milford Flats South SEZ Relative to Crucial Wild Turkey Habitat (Source: UDWR 2006a)

TABLE 13.2.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Milford Flats South SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Neotropical Migrants						
Bewick's wren (*Thryomanes bewickii*)	Generally associated with dense, brushy habitats. It is a permanent resident of lowland deserts and pinyon-juniper forests of southern Utah. Breeding occurs in brushy areas of open woodlands and other open habitats. It is a cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 4,050,200 acres[i] of potentially suitable habitat occurs within the SEZ region.	4,413 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	98,382 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,900 acres in area of indirect effect	840 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 16,903 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Neotropical Migrants (Cont.)						
Brewer's sparrow (*Spizella breweri*)	Considered a shrubsteppe obligate. It occupies open desert scrub and cropland habitats. However, it may also occur in high desert scrub (greasewood) habitats, particularly 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. It also breeds in large sagebrush openings in pinyon-juniper or coniferous forest habitats. About 1,969,900 acres of potentially suitable habitat occurs in the SEZ region.	4,017 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	73,051 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,139 acres in area of indirect effect	589 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 11,860 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.2.11.2-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]				
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 4,830,400 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	122,585 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,036 acres in area of indirect effect	859 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,280 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
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 (0.6 to 1.5 m) above ground. About 3,461,800 acres of potentially suitable habitat occurs within the SEZ region.	3,888 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	84,480 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,414 acres in area of indirect effect	708 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 14,245 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Neotropical Migrants (Cont.)						
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Fairly common in all desert habitats below 5,000 ft (1,524 m). 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 3,516,600 acres of potentially suitable habitat occurs in the SEZ region.	4,021 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	91,242 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,620 acres in area of indirect effect	742 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 14,930 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats, other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 2,666,900 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	109,260 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 3,024 acres in area of indirect effect	646 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 13,001 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Neotropical Migrants (Cont.)						
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 439,600 acres of potentially suitable habitat occurs in the SEZ region.	2,051 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	18,139 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	2 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 135 acres in area of indirect effect	17 acres of potentially suitable habitat lost (0.004% of available potentially suitable habitat) and 351 acres in area of indirect effect	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 4,282,800 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	121,330 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,035 acres in area of indirect effect	856 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,232 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Neotropical Migrants (Cont.)						
Rock wren (*Salpinctes obsoletus*)	Arid and semiarid habitats at elevations as high as 10,000 ft (3,048 m). 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 4,473,100 acres of potentially suitable habitat occurs within the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	112,898 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,558 acres in area of indirect effect	789 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,884 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
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 4,164,800 acres of potentially suitable habitat occurs within the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	110,640 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,562 acres in area of indirect effect	790 acres of potentially suitable habitat lost (<0.02% of available potentially suitable habitat) and 15,904 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Neotropical Migrants (Cont.)						
Sage thrasher (*Oreoscoptes montanus*)	It 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, the species 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 3,272,500 acres of potentially suitable habitat occurs within the SEZ region.	5,184 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	108,729 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,570 acres in area of indirect effect	789 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,581 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.2.11.2-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]				
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 2,262,500 acres of potentially suitable habitat occurs in the SEZ region.	3,891 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	85,955 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,883 acres in area of indirect effect	629 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 12,662 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Western kingbird (*Tyrannus verticalis*)	Occurs in a variety of habitats including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nests in trees, bushes, and other raised areas, such as buildings. Migrates to Central America or the southeastern United States for the winter. About 3,185,200 acres of potentially suitable habitat occurs within the SEZ region.	5,184 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	104,451 acres of potentially suitable habitat (4.6% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,548 acres in area of indirect effect	787 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 15,841 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 13.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 4,612,700 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	121,391 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,035 acres in area of indirect effect	858 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,262 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
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 4,709,700 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	119,266 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,035 acres in area of indirect effect	858 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,262 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.

TABLE 13.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 2,573,700 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	102,812 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 3,004 acres in area of indirect effect	581 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 11,685 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
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 1,994,500 acres of potentially suitable habitat occurs within the SEZ region.	3,892 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	85,223 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 2,881 acres in area of indirect effect	566 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 11,377 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 occur often occur in treeless areas. Large flocks often occur in agricultural areas near locust infestations. About 2,194,400 acres of potentially suitable habitat occurs in the SEZ region.	1,922 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	40,923 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	10 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 880 acres in area of indirect effect	324 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 6,526 acres in area of indirect effect	Small overall impact.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 2,139,000 acres of potentially suitable habitat occurs in the SEZ region.	2,051 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	36,878 acres of potentially suitable habitat (1.7% of available potentially suitable habitat)	7 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 616 acres in area of indirect effect	293 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 5,903 acres in area of indirect effect	Small overall impact.

TABLE 13.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Upland Game Birds						
Chukar (*Alectoris chukar*)	Steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds found within 0.25 mi (0.4 km) of water during the brooding period. About 4,019,200 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	104,719 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,546 acres in area of indirect effect	788 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,852 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. However, avoidance of Minersville Canal would protect a potential source of water.
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 4,317,400 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	121,831 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,027 acres in area of indirect effect	854 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,185 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.2-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]				
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 3,936,200 acres of potentially suitable habitat occurs within the SEZ region.	3,888 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	86,191 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,414 acres in area of indirect effect	772 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,537 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

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

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

[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 5,184 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 away from the SEZ.

Footnotes continued on next page.

TABLE 13.2.11.2-1 (Cont.)

[e] For access road development, direct effects were estimated within a 5-mi (8-km) long, 60-ft (18-m) wide ROW for an assumed new access road from the SEZ to the nearest state highway. Indirect effects were estimated within a 1-mi (1.6-km) wide road corridor to the state highway, less the assumed area of direct effects.

[f] For transmission development, direct effects were estimated within a 19-mi (30.6-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.

[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 acres to km^2, multiply by 0.004047.

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

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.

13.2.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds, especially for those species that depend on habitat types that can be avoided (e.g., Minersville Canal). 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, some design features can be identified at this time, as follows:

- For solar energy developments 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[7] of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and 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.

---

[7] 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.

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

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

13.2.11.3 Mammals

13.2.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Milford Flats South 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 the area of Beaver County (UDWR 2009a). On the basis of species distributions and habitat preferences, fewer than 30 mammal species could occur within the proposed Milford Flats South SEZ (UDWR 2009a). Similar to the overview of mammals provided for the six-state solar energy study area (Section 4.6.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share important habitats.

Big Game

The big game species that could occur within the area of the proposed Milford Flats South 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). No areas of substantial or crucial habitat occur within the immediate area of the proposed Milford Flats South SEZ (Figure 13.2.11.3-1). The shortest distance from the SEZ to substantial American black bear habitat is 6 mi (10 km), whereas the closest distance to crucial American black bear habitat is 19 mi (31 km). About 388,900 acres (1,574 km^2) of crucial black bear habitat and 1,080,100 acres (4,371 km^2) of substantial black bear habitat occur within the SEZ region.

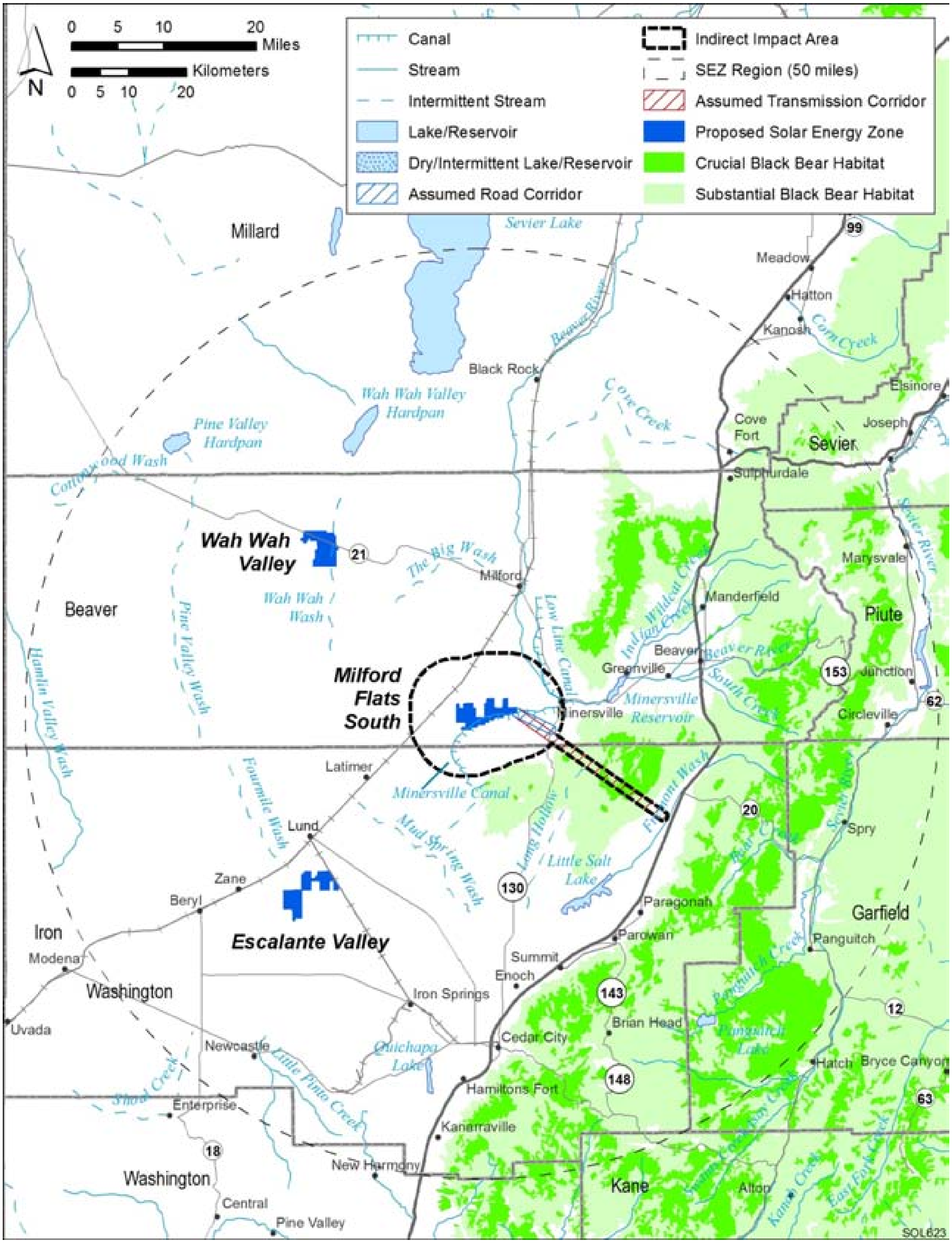


FIGURE 13.2.11.3-1 Location of the Proposed Milford Flats South SEZ Relative to Crucial and Substantial Black Bear Habitat (Source: UDWR 2006a)

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, with a statewide cougar population estimate somewhere between about 2,500 and 4,000 (UDWR 2009b). Cougars mostly occur in rough, broken foothills and canyon country, often in association with pinyon-juniper and pine-oak brush areas (CDOW 2009a; Pederson undated), avoiding areas of sagebrush and low-growing shrubs or other areas without tall cover (Pederson undated). The proposed Milford Flats South SEZ overlaps the cougar's overall range, but the SEZ does not occur within high-value cougar habitat (UDWR 2009a). Figure 13.2.11.3-2 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 shortest distance from these areas to the proposed Milford Flats South SEZ is 2 mi (3 km). About 1,373,300 acres (5,558 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 2010a). Crucial elk habitat is continuously being lost and fragmented within Utah. The statewide management plan for the elk has been updated (UDWR 2010a). The management objective is a statewide population of 80,000 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 Milford Flats South SEZ, the population estimate was 1,150 (UDWR 2010a). Figure 13.2.11.3-3 shows the location of the proposed Milford Flats South SEZ relative to areas of crucial elk habitat. The shortest distance from the SEZ to these areas is 7 mi (11 km). About 1,756,400 acres (7,108 km^2) of crucial elk habitat occur 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 over 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 13.2.11.3-4 shows the location of the proposed Milford Flats South SEZ relative to areas of crucial mule deer habitat. The shortest distance from the SEZ to these areas is 3 mi (5 km). About 2,729,900 acres (11,048 km^2) of crucial mule deer habitat occurs within the SEZ region.

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 plan for 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 Milford Flats South SEZ, the

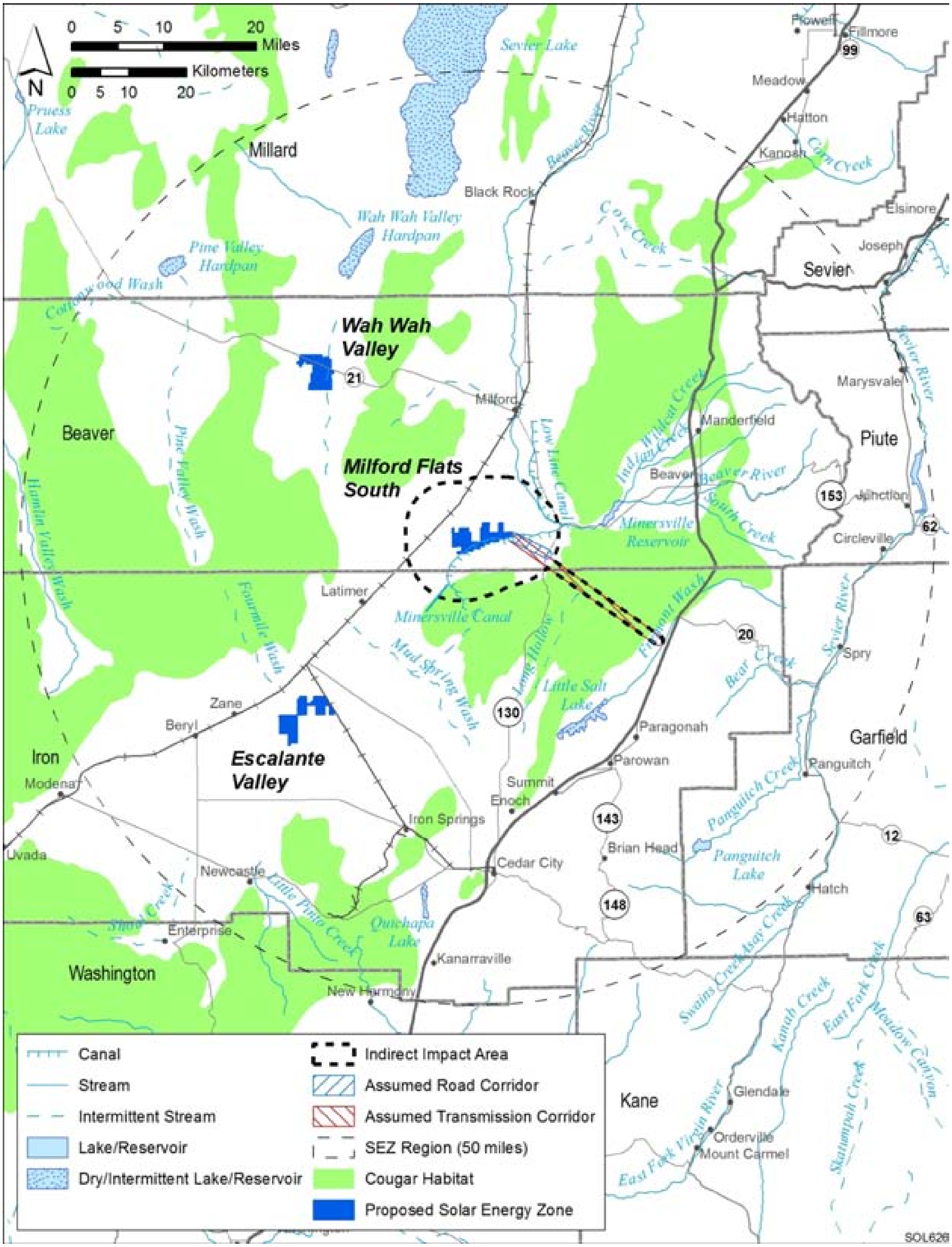
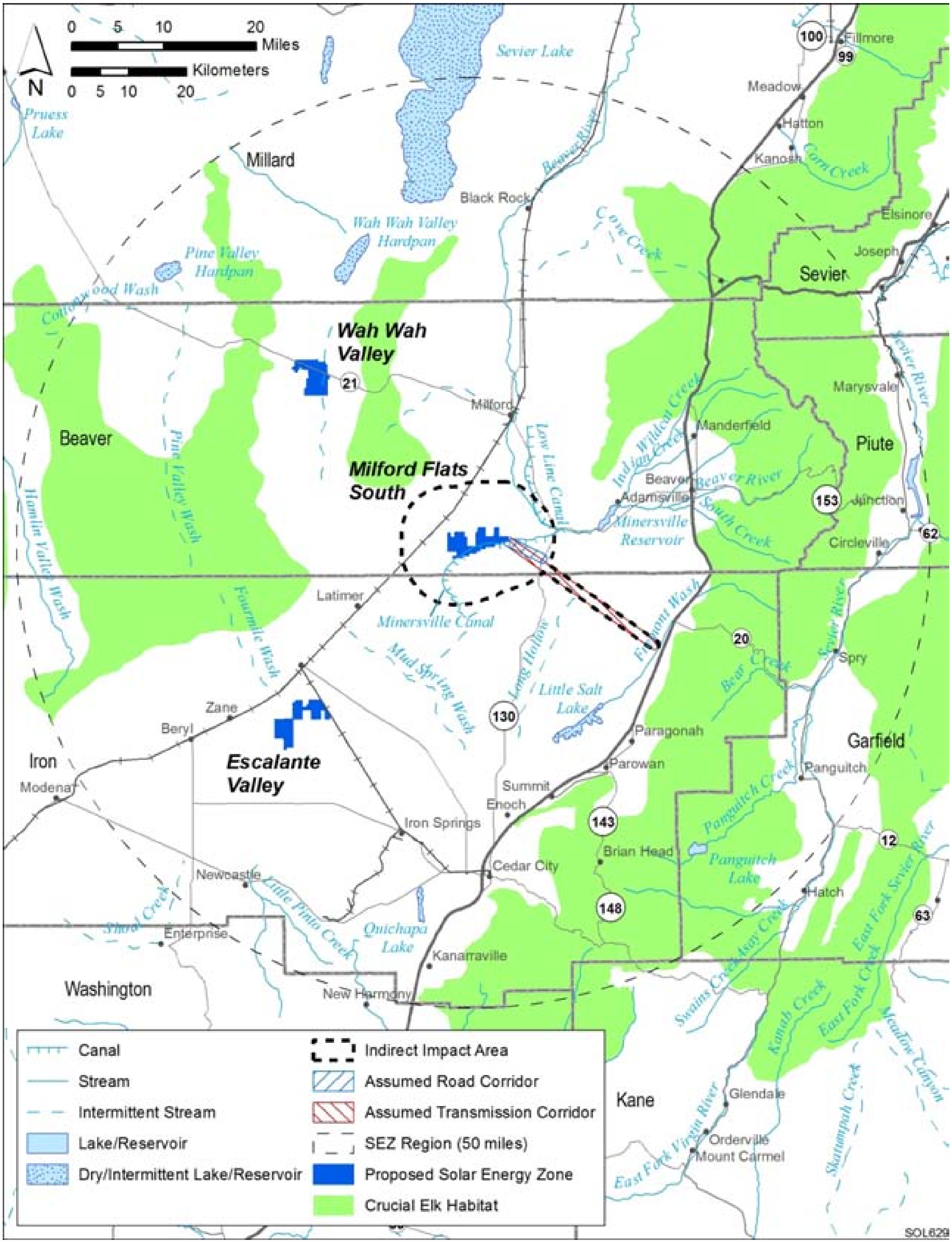


FIGURE 13.2.11.3-2 Location of the Proposed Milford Flats South SEZ Relative to Woodland and Shrub-covered Low Mountains Level IV Ecoregion Areas (Cougar Habitat) (Source: Woods et al. 2001)

1


2 **FIGURE 13.2.11.3-3 Location of the Proposed Milford Flats South SEZ Relative to Elk Crucial**
3 **Habitat Areas (Source: UDWR 2006a)**
4

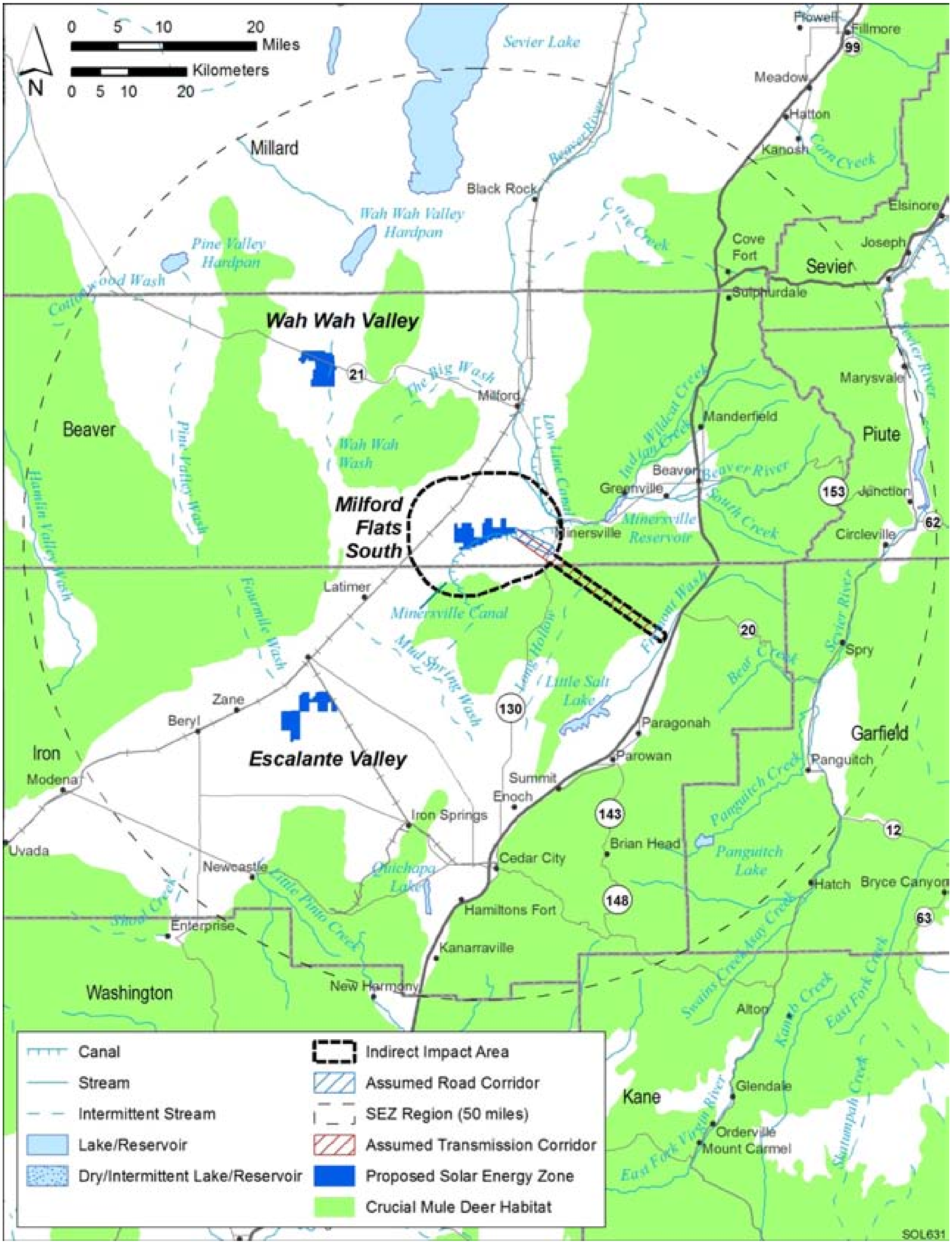


FIGURE 13.2.11.3-4 Location of the Proposed Milford Flats South SEZ Relative to Mule Deer Crucial Habitat Areas (Source: UDWR 2006a)

population estimate is 1,675 (UDWR 2009c). Figure 13.2.11.3-5 shows that the proposed Milford Flats South SEZ is contained within areas of crucial pronghorn habitat. About 2,179,400 acres (8,820 km^2) of crucial pronghorn habitat occur within the SEZ region.

Other Mammals

A number of small game and furbearer species occur within Beaver County. Species that could occur within the area of the proposed Milford Flats South 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).

The nongame (small) mammal species generally include bats, mice, voles, moles, and shrews. Species that could occur within the area of the proposed Milford Flats South 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 13.2.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Milford Flats South SEZ. Special status mammal species are discussed in Section 13.2.12.

13.2.11.3.2 Impacts

The types of impacts mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 13.2.11.3.3, identifies design features of particular relevance to mammals for the proposed Milford Flats South 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 13.2.11.3.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 13.2.11.3.3).

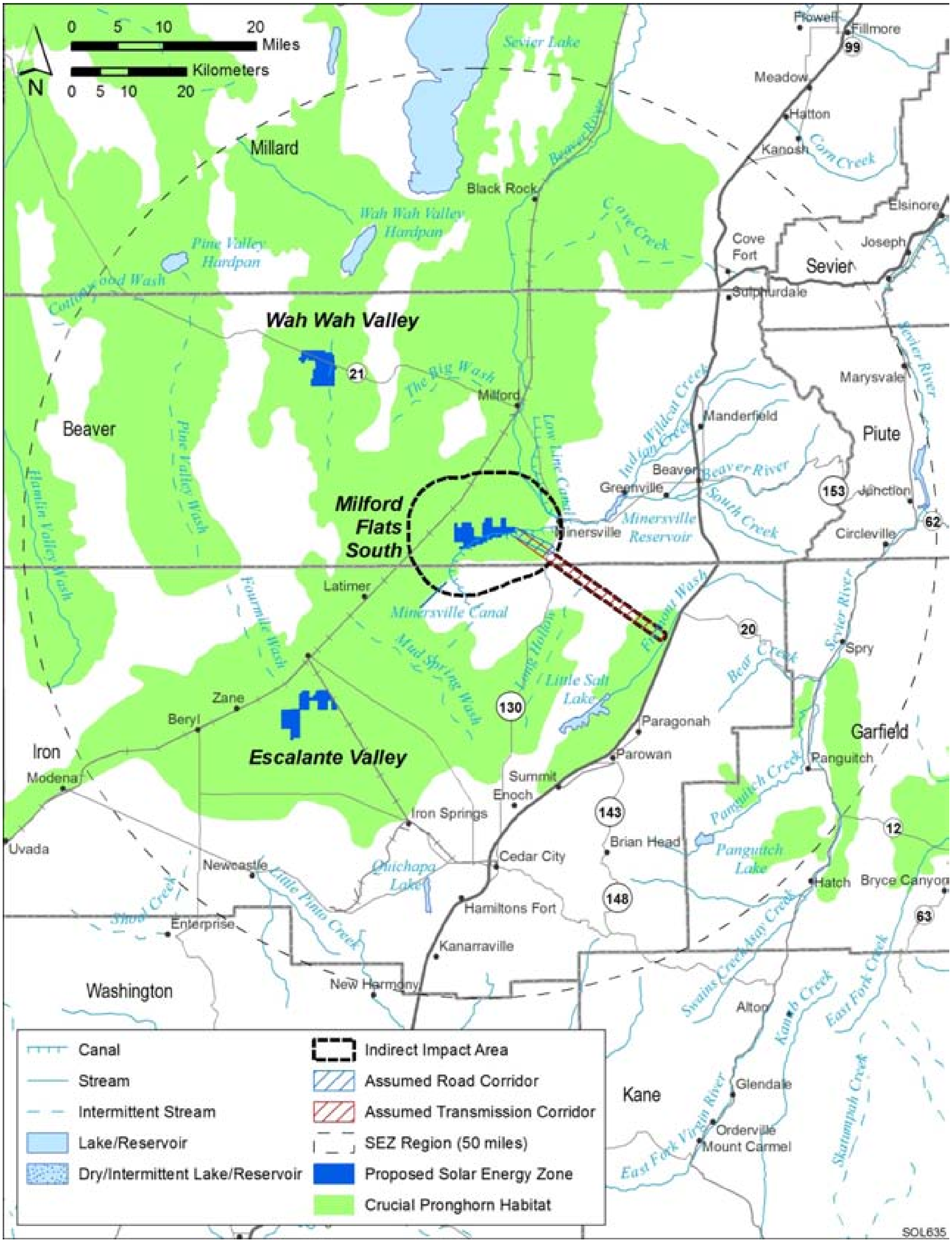


FIGURE 13.2.11.3-5 Location of the Proposed Milford Flats South SEZ Relative to Pronghorn Crucial Habitat Areas (Source: UDWR 2006a)

1

TABLE 13.2.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Milford Flats South SEZ

		Maximum Area of Potential Habitat Affected[b]				
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Big Game						
American black bear (*Ursus americanus*)	Montane shrublands and forests, and subalpine forests at moderate elevations. About 3,427,000 acres[i] 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	64,099 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	23 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,011 acres in area of indirect effect	723 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 14,552 acres in area of indirect effect	Small overall impact.
Cougar (*Puma concolor*)	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,451,700 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	104,074 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,550 acres in area of indirect effect	790 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,903 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 2,609,000 acres of potentially suitable habitat occurs in the SEZ region.	1,966 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	62,083 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	23 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,005 acres in area of indirect effect	722 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 14,533 acres in area of indirect effect	Small overall impact.
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 3,872,300 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	119,774 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,033 acres in area of indirect effect	858 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,254 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 1,995,400 acres of potentially suitable habitat occurs in the SEZ region.	4,413 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	89,644 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	33 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 2,889 acres in area of indirect effect	566 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 11,391 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
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 4,424,400 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	110,870 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,562 acres in area of indirect effect	790 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,897 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 4,423,700 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	121,580 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,035 acres in area of indirect effect	856 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,232 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Coyote (*Canis latrans*)	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 5,002,800 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	123,185 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,037 acres in area of indirect effect	859 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,285 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.3-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]				
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
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 4,317,800 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	121,286 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,035 acres in area of indirect effect	856 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,223 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.3-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]				
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Nongame (small) Mammals						
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, suburban and 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 4,417,500 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	121,061 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,023 acres in area of indirect effect	856 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 17,228 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Nongame (small) Mammals (Cont.)						
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. At elevations to 8,500 ft (1,524 m). Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,044,500 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	63,435 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,554 acres in area of indirect effect	788 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,857 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Nongame (small) Mammals (Cont.)						
Great Basin pocket mouse (*Perognathus parvus*)	Prefers arid grassland, sagebrush, and pinyon-juniper habitats with sandy soil. About 3,903,100 acres of potentially suitable habitat occurs within the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	110,343 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,554 acres in area of indirect effect	787 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,842 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Least chipmunk (*Neotamias minimus*)	Low-elevation semidesert shrublands, montane shrublands and woodlands, forest edges, and alpine tundra. About 4,603,600 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	110,865 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,562 acres in area of indirect effect	792 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,934 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Nongame (small) Mammals (Cont.)						
Little brown myotis (*Myotis lucifugus*)	Various habitats including pinyon-juniper woodlands, montane shrublands, and riparian woodlands. It uses man-made structures for summer roosting, although caves and hollow trees are also utilized. Winter hibernation often occurs in caves or mines, Most foraging activity occurs in woodlands over or near water. About 4,141,100 acres of potentially suitable habitat occurs within the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	13,009 acres of potentially suitable habitat (0.3% of available potentially suitable habitat)	35 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 3,015 acres in area of indirect effect	791 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,907 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-legged myotis (*Myotis volans*)	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees are used for daytime roosting and winter hibernation. It forages in open areas such as forest clearings. About 3,366,000 acres of potentially suitable habitat occurs within the SEZ region.	4,502 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	60,924 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	6 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 563 acres in area of indirect effect	343 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 6,908 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 13.2.11.3-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]				
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Nongame (small) Mammals (Cont.)						
Northern grasshopper mouse (*Onychomys leucogaster*)	Occurs in grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 3,519,000 acres of potentially suitable habitat occurs within the SEZ region.	3,888 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	85,864 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,414 acres in area of indirect effect	770 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) and 15,498 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Sagebrush vole (*Lemmiscus curtatus*)	Typically associated with semiarid sagebrush and grassland areas. Burrows are often constructed near sagebrush. About 1,240,200 acres of potentially suitable habitat occurs within the SEZ region.	1,966 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	52,951 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	23 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 1,992 acres in area of indirect effect	510 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) and 10,252 acres in area of indirect effect	Small overall impact.

TABLE 13.2.11.3-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]				
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Within Transmission Corridor (Indirect and Direct Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Nongame (small) Mammals (Cont.)						
Western pipistrelle (*Parastrellus esperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 3,453,500 acres of potentially suitable habitat occurs in the SEZ region.	5,184 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	110,789 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,544 acres in area of indirect effect	787 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat) and 15,835 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends its nights and other periods of inactivity in underground burrows. About 1,863,300 acres of potentially suitable habitat occurs within the SEZ region.	4,498 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	55,711 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	6 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 552 acres in area of indirect effect	276 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat) and 5,552 acres in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

Footnotes on next page.

1

TABLE 13.2.11.3-1 (Cont.)

---

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

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably 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 5,184 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 away from the SEZ.

[e] For access road development, direct effects were estimated within a 5-mi (84-km) long, 60-ft (18-m) wide ROW for an assumed new road from the SEZ to the nearest state highway. Indirect effects were estimated within a 1-mi (1.6-km) wide road corridor to the state highway, less the assumed area of direct effects.

[f] For transmission development, direct effects were estimated within a 19-mi (30.6-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.

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

[h] Species-specific 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 acres to km^2, multiply by 0.004047.

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

Table 13.2.11.3-1 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 Milford Flats South SEZ.

American Black Bear

Based on land cover analyses, about 1,970 acres (8 km^2) of potentially suitable American black bear habitat could be directly lost by solar energy development within the proposed Milford Flats South SEZ. This is 0.06% of the potentially suitable American black bear habitat within the SEZ region. Based on mapped ranges, the SEZ is 6 mi (10 km) from the closest substantial American black bear habitat and 19 mi (31 km) from the closest crucial American black bear habitat (Figure 13.2.11.3-1). Thus, solar energy development would not directly impact these habitats. The transmission line route that extends beyond the 5 mi (8 km) area of indirect effect area for the SEZ would occur within both categories of American black bear habitat. Direct impact would total 102 acres (0.4 km^2) of crucial American black bear habitat and 234 acres (0.9 km^2) of substantial American black bear habitat. These losses would represent 0.03 and 0.02% of the amount of crucial and substantial habitats within the SEZ region, respectively. The area of indirect effect from this portion of the transmission route would be 2,045 acres (8.3 km^2) of crucial American black bear habitat and 4,717 acres (19 km^2) of substantial American black bear habitat. Overall, impacts on the American black bear from solar energy development in the SEZ would be small.

Cougar

Based on land cover analyses, up to 5,184 acres (21 km^2) of potentially suitable cougar habitat could be directly lost by solar energy development within the proposed Milford Flats South 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 13.2.11.3-2). Thus, solar energy development would not directly impact preferred cougar habitat. The transmission line route for the SEZ that extends beyond the 5-mi (8-km) area of indirect effects for the SEZ would occur within preferred cougar habitat. Direct impact would total 399 acres (1.6 km^2) of preferred cougar habitat, which represents about 0.04% of preferred cougar habitat within the SEZ region. The area of indirect effect from this portion of the transmission line route would be 7,943 acres (32 km^2). Overall, impacts on cougar from solar energy development in the SEZ would be small.

Elk

Based on land cover analyses, about 1,970 acres (8 km^2) of potentially suitable elk habitat could be directly lost by solar energy development within the proposed Milford Flats South SEZ. This is 0.08% of potentially suitable habitat within the SEZ region. Based on mapped ranges, the SEZ is 7 mi (11 km) from the closest area of crucial elk habitat

(Figure 13.2.11.3-3). Thus, solar energy development would not directly affect important elk habitat. Neither the assumed access road nor the assumed transmission line for the SEZ would cross through crucial elk habitat. Overall, impacts on elk from solar energy development in the SEZ would be small.

Mule Deer

Based on land cover analyses, up to 5,184 acres (21 km^2) of potentially suitable mule deer habitat could be directly lost by solar energy development within the proposed Milford Flats South SEZ. This is 0.1% of potentially suitable 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 13.2.11.3-4). Thus, solar energy development would not directly impact crucial mule deer habitat. The transmission line route for the SEZ that extends beyond the 5 mi (8 km) area of indirect effect for the SEZ would occur within crucial mule deer habitat. Direct impact would total 379 acres (1.5 km^2) of crucial mule deer habitat, which represents about 0.01% of crucial mule deer habitat within the SEZ region. The area of indirect effect from this portion of the transmission line route would be 7,627 acres (31 km^2). Overall, impacts on mule deer from solar energy development in the SEZ would be small.

Pronghorn

Based on land cover analyses, more than 4,410 acres (17.8 km^2) of potentially suitable pronghorn habitat could be directly lost by solar energy development within the proposed Milford Flats South SEZ. This is 0.2% of potentially suitable habitat within the SEZ region. Based on mapped ranges, the SEZ and its assumed access road and transmission lines would be located within crucial pronghorn habitat (Figure 13.2.11.3-5). This could result in the direct reduction of 5,152 acres (21 km^2) of crucial pronghorn habitat within the SEZ, 248 acres (1 km^2) for the transmission line, and 31 acres (0.1 km^2) for the access road. Fencing, considered a major problem on pronghorn ranges, would present a barrier or hindrance to pronghorn movement (UDWR 2009c). Nevertheless, there are about 2,179,400 acres (8,820 km^2) of crucial pronghorn habitat within the SEZ region. Therefore, solar energy development would only have a small impact on crucial pronghorn habitat, directly eliminating about 0.2% of crucial pronghorn habitat that occurs 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 0.1 to 0.2% of potential habitats identified for these species would be lost (Table 13.2.11.3-1). Larger areas of potentially suitable habitat for these species occur within the area of potential indirect effects (i.e., ranging from 0.3% for the little brown myotis to 4.3% for the sagebrush vole).

Summary

Overall, direct impacts on mammal species would be small for all species, as only 0.3% or less of potentially suitable habitats for the mammal species would be lost (Table 13.2.11.3-1). Larger areas of potentially suitable habitat for mammal species occur within the area of potential indirect effects (e.g., up to 4.5% 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 (for example, impacts caused by dust generation, erosion, and sedimentation) would be negligible with implementation of programmatic design features.

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

13.2.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly 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 are:

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

- Development near Minersville Canal 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.

13.2.11.4 Aquatic Biota

13.2.11.4.1 Affected Environment

The proposed Milford Flats South SEZ is located in a 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. No perennial streams, water bodies, seeps, or springs are present on the proposed Milford Flats South SEZ or within the area of the presumed new transmission line corridor and access road. Ephemeral streams may cross the SEZ, but these drainages only contain water following rainfall and typically do not support wetland or riparian habitats. Four miles (6 km) of Minersville Canal, which redirects water from the Beaver River for irrigation, run through the southern portion of the proposed Milford Flats South SEZ. In addition, the presumed new transmission line (250-ft [76-m] wide) and access road (60 ft [18 m]) would cross over Minersville Canal. Minersville Canal is dry when not being used for irrigation and no significant aquatic biota would be expected to occur. There is little comprehensive information about the distribution of wetlands within the area, and there are no NWI data for the region that include the proposed SEZ (USFWS 2009). However, observations made during September 2009 indicated that wetlands would be unlikely or uncommon (Section 13.2.9.1).

No surface water bodies are located within the area of indirect effects. Segments of Minersville Canal and Low Line Canal that total approximately 16 mi (26 km) are located within 5 mi (8 km) of the SEZ, and a segment of Minersville Canal is located within the 1 mi (2 km) area of indirect effects associated with the new transmission line and road corridor. The Beaver River is the closest perennial stream to the proposed Milford Flats South SEZ; it is located about 4 mi (6 km) from the eastern SEZ boundary. Although 7 mi (11 km) of the Beaver River passes through the area of indirect effects, these portions of Beaver River are located downstream of Minersville, and are frequently dry because of irrigation withdrawals (Section 13.2.9.1.3). Such ephemeral or intermittent stream reaches may contain a diverse seasonal community of fish and invertebrates, with the latter potentially present in a dormant state even in dry periods (Levick et al. 2008). For example, one 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). Biota in ephemeral or intermittent streams may also contribute to populations in perennial reaches by dispersing downstream during wet periods when hydrologic connectivity is higher (Levick et al. 2008). However, site-specific surveys would be necessary to characterize aquatic biota, if present.

Outside of the indirect effects area, but within 50 mi (80 km) of the proposed Milford Flats South SEZ, are approximately 12 mi (19 km) of canals, 379 mi (610 km) of streams, and 180 mi (290 km) of intermittent streams. The presumed transmission line corridor extends 19 mi (31 km) from the SEZ and passes within 528 ft (161 m) of Long Hollow (intermittent stream) and stops 844 ft (257 m) from the Fremont Wash. The Minersville Reservoir, a 1,160-acre (5-km^2) impoundment formed by the Rocky Ford Dam on the Beaver River, is located approximately 10 mi (16 km) east of the proposed Milford Flats South SEZ. Minersville Reservoir has been stocked by the Utah Division of Wildlife Resources (UDWR) and currently supports populations of rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarki*), Utah chub (*Gila atraria*), and smallmouth bass (*Micropterus dolomieui*) (UDWR 2006b). The same fish species may also occur downstream of the reservoir, as long as sufficient water levels are present.

Also present within 50 mi (80 km) of the SEZ is an additional 3,441 acres (14 km^2) of lake and reservoir habitat, 1,069 acres (4 km^2) of intermittent lake, and 54,026 acres (219 km^2) of dry lake. However, these water bodies are all more than 20 mi (32 km) from the proposed Milford Flats South SEZ.

13.2.11.4.2 Impacts

Because surface water habitats are a unique feature in the arid landscape in the vicinity of the proposed Milford Flats South 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 5.10.2.4. Aquatic habitats present on or near the locations selected for construction of solar energy facilities could be affected in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality.

There are no permanent water bodies, streams, or wetlands present within the boundaries of either the proposed Milford Flats South SEZ or the presumed new access road and transmission line corridors, and consequently there would be no direct impacts on aquatic habitats from solar energy development. The man-made Minersville Canal is within the area of direct and indirect effects for the SEZ and the transmission line and access road. Although it may contain aquatic biota when water is present, Minersville Canal is an irrigation channel and does not support significant aquatic habitat or communities. Disturbance of land areas within the SEZ for solar energy facilities and the construction of a new transmission line corridor and access road could increase the transport of soil into the canal via waterborne and airborne pathways. Overhead transmission lines could potentially be used so there would be no need to place structures directly within the canal. However, road construction will likely require fill material within the canal. The introduction of waterborne sediments to Minersville Canal could be minimized using common mitigation measures such as settling basins, silt fences, or direction of water draining from the developed areas away from the canal. Any sediment that does enter the canal would be transported downstream and would not impact the Minersville Reservoir or Beaver River. It is unlikely any of the sediment from surface runoff or airborne dust associated with ground disturbance within the SEZ would reach aquatic habitat, given the slow to medium runoff and moderately high permeability of area soils and the large distance of the SEZ to the nearest stream (4 mi [6 km]). Although they are outside the area of direct and indirect effects, Fremont Wash and Long Hollow are located within 0.16 mi (257 m) of the new transmission line corridor. If necessary, dust and surface run off abatement measures could be used to reduce the potential for sediment deposition into these surface water features.

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 Milford Flats South 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 (Section 13.2.9.2). 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. However, because of the relatively large distance from any permanent surface water features to solar development activities, transmission line corridors, and road corridors, the potential for introducing contaminants into such water bodies would be small, especially if the appropriate mitigation measures were used.

13.2.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are identified at this time. If programmatic design features described in Appendix A, Section A.2.2, are implemented as needed, and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the Milford Flats South SEZ would be negligible.

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

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Milford Flats South SEZ. Special status species include the following types of species[8]:

- Species listed as threatened or endangered under the ESA;
- Species that are proposed for listing, are under review, or are candidates for listing under the ESA;
- Species that are listed by the BLM as sensitive;
- Species that are listed by the State of Utah[9]; and
- Species that have been ranked as S1 or S2 by the State of Utah or as 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 Milford Flats South SEZ (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 2009a) and UDWR Vertebrate Information (UDWR 2003), *Utah Rare Plant Guide* (UNPS 2009), and the Southwest Regional Gap Analysis Project (SWReGAP) (USGS 2004, 2005a, 2007). Information reviewed consisted of county-level occurrences as determined from NatureServe, 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, Garfield, Iron, Kane, Millard, Piute, Sevier, and Washington Counties, in Utah. However, the affected area occurs only in Beaver and Iron Counties (Figure 13.2.12.1-1). See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

13.2.12.1 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 Milford Flats South SEZ, the area of direct effects included the SEZ and the areas within the

[8] 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.

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

transmission line and road corridors where ground-disturbing activities are assumed to occur. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and the portion of the 1-mi (1.6-km) wide transmission line and road corridors where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but did not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance from the SEZ. 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 13.2.10). Potentially unique habitats in the affected area in which special status species may reside include desert playas, rocky cliffs and outcrops, and woodlands. The only aquatic or riparian habitats in the affected area occur within and along the Beaver River and a canal from the Beaver River. The Beaver River occurs about 4 mi (6.5 km) east of the SEZ; a canal from the Beaver River intersects the southern portion of the SEZ (Figure 13.2.12.1-1). There are also playa habitats and man-made earthen livestock-watering areas throughout the area of indirect effects (Section 13.2.9).

All special status species known to occur within the Milford Flats South 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, 20 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 13.2.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped SWReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 m) from the SEZ.

Based on information provided by the UDWR, quad-level occurrences for eight species intersect the Milford Flats South SEZ affected area (Table 13.2.12.1-1): the ferruginous hawk, greater sage-grouse, short-eared owl, western burrowing owl, dark kangaroo mouse, kit fox, Townsend's big-eared bat, and Utah prairie dog. 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 13.2.9).

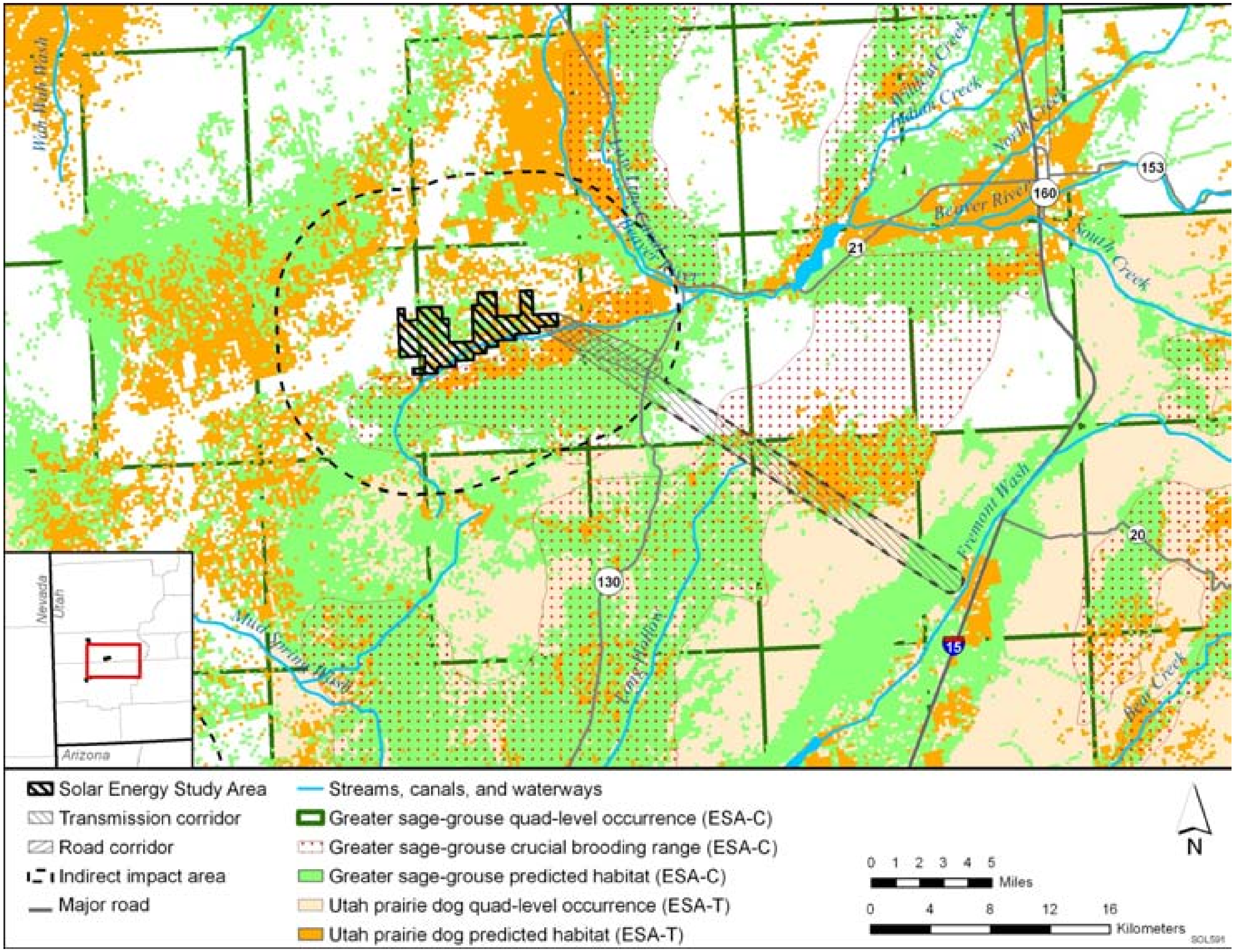


FIGURE 13.2.12.1-1 Known or Potential Occurrences of Species Listed as Endangered, Threatened, or Candidates for Listing under the ESA That May Occur in the Proposed Milford Flats South SEZ Affected Area (Sources: USGS 2007; UDWR 2009a)

TABLE 13.2.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Occur on or in the Affected Area of the Proposed Milford Flats South SEZ

				Maximum Area of Potential Habitat Affected[c]				
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
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.[j] Known from southwestern Millard County and northwestern Beaver County, Utah, and eastern Nevada. Nearest recorded occurrence is 45 mi[k] northwest of the SEZ. About 2,430,377 acres[l] of potentially suitable habitat occurs within the SEZ region.	5,899 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	89 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	56 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	88,250 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the areas of direct effect; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.
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 27 mi northwest of the SEZ. About 4,077,164 acres of potentially suitable habitat occurs within the SEZ region.	5,900 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	89 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	87 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	99,600 acres of potentially suitable habitat (2.4% 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.

1

TABLE 13.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
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 occurrences are 12 mi east of the SEZ. About 3,961,336 acres of potentially suitable habitat occurs within the SEZ region.	5,899 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	89 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	87 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	98,300 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.
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 40 mi northwest of the SEZ. About 3,468,227 acres of potentially suitable habitat occurs within the SEZ region.	4,505 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	75 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	84 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	83,450 acres of potentially suitable habitat (2.4% 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.
Birds								
American white pelican	*Pelecanus erythrorhynchos*	BLM-S; FWS-SC; UT-SC; UT-S1	May occur as a summer resident and migrant in large reservoirs within the SEZ region. Species is likely to be a transient only in the vicinity of the SEZ. Nearest recorded occurrence is from the Minersville Reservoir, approximately 11 mi east of the SEZ. About 81,437 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres	100 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation needed. Only transient individuals are expected in the affected area.

TABLE 13.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
Birds (Cont.)								
Bald eagle	*Haliaeetus leucocephalus*	BLM-S; UT-SC; UT-S1	Known as 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. Nearest recorded occurrences are from the Beaver River within 10 mi east of the SEZ. About 2,540,607 acres of potentially suitable habitat occurs within the SEZ region.	1,889 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	11 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	81 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	43,530 acres of potentially suitable habitat (1.7% 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.
Ferruginous hawk[m]	***Buteo regalis***	BLM-S; UT-SC; UT-S2	A year-round resident in the SEZ affected area. Grasslands, shrublands, agricultural lands, and the periphery of pinyon-juniper forests throughout the SEZ region. Quad-level occurrences intersect the SEZ and other portions of the affected area. About 1,761,837 acres of potentially suitable habitat occurs within the SEZ region.	2,500 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	93 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	63,700 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied nests and habitats in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 13.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
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 east of the SEZ. Crucial brooding habitat for the species exists about 1 mi south of the SEZ and intersects the transmission corridor. About 1,646,504 acres of potentially suitable habitat occurs within the SEZ region.	3,905 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	34 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	96 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	77,300 acres of potentially suitable habitat (4.7% 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 effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Mitigation should be developed in coordination with the USFWS and the UDWR.
Lewis's woodpecker	*Melanerpes lewis*	UT-SC; UT-S2	A year-round resident throughout the SEZ region, but only winter (nonbreeding) habitat is expected to occur in the affected area. Open ponderosa pine, Douglas-fir, pinyon-juniper, mixed conifer, and oak forests. Areas with under-story grasses and shrubs to support insect prey populations are preferred. Nests in cavities of dead or dying trees and stumps. Nearest recorded occurrence is approximately 35 mi south of the SEZ. About 351,500 acres of potentially suitable habitat occurs within the SEZ region.	14 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	6 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	6 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	9,300 acres of potentially suitable habitat (2.6% 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 13.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
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. Nearest recorded occurrences are from the Beaver River, approximately 10 mi east of the SEZ. About 285,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	6 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	6 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	8,565 acres of potentially suitable habitat (3.0% 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. Nearest recorded occurrences are approximately 18 mi southeast of the SEZ. About 704,300 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	29 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	7,000 acres of potentially suitable habitat (1.0% of available potentially suitable habitat)	Small overall impact on 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 13.2.12.1-1 (Cont.)

				Maximum Area of Potential Habitat Affected[c]				
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
Birds (Cont.)								
Short-eared owl	***Asio flammeus***	BLM-S; UT-SC; UT-S2	A year-round resident in portions of the SEZ region, although only winter (nonbreeding) habitat is expected to occur in the affected area. Grasslands, shrublands, and other open habitats throughout the SEZ region. Quad-level occurrences intersect the SEZ and other portions of the affected area. About 3,938,700 acres of potentially suitable habitat occurs within the SEZ region.	5,950 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	36 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	151 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	106,150 acres of potentially suitable habitat (2.7% 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.
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 2,432,600 acres of potentially suitable habitat occurs within the SEZ region.	5,964 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	36 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	81 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	96,300 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied burrows and habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 13.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
Mammals								
Dark kangaroo mouse	***Microdiposops megacephalus***	BLM-S; UT-SC; UT-S2	Occurs in the Great Basin region in sagebrush-dominated areas with sandy soils. 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 620,100 acres of potentially suitable habitat occurs within the SEZ region.	2,712 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	0 acres	2 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	42,100 acres of potentially suitable habitat (6.8% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Fringed myotis	*Myotis thysanodes*	BLM-S; 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. Nearest recorded occurrences are 40 mi southeast of the SEZ. About 4,555,400 acres of potentially suitable habitat occurs within the SEZ region.	6,433 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	36 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	152 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	114,600 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 13.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
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 affected area north of the SEZ. About 1,960,500 acres of potentially suitable habitat occurs within the SEZ region.	5,950 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	57 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	85,400 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effects; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Pygmy rabbit	*Brachylagus idahoensis*	BLM-S; UT-SC; UT-S2	Sagebrush-shrubland habitats throughout the SEZ region. Prefers loose soils to dig burrows. Nearest recorded occurrences are about 10 mi southeast of the SEZ. About 967,900 acres of potentially suitable habitat occurs within the SEZ region.	2,031 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	24 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	49 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	42,800 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effects; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 13.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
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. Nearest recorded occurrences are 15 mi north of the SEZ. About 3,269,200 acres of potentially suitable habitat occurs within the SEZ region.	4,544 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	25 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	124 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	81,500 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.
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 north of the SEZ. About 3,111,000 acres of potentially suitable habitat occurs within the SEZ region.	3,933 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	12 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	66 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	59,400 acres of potentially suitable habitat (1.9% 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 13.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Transmission Line (Direct Effects)[f]	Indirect Effects (Outside SEZ)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
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. Quad-level occurrences intersect the affected area south of the SEZ. Colonies are known to occur outside of the affected area within 10 mi south of the SEZ. About 825,000 acres of potentially suitable habitat occurs within the SEZ region.	1,874 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	11 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	27 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	30,600 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effects; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Mitigation should be developed in consultation with the USFWS and the UDWR.

[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.

Footnotes continued on next page.

TABLE 13.2.12.1-1 (Cont.)

[e] For access road development, direct effects were estimated within a 5-mi (8-km) long, 60-ft (18-m) wide road ROW from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of potentially suitable habitat within the 1-mi (1.6-km) wide road corridor.

[f] For transmission line development, direct effects were estimated within a 19-mi (30-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.

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

[h] 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.

[i] 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.

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

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

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

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

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

In scoping comments on the proposed Milford Flats South SEZ (Stout 2009), the USFWS expressed concern for impacts of project development on the Utah prairie dog, a species listed as threatened under the ESA. This species has the potential to occur within the SEZ on the basis of observed occurrences near the SEZ and the presence of potentially suitable habitat in the SEZ (Figure 13.2.12.1-1; Table 13.2.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of this species. No other species currently listed under the ESA is known to occur within the Milford Flats South 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 SEZ region (UDWR 2009a). 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.

Quad-level occurrences for this species intersect the area of indirect effects for the Milford Flats South SEZ. SWReGAP predicts the presence of potentially suitable habitat for the species on the SEZ and throughout other portions of the affected area (Figure 13.2.12.1-1; Table 13.2.12.1-1). Data provided by the Utah prairie dog colony tracking database[10] also indicates the presence of active Utah prairie dog colonies outside the affected area but within 10 mi (16 km) south of the SEZ. Critical habitat for this species has not been designated.

13.2.12.1.2 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 Milford Flats South SEZ. This species is known to occur in plains, foothills, and mountain valleys dominated by sagebrush. In its scoping comments on the SEZ (Stout 2009), the USFWS indicated that suitable sage-grouse habitat occurs throughout the Milford Flats South 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 occurrences for this species intersect the affected area east 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 1 mi (1.6 km) south of the SEZ. This crucial brooding habitat also intersects the transmission corridor (Figure 13.2.12.1-1; Table 13.2.12.1-1).

---

[10] The Utah prairie dog colony tracking database contains sensitive data provided by the UDWR, 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.

13.2.12.1.3 BLM-Designated Sensitive Species

There are 18 BLM-designated sensitive species that may occur in the affected area of the Milford Flats South SEZ (Table 13.2.12.1-1). These BLM-designated sensitive species include the following: (1) plants—compact cat's-eye, Jone's globemallow, long-calyx milkvetch, and money wild buckwheat; (2) birds—American white pelican, 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: ferruginous hawk, short-eared owl, western burrowing owl, dark kangaroo mouse, kit fox, 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 13.2.12.1-1. One species (greater sage-grouse) was discussed in Section 13.2.12.1.2 because of its status under the ESA. All other BLM-designated 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 Milford Flats South SEZ region. Suitable habitat includes salt desert shrub-scrub. The species is known to occur about 45 mi (72 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 13.2.12.1-1).

Jone's Globemallow

The 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 27 mi (43 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 13.2.12.1-1).

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) east of the SEZ. Potentially suitable habitat for the species may occur on the SEZ and in other portions of the affected area (Table 13.2.12.1-1).

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 40 mi (64 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 13.2.12.1-1).

American White Pelican

The American white pelican is known to occur in the SEZ region where it is a summer resident and migrant in large reservoirs and other bodies of water. The species has been recorded near the Minersville Reservoir, approximately 11 mi (18 km) east of the SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not exist in the area of direct effects, but potentially suitable nonbreeding migratory habitat exists in the area of indirect effects. Suitable nesting habitat does not occur in the affected area, but the species may be observed as a transient in portions of the affected area (Table 13.2.12.1-1).

Bald Eagle

The bald eagle is known to occur in the SEZ region, primarily associated with larger waterbodies. The species has been recorded in the vicinity of the Beaver River, approximately 10 mi (16 km) east of 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 13.2.12.1-1).

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 Milford Flats South SEZ and other portions of the affected area. According to the SWReGAP habitat suitability model, potentially suitable breeding and nonbreeding year-round habitat may occur in the SEZ affected area (Table 13.2.12.1-1). Most of this 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 7 acres (<0.1 km^2) of forested habitat within the access road corridor and 4,475 acres (18 km^2) of forested habitat within the transmission corridor may provide potentially suitable nesting habitat for this species. In addition, approximately 10,150 acres (41 km^2) of forested habitat occurs throughout other portions of the area of indirect effects outside the SEZ and the access road and transmission corridors. Approximately 30 acres (0.1 km^2) of rocky cliffs and outcrops may occur in the transmission corridor; an additional 70 acres (0.3 km^2) of this potentially suitable nesting habitat occurs in the area of indirect effects outside the SEZ and the access road and transmission corridors.

Long-Billed Curlew

The long-billed curlew is known to occur in the SEZ region as a summer resident and migrant in short-grass grasslands near standing water. The species has been recorded near the Beaver River, approximately 10 mi (16 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 in the assumed road and transmission line corridors 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 13.2.12.1-1).

Northern Goshawk

The northern goshawk is known to occur in the SEZ region where it forages in montane forests and valley shrubland habitats. Populations are known to occur approximately 18 mi (29 km) southeast of the SEZ. According to the SWReGAP habitat suitability model, year-round breeding and nonbreeding potential habitat does not occur on the SEZ or within the access road corridor; however, potentially suitable habitat may occur in the transmission corridor and within the area of indirect effects (Table 13.2.12.1-1). 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 7 acres (<0.1 km^2) of woodland habitat that may be potentially suitable nesting habitat occurs in the transmission corridor. Approximately 4,475 acres (18 km^2) of this habitat occurs in the area of indirect effects.

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 Milford Flats South SEZ and other portions of the affected area. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat occurs in the SEZ region, although only winter nonbreeding habitat is predicted to occur in the affected area. Suitable nesting habitat is not expected to occur in the affected area, but grassland and shrubland habitats suitable for foraging may occur throughout the affected area (Table 13.2.12.1-1).

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 Milford Flats South 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 13.2.12.1-1). 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 Milford Flats South SEZ region. Quad-level occurrences for this species intersect the SEZ and other portions of the affected area. According to the SWReGAP habitat suitability model, year-round habitat is expected to occur throughout the SEZ and other portions of the affected area (Table 13.2.12.1-1).

Fringed Myotis

The fringed myotis is known to occur in the SEZ region in a variety of habitats including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. The species roosts in buildings and caves. The species is known to occur in the Dixie National Forest, approximately 40 mi (64 km) southeast of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat may be present within the affected area (Table 13.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ or within the access road corridor. However, approximately 30 acres (0.1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 70 acres (0.3 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.

Kit Fox

The kit fox is widely distributed throughout western North America. Within the Milford Flats South 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 affected area north of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round shrubland habitat for the species may occur on the SEZ and in other portions of the affected area (Table 13.2.12.1-1).

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. The species is known to occur approximately 10 mi (16 km) southeast of the Milford Flats South SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round sagebrush-shrubland habitat for the species may occur on the SEZ and in other portions of the affected area (Table 13.2.12.1-1).

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. The species has been recorded about 15 mi (24 km) north of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat may be present within the affected area (Table 13.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ or within the access road corridor. However, approximately 30 acres (0.1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 70 acres (0.3 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.

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 north of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round habitat may be present within the affected area (Table 13.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ or within the access road corridor. However, approximately 30 acres (0.1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 70 acres (0.3 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.

13.2.12.1.4 State-Listed Species

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

13.2.12.1.5 Rare Species

There are 18 species with a state status of S1 or S2 in Utah or considered species of concern by the State of Utah or the USFWS that may occur in the affected area of the Milford Flats South SEZ (Table 13.2.12.1-1). Only the Lewis's woodpecker has not been previously discussed as ESA-listed (Section 13.2.12.1.1), an ESA candidate (Section 13.2.12.1.2), or BLM-designated sensitive (Section 13.2.12.1.3).

13.2.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Milford Flats South 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 13.2.12.1, following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 13.2.12.3).

Solar energy development within the Milford Flats South SEZ could affect a variety of habitats (see Sections 13.2.9 and 13.2.10). Impacts on these habitats could in turn affect special status species dependent on those habitats. Based on UDWR records, quad-level occurrences of the following eight special status species intersect the affected area of the Milford Flats South SEZ: ferruginous hawk, greater sage-grouse, short-eared owl, western burrowing owl, dark kangaroo mouse, kit fox, Townsend's big-eared bat, and Utah prairie dog. 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 13.2.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effects outside the SEZ are presented in Table 13.2.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming programmatic design features are in place) is presented, along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning/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 were sited in areas where special status species are known to or could occur. As presented in Section 13.2.1.2, a 5-mi (8-km) long road corridor and a 19-mi (30-km) long transmission line corridor are assumed to be needed to serve solar facilities within this SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ and assumed road and transmission corridors 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.

13.2.12.2.1 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 Milford Flats South SEZ and is the only ESA-listed species that the USFWS identified as potentially affected by solar energy development on the SEZ (Stout 2009). Quad-level occurrences for this species intersect the affected area south of the SEZ, and potentially suitable shrubland habitat occurs throughout the affected area (Figure 13.2.12.1-1). Furthermore, information provided by the Utah prairie dog colony tracking database indicates the presence of Utah prairie dog colonies outside the affected area within 10 mi (16 km) south of the SEZ. According to SWReGAP, about 1,874 acres (8 km^2) of potentially suitable habitat on the SEZ, 11 acres (<0.1 km^2) in the road corridor, and 27 acres (<0.1 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.2% of available suitable habitat of the Utah prairie dog in the SEZ region. About 30,600 acres (124 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the Utah prairie dog from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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.

13.2.12.2.2 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 Milford Flats South SEZ. Quad-level occurrences for this species intersect the affected area east of the SEZ, and potentially suitable sagebrush habitat occurs throughout the affected area (Figure 13.2.12.1-1). In its 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, about 3,905 acres (16 km^2) of potentially suitable habitat on the SEZ, 34 acres (0.1 km^2) in the road corridor, and 96 acres (0.4 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.2% of available suitable habitat for the greater sage-grouse in the SEZ region. About 77,300 acres (313 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 4.7% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the greater sage-grouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 throughout the area of direct effects.

Efforts to mitigate the impacts of solar energy development in the Milford Flats South SEZ on the greater sage-grouse should be developed in consultation with the USFWS and UDWR following the *Strategic Plan for Management of Sage Grouse* (UDWR 2009d) and

Guidelines to Manage Sage Grouse Populations and Their Habitats (Connelly et al. 2000). Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the 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 the UDWR.

13.2.12.2.3 Impacts on BLM-Designated Sensitive Species

Of the 17 BLM-designated sensitive species that could occur in the affected area of the proposed Milford Flats South SEZ, one species, greater sage-grouse, was discussed in Section 13.2.12.2.2 because of its status under the ESA. Impacts on all other BLM-designated sensitive species that have potentially suitable habitat within the SEZ, road corridor, or transmission line corridor (i.e., the area of direct effects) are discussed below.

Compact Cat's-Eye

The compact cat's-eye is not known to occur in the affected area of the Milford Flats South SEZ; however, approximately 5,899 acres (24 km^2) of potentially suitable habitat on the SEZ, 89 acres (0.4 km^2) in the road corridor, and 56 acres (0.2 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.2% of available suitable habitat in the SEZ region. About 88,250 acres (357 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.6% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the compact cat's-eye from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 effects. For this species and other special status plants, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effect. If avoidance or minimization is not a feasible option, plants could be translocated from areas of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or more of these options could be designed to completely offset the impacts of development.

Jone's Globemallow

The Jone's globemallow is not known to occur in the affected area of the Milford Flats South SEZ; however, approximately 5,900 acres (24 km^2) of potentially suitable habitat on the SEZ, 89 acres (0.4 km^2) in the road corridor, and 87 acres (0.4 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.1% of available suitable habitat in the SEZ region. About 99,600 acres (403 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 2.4% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the Jone's globemallow from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 Milford Flats South SEZ; however, approximately 5,899 acres (24 km^2) of potentially suitable habitat on the SEZ, 89 acres (0.4 km^2) in the road corridor, and 87 acres (0.4 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct impact area represents about 0.2% of available suitable habitat in the SEZ region. About 98,300 acres (398 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 2.5% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the long-calyx milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 Milford Flats South SEZ; however, approximately 4,505 acres (18 km^2) of potentially suitable habitat on the SEZ, 75 acres (0.3 km^2) in the road corridor, and 84 acres (0.3 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.1% of available 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 suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the money wild buckwheat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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.

American White Pelican

The American white pelican is known to occur in the SEZ region where it is a summer resident and migrant in large reservoirs and other bodies of water. According to the SWReGAP habitat suitability model, suitable habitat for this species does not exist in the area of direct effects. However, approximately 100 acres (0.4 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 0.1% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1). This habitat represents potentially suitable nonbreeding migratory habitat; suitable nesting habitat does not occur in the affected area, but the species may be observed as a transient in portions of the affected area (Table 13.2.12.1-1).

Because potentially suitable habitat does not exist in the area of direct effects, it is expected that the implementation of programmatic design features would be sufficient to reduce 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 habitat in the SEZ region.

Bald Eagle

The bald eagle is a winter resident within the proposed Milford Flats South SEZ region. Approximately 1,889 acres (8 km^2) of potentially suitable foraging habitat on the SEZ, 11 acres (<0.1 km^2) of potentially suitable foraging habitat in the road corridor, and 81 acres (0.3 km^2) of potentially suitable foraging habitat in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.1% of available suitable foraging habitat in the SEZ region. About 43,530 acres (176 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 1.7% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the bald eagle from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 is 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 Milford Flats South SEZ region and potentially suitable breeding and nonbreeding habitat may occur in the affected area. Approximately 2,500 acres (10 km^2) of potentially suitable habitat on the SEZ, 30 acres (0.1 km^2) in the road corridor, and 93 acres (0.4 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.1% of available suitable habitat in the SEZ region. About 63,700 acres (256 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.6% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1). Most of this 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 7 acres (<0.1 km^2) of forested habitat within the access road corridor and 4,475 acres (18 km^2) of forested habitat within the transmission corridor may provide potentially suitable nesting habitat for this species. In addition, approximately 10,150 acres (41 km^2) of forested habitat occurs throughout other portions of the area of indirect effects outside the SEZ and the access road and transmission corridors. Approximately 30 acres (0.1 km^2) of rocky cliffs and outcrops may occur in the transmission corridor; an additional 70 acres (0.3 km^2) of this potentially suitable nesting habitat occurs in the area of indirect effects outside the SEZ and the access road and transmission corridors.

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 or potential 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 or potential 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 Milford Flats South SEZ region and individuals may occur as migratory transients in grassland and wetland habitats (playas) in the affected area. Although suitable habitat does not occur on the SEZ, approximately 6 acres (<0.1 km^2) of potentially suitable habitat in the road corridor and 6 acres (<0.1 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents <0.1% of available suitable habitat in the SEZ region. About 8,565 acres (35 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.0% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1). 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 Milford Flats South 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 Milford Flats South 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 or within the road corridor. However, approximately 29 acres (<0.1 km^2) of potentially suitable habitat in the transmission line corridor could be directly affected (Table 13.2.12.1-1). This direct effects area represents about <0.1% of available suitable habitat in the SEZ region. About 7,000 acres (28 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 1.0 % of the available suitable habitat in the SEZ region (Table 13.2.12.1-1). 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 7 acres (<0.1 km^2) of woodland habitat that may be potentially suitable nesting habitat occurs in the transmission corridor. Approximately 4,475 acres (18 km^2) of this habitat occurs in the area of indirect effects.

The overall impact on the northern goshawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 (shrublands) 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 or potential nesting habitat (woodlands) within the transmission corridor is feasible, and could reduce impacts. If avoiding or minimizing disturbance of all occupied or potential 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 Milford Flats South SEZ region, although it may only occur as a winter resident in the affected area. It is known to occur in open grasslands and shrublands. Approximately 5,950 acres (24 km^2) of potentially suitable habitat on the SEZ, 36 acres (0.1 km^2) in the road corridor, and 151 acres (0.6 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.2% of available suitable habitat in the SEZ region. About 106,150 acres (430 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 2.7% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the short-eared owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 is 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 short-eared owl because potentially suitable shrubland is widespread throughout the area of direct effects and readily available in other portions of the affected area.

Western Burrowing Owl

The western burrowing owl is considered to be a summer resident within the proposed Milford Flats South 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 5,964 acres (24 km^2) of potentially suitable habitat on the SEZ, 36 acres (0.1 km^2) in the road corridor, and 81 acres (0.3 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.2% of available suitable habitat in the SEZ region. About 96,300 acres (390 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 4.0% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 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 Milford Flats SEZ region where it is known to occur in sandy regions dominated by sagebrush. Approximately 2,712 acres (11 km^2) of potentially suitable habitat on the SEZ and 2 acres (<0.1 km^2) of potentially suitable foraging habitat in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.4% of available suitable foraging habitat in the SEZ region. About 42,100 acres (170 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 6.8% of the available suitable foraging habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the dark kangaroo mouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 of occupied habitats in the area of direct effects could reduce impacts. If avoidance 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 Milford Flats South SEZ region where it is known to forage in riparian, shrubland, and forested habitats. Approximately 6,433 acres (26 km^2) of potentially suitable foraging habitat on the SEZ, 36 acres (0.1 km^2) in the road corridor, and 152 acres (0.6 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.1% of available suitable foraging habitat in the SEZ region. About 114,600 acres (464 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 2.5% of the available suitable foraging habitat in the SEZ region (Table 13.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ or within the access road corridor. However, approximately 30 acres (0.1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 70 acres (0.3 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 fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 or potential roosting habitat (rocky cliffs and outcrops) within the transmission corridor is feasible, and could reduce impacts. If avoiding or minimizing disturbance of all occupied or potential 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 Milford Flats South SEZ region where it is known to occur in grassland and shrubland habitats. Approximately 5,950 acres (24 km^2) of potentially suitable habitat on the SEZ, 30 acres (0.1 km^2) in the road corridor, and 57 acres (0.2 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.3% of available suitable habitat in the SEZ region. About 85,400 acres (346 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 4.4% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the kit fox from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 Milford Flats South SEZ region where it is known to occur in sagebrush habitats. Approximately 2,031 acres (8 km^2) of potentially suitable habitat on the SEZ, 24 acres (0.1 km^2) in the road corridor, and 49 acres (0.2 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.2% of available suitable habitat in the SEZ region. About 42,800 acres (173 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 4.4% of the available suitable habitat in the SEZ region (Table 13.2.12.1-1).

The overall impact on the pygmy rabbit from construction, operation, and decommissioning of utility-scale solar energy facilities within the Milford Flats South 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 Milford Flats South SEZ region where it is known to forage in shrubland and forested habitats. Approximately 4,544 acres (18 km^2) of potentially suitable foraging habitat on the SEZ, 25 acres (0.1 km^2) in the road corridor, and 124 acres (0.5 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.1% of available suitable foraging habitat in the SEZ region. About 81,500 acres (330 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 2.5% of the available suitable foraging habitat in the SEZ region (Table 13.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ or within the access road corridor. However, approximately 30 acres (0.1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 70 acres (0.3 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 Milford Flats South 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 or potential roosting habitat (rocky cliffs and outcrops) within the transmission corridor is feasible, and could reduce impacts. If avoiding or minimizing disturbance of all occupied or potential 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 Milford Flats South SEZ region where it is known to forage in shrubland and forested habitats. Approximately 3,933 acres (16 km^2) of potentially suitable foraging habitat on the SEZ, 12 acres (<0.1 km^2) in the road corridor, and 66 acres (0.3 km^2) in the transmission line corridor could be directly affected by construction and operations (Table 13.2.12.1-1). This direct effects area represents about 0.1% of available suitable foraging habitat in the SEZ region. About 59,400 acres (240 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 1.9% of the available suitable foraging habitat in the SEZ region (Table 13.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ or within the access road corridor. However, approximately 30 acres (0.1 km^2) of this potentially suitable roosting habitat may occur in the transmission corridor; an additional 70 acres (0.3 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 Milford Flats South 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 or potential roosting habitat (rocky cliffs and outcrops) within the transmission corridor is feasible, and could reduce impacts. If avoiding or minimizing disturbance of all occupied or potential 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.

13.2.12.2.4 Impacts on State-Listed Species

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

13.2.12.2.5 Impacts on Rare Species

There are 18 species with a state status of S1 or S2 in Utah or considered species of concern by the State of Utah or the USFWS that may occur in the affected area of the Milford Flats South SEZ. Impacts have been previously discussed for 17 of these species that are also ESA-listed (Section 13.2.12.2.1), ESA candidates (Section 13.2.12.2.2), or BLM-designated sensitive (Section 13.2.12.2.3). Potential impacts on the Lewis's woodpecker are presented in Table 13.2.12.1-1.

13.2.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- Pre-disturbance surveys should be conducted to determine the presence and abundance of special status species, including those identified in Table 13.2.12.1-1; 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 woodland habitats (e.g., pinyon-juniper, mixed conifer, oak) in the area of direct effects could reduce impacts on the ferruginous hawk (nesting), Lewis's woodpecker, and northern goshawk (nesting).

- Avoiding or minimizing disturbance of rocky cliffs and outcrops in the area of direct effects, particularly within the transmission corridor, could reduce impacts on the fringed myotis, spotted bat, and Townsend's big-eared bat.

- 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.

- 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 would identify an appropriate pre-disturbance survey protocol, avoidance measures, and any potential compensatory mitigation actions.

- 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 the 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, as indicated in Table 13.2.12.1-1.

This page intentionally left blank.

13.2.13 Air Quality and Climate

13.2.13.1 Affected Environment

13.2.13.1.1 Climate

The proposed Milford Flats South SEZ is located in southwestern Utah, in the south central portion of Beaver County. The SEZ is at an elevation of about 5,060 ft (1,542 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. As a consequence, 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 around the proposed SEZ is temperate and dry (NCDC 1989). Meteorological data collected at the Milford Municipal Airport and Milford, which are located about 14 mi (22 km) and 12 mi (19 km) north-northeast of the proposed Milford Flats South SEZ, respectively, are summarized below.

A wind rose from the Milford Municipal Airport for the five-year period 2004 to 2008 (taken at a level of 33 ft [10 m]) is presented in Figure 13.2.13.1-1 (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 directions ranging from south to southwest inclusive. Winds blew predominantly from the south-southwest every month except March, when they blew predominantly 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 1906 to 2010 period, the annual average temperature at Milford was 49.4°F (9.7°C) (WRCC 2010c). January was the coldest month, with an average minimum temperature of 13.6°F (–10.2°C), and July was the warmest with an average maximum of 92.1°F (33.4°C). In summer, daytime maximum temperatures were frequently above 90°F (32.2°F) and minimums were in the mid-40s or higher. On most days of colder months (November through March), the minimum temperatures recorded were below freezing (≤32°F [0°C]); subzero temperatures also occurred about five days in January and four days in December. During the same period, the highest temperature, 107°F (41.7°C), was recorded in July 1998, and the lowest, –35°F (–37.2°C), occurred in December 1990. Each year, about 54 days had a maximum temperature of ≥90°F (32.2°C), while about 178 days had minimum temperatures at or below freezing.

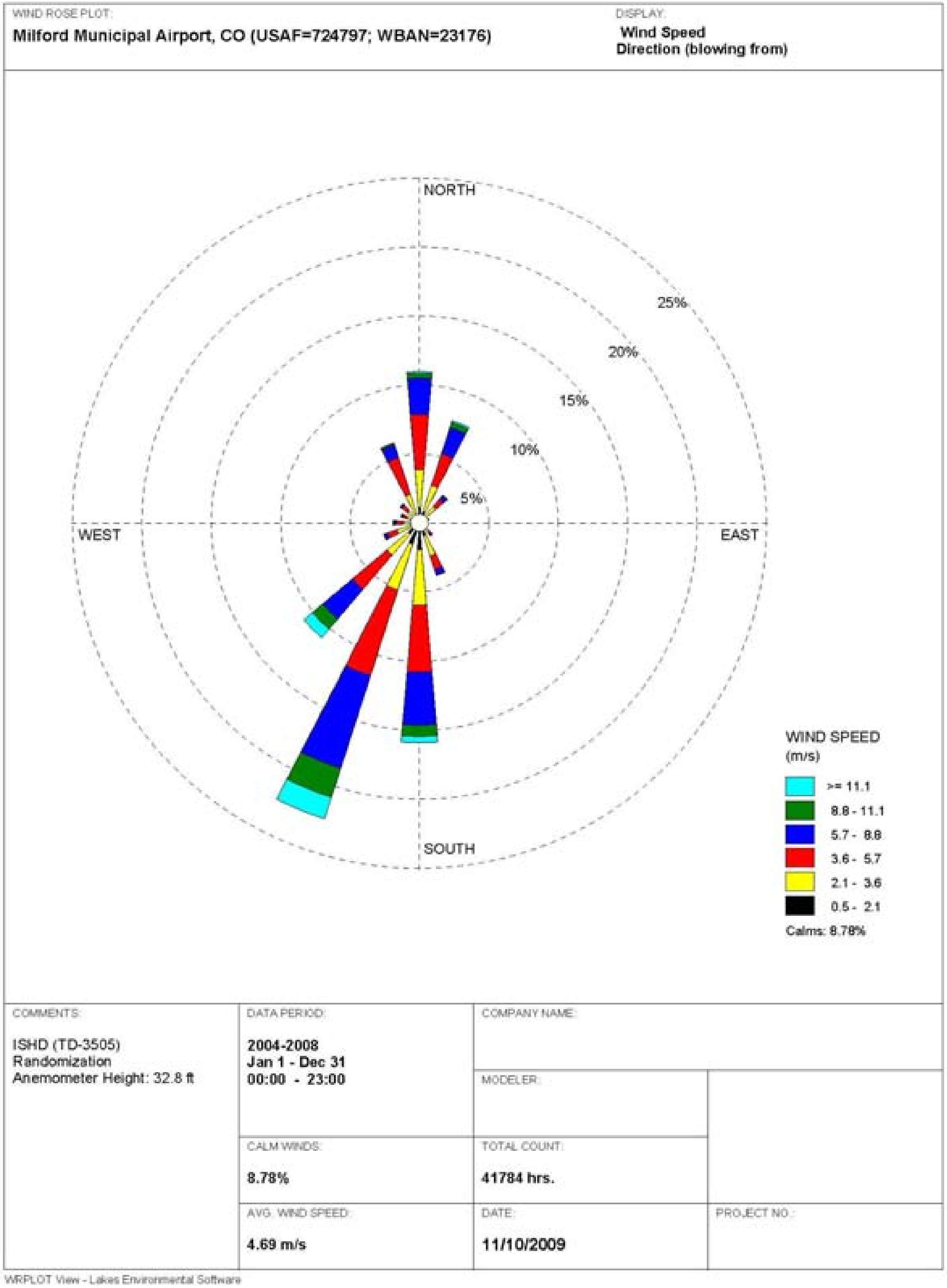


FIGURE 13.2.13.1-1 Wind Rose at 33-ft (10-m) Height at Milford Municipal Airport, Milford, Utah, 2004–2008 (Source: NCDC 2009b)

For the 1906 to 2010 period, annual precipitation at Milford averaged about 9.05 in. (23.0 cm) (WRCC 2010c). On average, 62 days each year have measurable precipitation (0.01 in. [0.025 cm] or higher). Precipitation is rather evenly distributed by season. 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, starts as early as September, and continues as late as May. Most of the snow falls from November through April. The annual average snowfall at Milford is about 34.1 in. (86.6 cm) (WRCC 2010c).

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 floods and high winds were reported in Beaver County (NCDC 2010).

In Beaver County, two hail storms in total have been reported since 1981, which caused no damage. 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 mostly during the summer months on occasion 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 silt 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 Milford Flats South SEZ, occur infrequently. In the period from 1950 to July 2010, a total of six tornadoes (0.1 per year) 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 occurred in the area near the proposed Milford Flats South SEZ (more than 11 mi [18 km] from the SEZ).

13.2.13.1.2 Existing Air Emissions

Beaver County 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.

Data from 2002 on annual emissions of criteria pollutants and VOCs in Beaver County are presented in Table 13.2.13.1-1 (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 of SO_2, PM_{10}, and $PM_{2.5}$[11]—about 58%, 83%, and 57%, respectively, of total county emissions. Onroad sources were major contributors of 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 of CO emissions (about 34%). Nonroad sources were secondary contributors of 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.)

TABLE 13.2.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Beaver County, Utah, Encompassing the Proposed Milford Flats South 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).

Information on GHG emissions was not available at the county level in Utah. In 2005, the state as a whole produced about 69 million metric tons (MMt) of *gross*[12] carbon dioxide equivalent (CO_2e) emissions[13] (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 of gross GHG emissions 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 production 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 three-fourths of the CO_2 emission total, and the residential, commercial, and industrial sectors accounted for the remainder.

[11] 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.

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

[13] 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.

13.2.13.1.3 Air Quality

The State of Utah has adopted NAAQS for six criteria pollutants: SO_2, NO_2, CO, O_3, particulate matter (PM; PM_{10} and $PM_{2.5}$), and Pb (EPA 2010; Prey 2009). The NAAQS for criteria pollutants are presented in Table 13.2.13.1-2.

Beaver County, which encompasses the proposed Milford Flats South SEZ, is located administratively within the Utah Intrastate AQCR, along with the remaining 15 counties in Utah, except Wasatch Front Intrastate AQCR (including Salt Lake City) and 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 (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, and thus ambient air quality is relatively good. The primary air quality concern for the lower elevations in Beaver County (e.g., around the proposed Milford Flats South 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 13.2.13.1-2 (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 Milford Flats South SEZ, two of which are situated within 62 mi (100 km). The nearest Class I area is Zion NP (40 CFR 81.430), about 47 mi (75 km) south of the SEZ; the other Class I area is Bryce Canyon NP, about 59 mi (95 km) southeast of the SEZ. These Class I areas are not located directly downwind of prevailing winds at the SEZ (Figure 13.2.13.1-1). The next nearest Class I areas are located beyond 62 mi (100 km): the Capital Reef NP and Grand Canyon NP in Arizona are located about 87 mi (140 km) east and 120 mi (193 km) south of the proposed Milford Flats South SEZ, respectively.

TABLE 13.2.13.1-2 NAAQS and Background Concentration Levels Representative of the Proposed Milford Flats South SEZ

			Background Concentration Level[c,d]	
Pollutant[a]	Averaging Time	NAAQS[b]	Concentration	Data Source
SO_2	1-hour	0.075 ppm[e]	NA[f]	NA
SO_2	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	0.12 ppm[h]	NA	NA
	8-hour	0.075 ppm	0.091 ppm (121%)	Zion NP, Washington County, 2005; highest of 4th highest daily maximum during 2004–2008
PM_{10}	24-hour	150 μg/m^3	83 μg/m^3 (55%)	Graymont Lime Kiln, about 17 mi (27 km) north–northeast of Black Rock in Millard County
	Annual	50 μg/m^3 [i]	21.8 μg/m^3 (44%)	
$PM_{2.5}$	24-hour	35 μg/m^3	18 μg/m^3 (51%)	St. George, Washington County, 2005
	Annual	15.0 μg/m^3	8 μg/m^3 (53%)	Estimate, 2006
Pb	Calendar quarter	1.5 μg/m^3	0.08 μg/m^3 (5.3%)	Magna, Salt Lake County, 2005
	Rolling 3-month	0.15 μg/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 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 13.2.13.1-2 (Cont.)

---

[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).

13.2.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using heat transfer fluids [HTFs], fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities would displace air emissions that would otherwise be released from fossil fuel–fired 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 Milford Flats South 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 13.2.13.3 identifies SEZ-specific design features of particular relevance to the proposed Milford Flats South SEZ.

13.2.13.2.1 Construction

The Milford Flats South SEZ has a relatively flat terrain; thus, only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required for solar development. 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 already 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.[14,15] However, no receptors were modeled for PSD analysis at the nearest Class I area, Zion NP, because it is about 47 mi (75 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the Zion NP were selected as surrogates for the PSD analysis. For the Milford Flats South SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions over the 3,000 acres (12.1 km^2), and in the eastern portion of the SEZ, close to the nearest residences and nearby communities,

- Surface hourly meteorological data 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 × 62 mi (100 km × 100 km) centered on the proposed SEZ, and additional discrete receptors at the SEZ boundaries.

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled concentrations plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 13.2.13.2-1. The maximum 24-hour PM_{10} concentration increment modeled at the site boundaries is 515 $\mu g/m^3$, which far exceeds the relevant standard level of 150 $\mu g/m^3$. The total 24-hour PM_{10} concentration (increment plus background) of 598 $\mu g/m^3$ would further exceed this standard level at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate area

14 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.

15 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 upon 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 13.2.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Milford Flats South 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	515	83	598	150	343	398
	Annual[d]	NA[e]	101	21.8	123	50	202	246
$PM_{2.5}$	24 hour	H8H	37.1	18	55.1	35	106	157
	Annual	NA[e]	10.1	8	18.1	15.0	67	121

[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 13.2.13.1-2 (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.

surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 82 $\mu g/m^3$ at the second nearest residence (about 2.8 mi [4.5 km] north of the SEZ), about 65 $\mu g/m^3$ at the nearest residence (about 1.1 mi [1.8 km] south of the SEZ), about 29 $\mu g/m^3$ at Milford, about 16 $\mu g/m^3$ at Minersville, and less than 4 $\mu g/m^3$ at more distant communities. Annual modeled PM_{10} concentration increment and total PM_{10} at the SEZ boundary are 101 $\mu g/m^3$ and 123 $\mu g/m^3$, respectively. These concentrations are higher than the standard level of 50 $\mu g/m^3$, which was revoked by the EPA in 2006. Annual PM_{10} increments would be much lower; about 4.7 $\mu g/m^3$ at the second nearest residence, about 1.5 $\mu g/m^3$ at the nearest residence, about 1.3 $\mu g/m^3$ at Milford, and less than 0.1 $\mu g/m^3$ at the aforementioned communities.

The total 24-hour $PM_{2.5}$ concentration at the SEZ boundary would be 55.1 $\mu g/m^3$, which is higher than the NAAQS of 35 $\mu g/m^3$. The background level near the SEZ is 18 $\mu g/m^3$. The total annual average $PM_{2.5}$ concentration would be 18.1 $\mu g/m^3$, which is above the standard level of 15.0 $\mu g/m^3$. At the second nearest residence, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments of about 4.2 and 0.45 $\mu g/m^3$, respectively, are higher than those of about 2.0 and 0.15 $\mu g/m^3$, respectively, at the nearest residence.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—Zion NP—would be about 6.6 and 0.23 $\mu g/m^3$, or 83 and 5.7% of the PSD increments for Class I area. These surrogate receptors are more than 15 mi (24 km) from Zion NP, and thus predicted concentrations in the NP would be lower than those values (about 55% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} and $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby residences 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 air quality-related values (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 in nature and thus would cause some unavoidable but short-term impacts.

Transmission lines within a designated ROW would be constructed to connect to the nearest regional grid. A regional 345-kV transmission lines is located about 19 mi (31 km) southeast of the proposed Milford Flats South SEZ; thus, construction of a transmission line over this relatively long distance would likely be needed. Construction activities would result in fugitive dust emissions from soil disturbance and engine exhaust emissions from heavy equipment and vehicles. Construction time for the transmission line could be about two years. However, the site of construction 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 in nature.

13.2.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology if wet cooling 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 the solar project development at the proposed Milford Flats South SEZ are presented in Table 13.2.13.2-2. Total power generation capacity ranging from 576 to 1,037 MW is estimated for the proposed Milford Flats South SEZ for various solar technologies (see Section 13.2.1.2.). 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 proposed Milford Flats South SEZ becomes 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 2.7% to 4.9% 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 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 3.3% of SO_2, 1.4% of NO_x, and 2.7% 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 to be built in the proposed Milford Flats South 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 such activities 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.

13.2.13.2.3 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).

TABLE 13.2.13.2-2 Annual Emissions from Combustion-Related Power Generation Displaced by Full Solar Development of the Proposed Milford Flats South 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
6,480	576–1,037	1,009–1,817	1,004–1,808	1,921–3,457	0.004-0.007	1,089–1,960
Percentage of total emissions from electric power systems in Utah[d]			2.7–4.9%	2.7–4.9%	2.7–4.9%	2.7–4.9%
Percentage of total emissions from all source categories in Utah[e]			1.8–3.3%	0.79–1.4%	NA[f]	1.5–2.7%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.40–0.72%	0.52–0.93%	0.13–0.24%	0.42–0.75%
Percentage of total emissions from all source categories in the six-state study area[e]			0.21–0.38%	0.07-0.13%	NA	0.13–0.23%

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.04 km^2) per MW (power tower, dish engine, and PV technologies) of land 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).

13.2.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

13.2.14 Visual Resources

13.2.14.1 Affected Environment

As shown in Figure 13.2.14.1-1, the proposed Milford Flats South SEZ is located in the northeastern section of the Escalante Desert, approximately 2 mi (3.2 km) north of the Black Mountains and 8 mi (12.8 km) southwest of the Mineral Mountains. In the vicinity of the Milford Flats South SEZ, the Escalante Desert is bounded by the Mineral Mountains to the northeast, the Black Mountains to the south and southeast, the Shauntie Hills to the northwest, and the Wah Wah Mountains to the west. Within the SEZ, elevation ranges from approximately 5,022 ft (1,531 m) in the western portion of the SEZ, sloping gently upward to 5,120 ft (1,561 m) in the eastern portion. No large water bodies or large urban areas are located near the SEZ.

The SEZ is within a flat treeless plain, with the strong horizon line being the dominant visual feature. Vegetation consists primarily of low shrubs (generally less than 3 ft [1 m] in height but in some parts of the site generally less than 1 ft [0.3 m] in height), with some areas of bare, generally tan soil and gravel. During a September 2009 site visit, the vegetation presented a range of mostly light greens, light browns, and gray bare wood, with minimal banding and other variation sufficient to add slight visual interest. Bands or patches of light tan bare soil or gray gravel are interspersed with the vegetation in some areas. 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 permanent water features are present on the site. This landscape type is common within the region. Panoramic views of the site are shown in Figures 13.2.14.1-2, 13.2.14.1-3, and 13.2.14.1-4.

No paved roads pass through or near the SEZ; however, a well-traveled, unpaved road passes through the northwestern corner of the site, and a number of other unpaved roads cross the site. No electric transmission lines occur within the SEZ. Other than normally dry livestock ponds, cattle trails, and wire fences, there is little evidence of cultural modifications that detract from the site's scenic quality. In general, the SEZ itself is natural appearing; however, there are numerous cultural disturbances on adjacent lands that significantly detract from the scenic quality of the SEZ (see below).

Off-site views include mountains to the north, east, west, and south, with more open views to the northeast and southwest. In general, the nearby mountains add to the scenic quality of the SEZ, particularly the Black Mountains, about 2 mi (3.2 km) south of the SEZ.

Numerous off-site cultural disturbances are visible from the SEZ; most prominent is a series of commercial confined hog-rearing facilities immediately north of much of the SEZ. These facilities include large confinement buildings, ponds, roads, and other structures, and are prominent in views from the northern and central portions of the SEZ. The confinement structures are large, low, white sheet-metal buildings that while mimicking the horizontal character of the surrounding landscape, contrast significantly with the surroundings in form, color, and texture. In some locations within the SEZ, many of these facilities are visible at once.

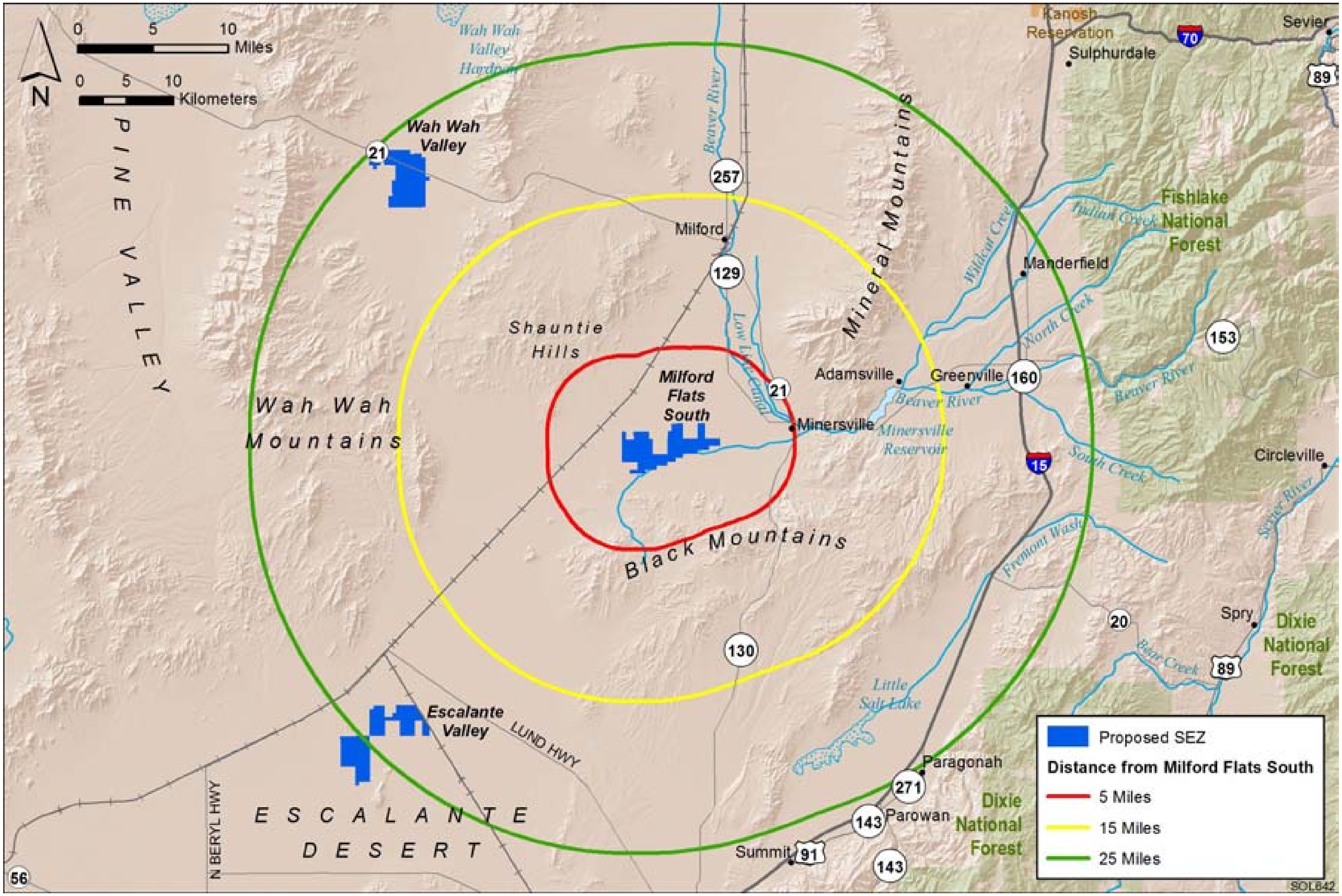


FIGURE 13.2.14.1-1 Proposed Milford Flats South SEZ and Surrounding Lands

FIGURE 13.2.14.1-2 Approximately 180° Panoramic View of the Proposed Milford Flats South SEZ, Looking East from Western Boundary of the Proposed SEZ

FIGURE 13.2.14.1-3 Approximately 90° Panoramic View of the Proposed Milford Flats South SEZ, Looking East–Southeast from Northwest Portion of the Proposed SEZ, with the Confinement Hog-Rearing Facilities Visible at Left Center

FIGURE 13.2.14.1-4 Approximately 120° Panoramic View of the Proposed Milford Flats South SEZ, Looking South from Northern Boundary of Eastern Section of the Proposed SEZ

Utility poles and other structures associated with the hog farms also add vertical line contrasts, and some facilities have adjacent trees that add color, form, and texture contrasts. The Union Pacific railroad is visible less than 2 mi (3.2 km) northwest of the SEZ. Irrigated cropland and associated structures (some with surrounding trees) are visible just southeast of the SEZ and contrast in color and texture with the surrounding landscape. Large and small transmission lines are visible from numerous locations within the SEZ, particularly the western and northern portions. Traffic is often visible on the road in the northwestern corner of the site and another road along the northern boundary of the site. In general, the off-site cultural modifications noted here detract significantly from the scenic quality of the SEZ, especially in its northern portions.

Current land uses within the SEZ include grazing, general outdoor recreation, backcountry and OHV driving, 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 few visitors, the number of viewers is relatively low.

The BLM conducted a VRI for the SEZ and surrounding lands in 2009-2010 (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. Class I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is 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, presence of cultural disturbances, and the relative commonness of the landscape type within the region. The SEZ also received relatively low scores for variety in vegetation types and color. 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 most of the SEZ and its immediate surroundings, due in part to relatively low levels of use and public interest; however, the far western portion of the SEZ received a sensitivity designation of “Moderate” because of its proximity to Thermo Hot Springs, an historic site associated with the Escalante Expedition of 1776.

Lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain 58,988 acres (238.72 km^2) of VRI Class II areas, primarily east and southeast of the SEZ; 15,284 acres (61.852 km^2) of Class III areas, primarily south and east of the SEZ; and 412,101 acres (1,667.7 km^2) of VRI Class IV areas, concentrated primarily in the Escalante Desert and nearby mountain ranges. The VRI map for the SEZ and surrounding lands is shown in Figure 13.2.14.1-5.

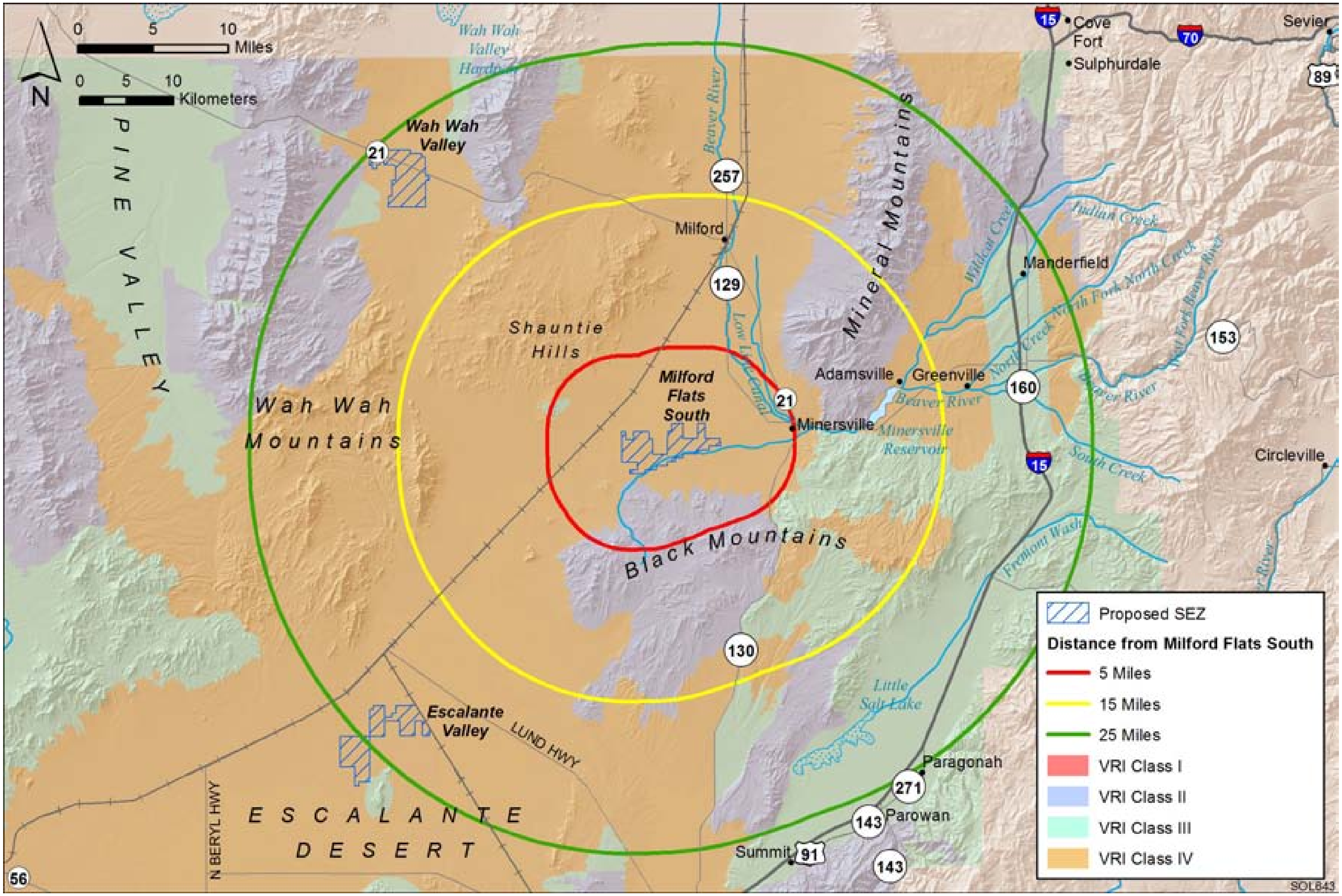


FIGURE 13.2.14.1-5 Visual Resource Inventory Values for the Proposed Milford Flats South SEZ and Surrounding Lands

The Pinyon Management Framework Plan (BLM 1983b) 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 13.2.14.1-6. More information about the BLM VRM program is available in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

13.2.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Milford Flats South 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, as are potential SEZ-specific design features.

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

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

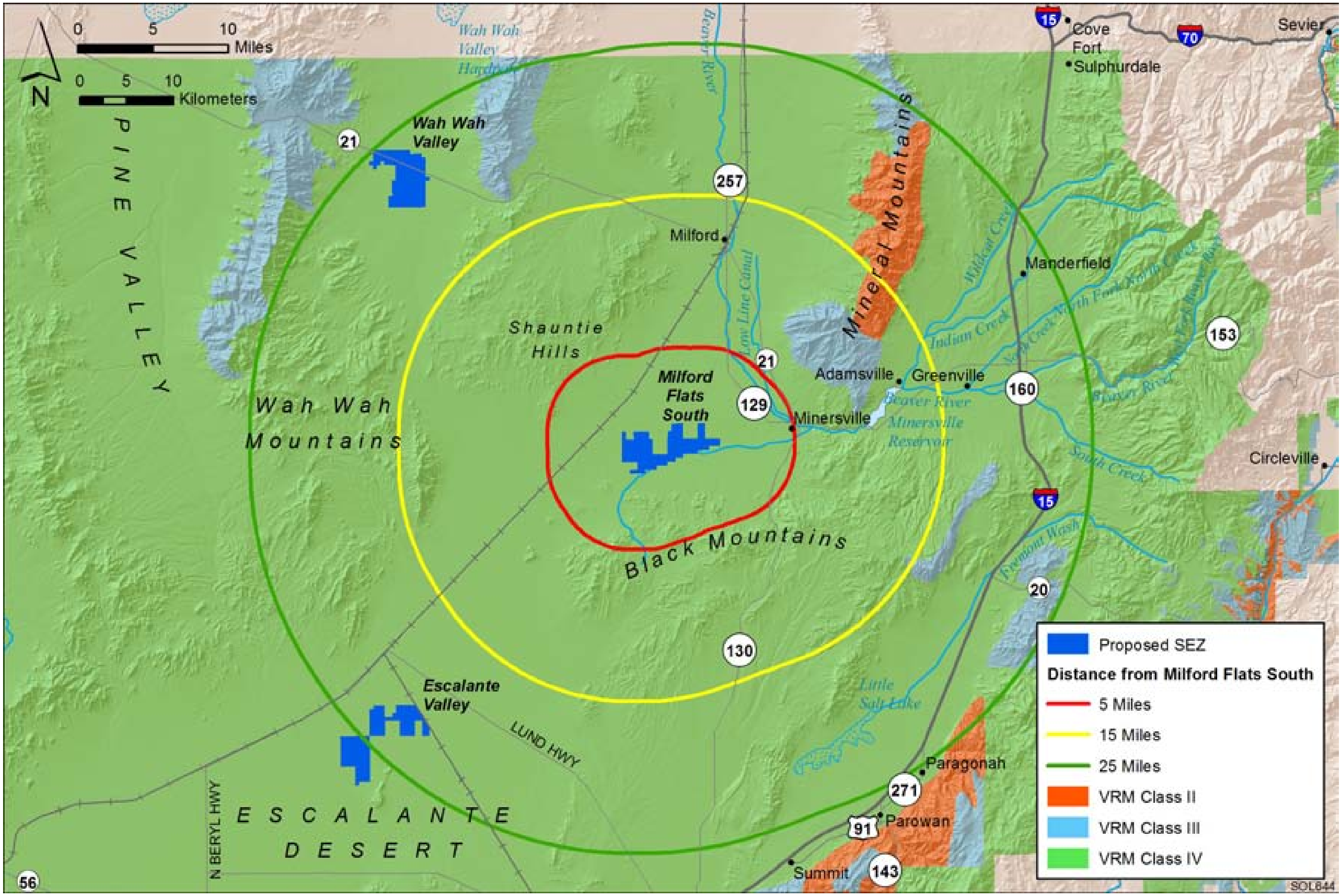


FIGURE 13.2.14.1-6 Visual Resource Management Classes for the Proposed Milford Flats South SEZ and Surrounding Lands

13.2.14.2.1 Impacts on the Proposed Milford Flats South SEZ

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

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 of the PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV. 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.

13.2.14.2.2 Impacts on Lands Surrounding the Proposed Milford Flats South 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 conducted—one each for four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are available in Appendix N.

Figure 13.2.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and the 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 for at least the upper portions of power tower receivers, could be visible from the additional areas shaded in medium brown.

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

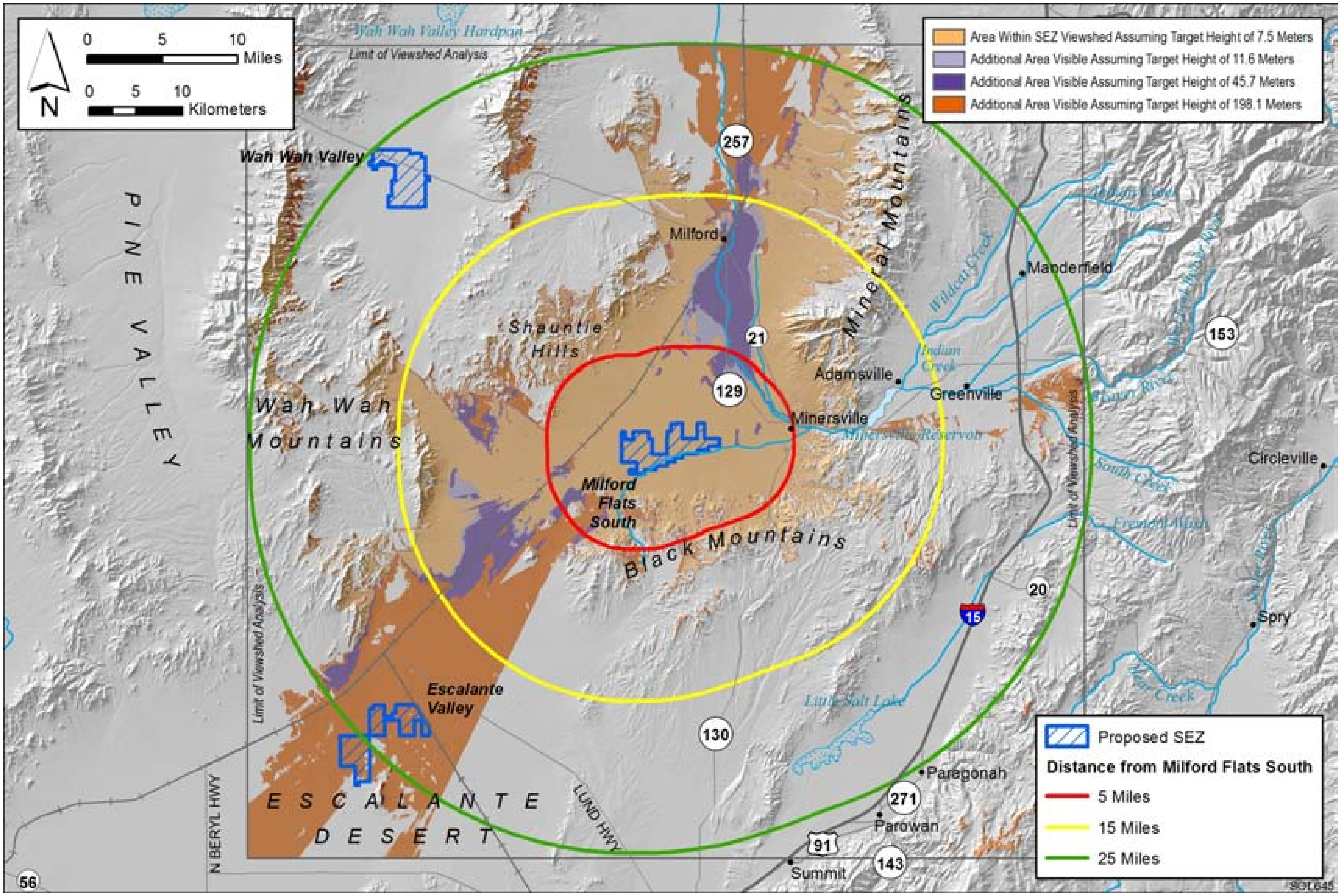


FIGURE 13.2.14.2-1 Viewshed Analyses for the Proposed Milford Flats South SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

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

A GIS analysis was conducted that overlaid selected federal, state, and BLM-designated sensitive visual resource areas onto the combined viewsheds for the four solar technologies, in order to illustrate which of these sensitive visual resource areas could have views of solar facilities within the SEZ and could therefore be subject to visual impacts from those facilities.

The scenic resources included in the analysis were as follows:

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

The analysis indicated that no selected sensitive visual resource areas are within the 25-mi (40-km) viewsheds of the Milford Flats South SEZ; however, additional scenic resources may exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other nonfederal sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected nonfederal lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. Currently, 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. 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

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the landscape as seen by viewers, including changes in the forms, lines, colors, and textures of objects 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 where 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 of the PEIS.

Communities of Milford and Minersville. The viewshed analyses indicate visibility of the SEZ from the communities of Milford (approximately 12 mi [19 km] north of the SEZ) and Minersville (approximately 5 mi [8 km] east). Milford is approximately 70 ft (21 m) lower in elevation than the closest boundary of the SEZ, while Minersville is approximately 215 ft (66 m) higher in elevation than the closest boundary of the SEZ.

Screening by small undulations in topography, vegetation, buildings or other structures would likely restrict or eliminate visibility of the SEZ and associated solar facilities within these communities, but a detailed future site-specific NEPA analysis is required to determine visibility precisely.

Because of the long distance from Milford to the SEZ, and because Milford is slightly lower in elevation than the SEZ, the angle of view to the SEZ from Milford is quite low, and where screening from nearby vegetation or structures was absent, the SEZ would occupy a very small portion of the field of view. Much of Milford is outside the 24.6-ft (7.5-m) viewshed of the SEZ, indicating that within these areas, solar trough and PV arrays would be unlikely to be visible. There are parts of the community outside the 38-ft (11.6-m) viewshed, indicating that solar dish engine arrays would not be visible. Higher solar and ancillary facilities such as transmission towers, could be visible from anywhere within Milford, but would be very low on the horizon and, except for power tower receivers, might not be noticeable against the backdrop landforms. Power tower receivers within parts of the SEZ might be visible as lights on the southern horizon. At night, if sufficiently tall, power tower receivers could have required hazard flashing red or white hazard navigation lighting that could be visible from Milford. Visual contrasts resulting from solar development within the SEZ would be expected to be minimal, as seen from Milford.

The SEZ would occupy a larger portion of the field of view from Minersville, at 5 mi (8 km) distance from the SEZ. However, the view from Minersville is aligned with the relatively narrow east-west axis of the SEZ, and, therefore, the SEZ would occupy a small portion of the field of view as seen from Minersville. Furthermore, the angle of view is sufficiently low that any solar collector/reflector arrays and other low-height facilities within the SEZ would be seen nearly on edge, which would reduce their visibility and visual contrast.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) could 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.

Operating power tower receivers within the SEZ would likely be visible as bright lights on the western horizon and could be conspicuous if located in the closest portions of the SEZ. At night, if sufficiently tall, power tower receivers could have required hazard flashing red or white hazard navigation lighting that would likely be visible from Minersville, though there would be other lights visible in the vicinity of the SEZ.

It should be noted that as discussed in Section 13.2.14.1, numerous confinement hog farms are located between Minersville and most of the SEZ. These farms include large, white (and therefore highly noticeable) hog sheds that represent significant cultural modifications that detract markedly from scenic quality as viewed from Minersville. Associated facilities, such as transmission lines and roads, detract further from the view from Minersville in the direction of the SEZ. Visual contrasts resulting from solar development within the SEZ would be expected to be weak, as seen from Minersville, and the associated visual impact would be lowered by the numerous visual intrusions already visible in the area.

Area Roads. In addition to the potential visual impacts on the local communities, residents, workers, and visitors to the area also would likely experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including State Routes 21, 129, 130, and 257. Except for State Routes 21 and 129, visual contrasts resulting from solar development within the SEZ would be expected to be minimal to weak as viewed from these roads. State Route 21 approaches to within 5 mi (8 km) of the SEZ, and State Route 129 approaches to within 3.2 mi (5.1 km) of the SEZ. Near the points of closest approach, travelers on these two roads might be subjected to moderate visual contrasts, depending on viewer location on the roads; solar facility type, size, and location within the SEZ; and other visibility factors.

13.2.14.2.3 Summary of Visual Resource Impacts for the Proposed Milford Flats South SEZ

Under the 80% development scenario analyzed in this PEIS, there could be multiple solar facilities within the Milford Flats South SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape would be essentially industrial in appearance and would contrast strongly with the surrounding mostly natural-appearing landscape. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development due to major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within the SEZ.

The SEZ is in an area of low scenic quality, with numerous cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ.

Utility-scale solar energy development within the proposed Milford Flats South SEZ is unlikely to cause even moderate visual impacts on highly sensitive visual resource areas, the closest of which is more than 25 mi (40 km) from the SEZ. The closest community (Minersville) is approximately 5 mi (8 km) from the SEZ, and weak visual contrasts from solar development within the SEZ are expected where the SEZ is visible within the community.

13.2.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified to protect visual resources for the proposed Milford Flats South 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 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.

13.2.15 Acoustic Environment

13.2.15.1 Affected Environment

The proposed Milford Flats South SEZ is located in southwestern Utah, in the south central portion of Beaver County. The State of Utah and Beaver County have no applicable quantitative noise-level regulations; however, neighboring Iron County has quantitative noise limits applicable to solar power plants that have been used for comparative purposes in this analysis. Under the Iron County regulations, 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).

The nearest major roads are State Route 21/130, about 5 mi (8 km) east in Minersville, and a smaller spur of State Route 129 about 3 mi (5 km) northeast of the SEZ. Beryl Milford Road runs as close as about 3 mi (5 km) to the northwest. The Union Pacific Railroad is about 1.3 mi (2.1 km) west. The nearest airport is Milford Municipal Airport, about 14 mi (22 km) north-northeast of the SEZ. Large-scale irrigated agricultural lands are situated to the east, starting from 0.25 mi (0.4 km) from the SEZ and extending to Minersville, and to the north, starting about 2 mi (3 km) from the SEZ and continuing up to Milford. Commercial hog production facilities exist on private lands adjacent to the northern boundary of the SEZ and farther to the west. No sensitive receptors (e.g., residences, hospitals, schools, or nursing homes) exist on or in the immediate vicinity of the SEZ. The nearest residence from the boundary of the SEZ is located more than 1.1 mi (1.8 km) to the southeast. The nearby population centers with schools are Minersville, about 5 mi (8 km) east, and Milford, about 12 mi (19 km) north-northeast. Accordingly, noise sources around the SEZ include road traffic, railroad traffic, aircraft flyover, agricultural activities, commercial hog production facilities, and occasional community activities and events. Other noise sources are associated with current land use around the SEZ, including grazing, outdoor recreation, backcountry and OHV use, and hunting. The proposed Milford Flats South SEZ is in a remote and undeveloped area with an overall rural character. To date, no environmental noise survey has been conducted around the proposed Milford Flats South SEZ. On the basis of the population density, the day-night 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 is in the range of 33 to 47 dBA L_{dn}[16] (Eldred 1982; Miller 2002).

13.2.15.2 Impacts

Potential noise impacts associated with solar projects in the Milford Flats South SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment and vehicular traffic would be anticipated at the nearest residence (within 1.1 mi [1.8 km]), albeit of short duration. Potential impacts also

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

would be anticipated at the nearest residence during the operations phase, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed Milford Flats South SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional SEZ-specific design features applied (see Section 13.2.15.3). This section primarily addresses 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.

13.2.15.2.1 Construction

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

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area where key components (e.g., steam turbine/generator) needed to generate electricity would be located. A maximum of 95 dBA at a distance of 50 ft (15 m) is assumed if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 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 the Iron County regulation level would occur at distances somewhat shorter than 0.5 mi (0.8 km). For a 10-hour daytime work schedule, 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 eastern SEZ boundary (the boundary closest to the nearest residence), estimated noise levels at the nearest residence would be about 41 dBA, which is below the Iron County regulation of 50 dBA for a solar facility and comparable to a typical daytime mean rural background level of 40 dBA. In addition, an estimated 42 dBA L_{dn}[17] at this residence is well below the EPA guideline of 55 dBA L_{dn} for residential areas.

---

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

There are no specially designated areas within a 5-mi (8-km) range from the Milford Flats South SEZ, which is the farthest distance that noise, except extremely loud noise, can be discernable. Thus, no noise impact analysis for nearby specially designated areas was made.

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 vibratory or sonic drivers, rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearest residence would be anticipated to be minor, considering the distance to the nearest residence (about 1.1 mi [1.8 km] from the eastern SEZ boundary).

It is assumed that most construction activities would occur during the day when noise is better tolerated than at night, because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction would cause some unavoidable but localized short-term noise impacts on neighboring communities, particularly for activities occurring near the eastern SEZ boundary, close to the nearest residence.

Construction activities could result in various degrees of ground vibration, depending on the equipment and construction methods used. 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). No major construction equipment that can cause ground vibration would be used during the construction phase, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including from pile driving for dish engines.

Transmission lines would be constructed within a designated ROW to connect to the nearest regional power grid. A regional 345-kV transmission line is located about 19 mi (31 km) southeast of the proposed Milford Flats South SEZ; thus, construction of a transmission line over this relatively long distance would be needed to connect to the regional grid. For construction of transmission lines, noise sources and their noise levels might be similar to construction noise sources at an industrial facility of a comparable size. Transmission line construction for the proposed Milford Flats South SEZ could be performed over about two years. However, the area under construction along the transmission line ROW would move continuously, and 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.

13.2.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking; maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area; commuter/visitor/support/delivery traffic within and around the solar facility; and activities at control/administrative buildings, warehouses, and other auxiliary buildings and 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 would be more than 85 dBA immediately around the power block, but would decrease to 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 eastern corner of the SEZ, the predicted noise level would be about 40 dBA at the nearest residence, which is lower than the Iron County regulation of 50 dBA and the same as typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation was limited to daytime, 12 hours only[18]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residence, about 42 dBA L_{dn} would be estimated, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. However, day-night average sound levels higher than those estimated above by using the simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night, typical of the proposed Milford Flats South 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[19] within 1 or 2 mi (2 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are the lowest. To estimate the L_{dn}, 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to 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 residence (about 1.1 mi [1.8 km] from the eastern SEZ boundary) would be 50 dBA, which is the same as the Iron County regulation level of 50 dBA but is much higher than typical nighttime mean rural background

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

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

level of 30 dBA. The day-night average noise level is estimated to be about 52 dBA L_{dn}, which is lower than the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit is given to other attenuation mechanisms, so it is likely that sound levels would be lower than 52 dBA L_{dn} at the nearest residence, even if TES were used at a solar facility. In consequence, operating parabolic trough or power tower facilities using TES and located near the eastern SEZ boundary could result in adverse noise impacts at the nearest residence, 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 proposed Milford Flats South SEZ, on the basis of the assumption of dish engine facilities of up to 576-MW total capacity (covering 80% of the total area, or 5,184 acres [21.0 km^2]), up to 23,040 25-kW dish engines could be employed. Also, 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 those 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 these noise levels are lower than the Iron County regulation of 50 dBA for a solar facility but higher than 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 somewhat shorter distance than the aforementioned 0.8-mi (1.3-km) distance, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours.

To estimate noise levels at the nearest residence, it was assumed that dish engines were placed over 80% of the Milford Flats South SEZ at intervals of 98 ft (30 m). Under this assumption, the estimated noise level at the nearest residence about a 1.1-mi (1.8-km) from the SEZ boundary would be about 44 dBA, which is lower than the Iron County regulation of 50 dBA for a solar facility but is higher than typical daytime mean rural background level of 40 dBA. For a 12-hour daytime operation, the estimated 44 dBA L_{dn} at this residence is well below the EPA guideline of 55 dBA L_{dn} for residential areas. However, depending on background noise levels and meteorological conditions, noise from dish engines could have adverse impacts on the nearest residence. Thus, consideration of minimizing noise impacts is very important during 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 located close enough to the Milford Flats South SEZ to experience physical damage from vibration. 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 to within the facility boundary and not be heard at the nearest residence, assuming a 1.6-mi (2.6-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 1.1 mi [1.8 km] to the nearest residence). Accordingly, potential impacts of these noise sources on the nearest residence would be minimal.

For impacts from transmission line corona discharge noise (Section 5.13.1.5) during rainfall, the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line tower would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. The noise levels at 65 ft (20 m) and 300 ft (91 m) from the center of 500-kV transmission line towers would be about 49 and 42 dBA, typical of high-end and mean, respectively, daytime background noise levels in rural environments. Corona noise includes high-frequency components, which may be judged to be more annoying than other environmental noises. However, corona noise would not likely cause impacts, unless a residence was located close to the source (e.g., within 500 ft [152 m] of a 230-kV transmission line and 0.5 mi [0.8 km] of a 500-kV transmission line). The proposed Milford Flats South SEZ is located in an arid desert environment, and incidents of corona discharge would be infrequent. Therefore, potential impacts on nearby residents along the transmission line ROW would be negligible.

13.2.15.2.3 Decommissioning/Reclamation

Activities for decommissioning/reclamation would be similar to those for construction (but more limited) and would require many of the same procedures and equipment used in construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities, such as structures and mechanical or electrical installations; disposal of debris; grading; and revegetation as needed. Potential noise impacts at surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential noise impacts would be minor and temporary in nature. The same mitigation measures used 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, would be minimal.

13.2.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. 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 levels at the nearest residence to the southeast of the SEZ are kept within applicable guidelines. This could be accomplished in several ways; for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

- Dish engine facilities within the Milford Flats South SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residence around the SEZ (i.e., the facilities should be located in the central or western area 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.

This page intentionally left blank.

13.2.16 Paleontological Resources

13.2.16.1 Affected Environment

The Milford Flats South 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 (see 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).

13.2.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in the proposed Milford Flats South SEZ. Vertebrate paleontological resources have been found in ancient lacustrine deposits associated with 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 on any significant paleontological resources found to be present within the Milford Flats South 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.

The nearest state or U.S. route is 5 mi (8 km) from the SEZ (State Route 21/130); thus, a new road is anticipated to be needed to access the proposed Milford Flats South SEZ, which would result in approximately 36 acres (0.15 km^2) of disturbance to PFYC Class 2 deposits. Approximately 19 mi (31 km) of transmission line is anticipated to be needed to connect to the nearest existing line, which would result in approximately 576 acres (2.3 km^2) of disturbance in areas 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; 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.

13.2.16.3 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 Class 2 or Class 1, SEZ-specific design features for mitigating impacts on paleontological resources within the proposed Milford Flats South SEZ and associated ROWs are not likely to be necessary.

13.2.17 Cultural Resources

13.2.17.1 Affected Environment

13.2.17.1.1 Prehistory

The proposed Milford Flats South SEZ is located in the Escalante Desert of southwest Utah and follows the same prehistoric sequence as presented for the Escalante Valley SEZ in Section 13.1.17.1.1. Of particular note for the Milford Flats South SEZ, several Fremont sites have been recorded just south of the SEZ at higher elevations (Dalley 2009).

13.2.17.1.2 Ethnohistory

Before the arrival of Euro-Americans, the Escalante Valley fell primarily within the traditional use area of the Numic-speaking Southern Paiute, although their linguistically related neighbors, the Utes and Western Shoshone, probably traversed the area as well. The proposed Milford Flats South SEZ falls within *Yanawant*, the traditional eastern subdivision of the Southern Paiute (Stoffle et al. 1997). Situated in the Escalante Desert, it is located in a little-used no-man's-land, nominally in 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 the Utes, who from their core territory around Sevier Lake ranged almost to the present Nevada border (Callaway et al. 1986; Duncan 2010). The Western Shoshone and Goshute core territories were to the northwest (Crum 1994; Defa 2010). The Escalante Valley is within the area that the Indian Claims Commission ruled was the traditional territory of the Southern Paiutes (Royster 2008). The ethnohistory of these Tribes is discussed in Section 13.1.17.1.2.

13.2.17.1.3 History

The historic framework for the proposed Milford Flats South SEZ follows closely with that of all of the Utah SEZs and is summarized in Section 13.1.17.1.3 for the Escalante Valley SEZ. Items of particular relevance to the Milford Flats South SEZ are added below, including a summary of Beaver County history as relevant for both the Milford Flats South and Wah Wah Valley proposed 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 2009). 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, it 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 2009). Another town, Newhouse, was established in 1905 just west of Frisco to support the Cactus Mine, which produced gold, silver, copper, and other minerals. However, within five years of being settled, the Cactus Mine gave out and Newhouse was abandoned. Many of the Newhouse buildings were relocated to Milford (Carr 1972).

Railroad lines are discussed in Section 13.1.17.1.3; the UP Railroad line passes just west of the proposed Milford Flats South SEZ.

13.2.17.1.4 Traditional Cultural Properties

The Southern Paiute see themselves as persisting in a cultural landscape composed of many culturally significant places bound together into the land called *Puaxant Tuvip* (sacred land or power land), created by a supernatural being who established a birthright relationship between them and the land upon which they were created. Significant sites, such as the mountain *Nuvagntu* (Mount Charleston in southwestern Nevada), have meaning for all Southern Paiutes (Stoffle et al. 1997). Traditional cultural properties of significance to the Southern Paiute could be present in the valleys. Government-to-government consultation is ongoing with these Native American Tribes so their concerns, including any potential impacts on traditional cultural properties, can be adequately addressed (see Section 13.2.18 on Native American Concerns and Chapter 14 and Appendix K for a summary of government-to-government consultation for this PEIS). Identification of traditional cultural properties may be considered sensitive, and therefore, may not be fully described or disclosed in this PEIS.

As of yet, no traditional cultural properties have been identified within the proposed Milford Flats South SEZ, nor have concerns been raised to date for 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 Section 13.2.18).

13.2.17.1.5 Cultural Surveys and Known Archaeological and Historic Resources

Nine archaeological surveys have been conducted either entirely within the proposed Milford Flats South SEZ or passed through the SEZ (Dalley 2009; Utah SHPO 2009). Most of these surveys have been linear and consequently have not covered a large number of acres. No sites have been recorded as a result of these surveys. One linear survey that was conducted just north of the SEZ boundary for a county road recorded two sites, neither of which was considered eligible for listing in the NRHP. One of the sites is a historic trash scatter of numerous cans, jars, and ceramics, and the other is a lithic scatter of obsidian and chert flakes that does not include any tools. One large block survey (4,550 acres [18 km^2]) was conducted just south of the SEZ for a wildland fire rehabilitation project. In the valley areas closest to the SEZ (within 2 mi [3 km]), only one site was recorded. The site is a lithic scatter (mostly flakes with no tools) with a historic component; the site is not eligible for the NRHP. No historic structures were observed within the proposed SEZ. Nearly 100 sites have been recorded within 5 mi (8 km) of the SEZ. Approximately three-quarters of those are located south of the SEZ, near higher elevations and along linear features, such as the UP Railroad line and State Route 130.

The SEZ has the potential to contain significant cultural resources, although the potential is relatively low. Several historic period artifacts were found in the SEZ during a preliminary site visit, including a number of broken glass insulators; additional artifacts are likely to be encountered in the area. The route of the circa-1935 Bell System Telephone Line between Salt Lake City and Las Vegas probably cuts across the SEZ and would explain the presence of broken insulators. The line is a NRHP-eligible telephone line that was documented in 2003 as mitigation for a gas pipeline expansion project.

National Register of Historic Places

Within Beaver and Iron Counties, 134 properties (including a couple of districts) are listed in the NRHP (115 in Beaver County and 19 in Iron County). The SEZ is located in Beaver County, less than 2 mi (3 km) from the Iron County line. Most of these properties are houses (73%) or are related to town (courthouses, meeting halls, schools, stores, and hotels) and industrial (railroad depots, flour mills, mining sites, and power plants) development. Other property types include cabins, homesteads/ranches, forts, and archaeological sites. None of these properties are located within or adjacent to the SEZs. The Rollins-Eyre House in Minersville is the nearest NRHP-listed property located approximately 5 mi (8 km) east of the SEZ. The Jenner-Griffiths House and the Minersville City Hall are also located in Minersville, a short distance farther east. No other NRHP-listed properties are located within 15 mi (24 km) of the proposed SEZ. Three of the sites listed in the NRHP are located on BLM-administered lands: Parowan Gap, Wild Horse Obsidian Quarry, and Gold Spring Historic Site. Parowan Gap is a Fremont rock art site in Iron County that is important to the Paiute Indians and is located approximately 15 to 20 mi (24 to 32 km) south of the proposed Milford Flats South SEZ. The Wild Horse Obsidian Quarry is about 20 mi (32 km) northwest of the SEZ in the Mineral Mountains. The Gold Spring Historic Site is a mining town located southwest of the SEZ in Iron County near the Nevada border.

13.2.17.2 Impacts

No adverse impacts are currently anticipated at the proposed Milford Flats South SEZ, but such 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, 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 Milford Flats South SEZ. Impacts would be minimized through the implementation of applicable general mitigation measures listed in Section 5.15, as well as 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).

The nearest state or U.S. route is 5 mi (8 km) from the SEZ (State Route 130/21); thus, a new road is anticipated to be needed to access the proposed Milford Flats South SEZ, the creation of which would result in approximately 36 acres (0.15 km^2) of disturbance. Approximately 19 mi (31 km) of transmission line is anticipated to be needed to connect to the nearest existing line, which would result in approximately 576 acres (2.3 km^2) of disturbance. Impacts on cultural resources are possible in areas related to these associated ROWs, as new areas of potential cultural significance could be directly impacted by construction or opened to increased access due to road and 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 were to occur. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur with the ROWs, as with the SEZ footprint.

13.2.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features, 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.

13.2.18 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 Milford Flats South SEZ, Section 13.2.17 discusses archaeological sites, structures, landscapes, and traditional cultural properties; Section 13.2.8 discusses mineral resources; Section 13.2.9.1.3 discusses water rights and water use; Section 13.2.10 discusses plant species; Section 13.2.11 discusses wildlife species, including wildlife migration patterns; Section 13.2.13 discusses air quality; Section 13.2.14 discusses visual resources; Sections 13.2.19 and 13.2.20 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.

13.2.18.1 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 Milford Flats South SEZ is within the area so recognized by the courts (Royster 2008), but is close to the traditional ranges of the Western Shoshone and the Utes, with whom the Southern Paiute interacted. It is likely that members of all three Tribes were present from time to time in this 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. They are listed in Table 13.2.18.1-1. A listing of all federally recognized Tribes contacted for this PEIS is found in Appendix K.

13.2.18.1.1 Territorial Boundaries

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

13.2.18.1.2 Plant Resources

The vegetation present at the proposed Milford Flats South SEZ is described in Section 13.2.10. The cover types present at the SEZ are from the Inter-Mountain Basins series. They are mostly Mixed Salt Desert Scrub and Big Sagebrush Shrubland. There are smaller areas of Greasewood Flat and Semi-Desert Shrub-Steppe. Greasewood and sagebrush are the dominant species. Native Americans made use of these plants for medicinal purposes, and greasewood seeds were harvested for food. As shown in Table 13.2.18.1-2, 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 13.2.18.1-1 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 13.2.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Milford Flats South SEZ

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

Sources: Field visit and USGS (2005b).

13.2.18.1.3 Other Resources

Wildlife likely to be found in the proposed Milford Flats South SEZ is described in Section 13.2.11. This SEZ is generally arid, but is located only 4 mi (6 km) from the Beaver River. In the arid flats, there are few game species traditionally important to Native Americans. The most important are the black-tailed jackrabbit (*Lepus californicus*) and the pronghorn antelope (*Antilocapra Americana*) (Stoffle and Dobyns 1983; Kelly and Fowler 1986). Pronghorn tracks were observed at the SEZ during a field visit. Of the large game species, mule deer (*Odocoileus hemionus*) occur in the surrounding mountains but are less common on the desert floor. Smaller game that are important to Native Americans and found in the SEZ include cottontails (*Sylvilagus audubonii*), chipmunks (*Neotamias minimus*), and woodrats (*Neotoma lepida*). Migrating waterfowl traditionally have been an important seasonal resource. They are uncommon in the SEZ and are more likely to be present near the Beaver River and the Minersville Canal when it contains water.

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 chrysaetoi*). The SEZ falls within the range of the wide-ranging eagle. A representative list of animal species important to Native Americans whose range includes the proposed Milford Flats South SEZ is presented in Table 13.2.18.1-3.

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). There is some potential for clay deposits in the eastern end of the SEZ.

13.2.18.2 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 homeland. 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 world view (Stoffle and Dobyns 1983). While no comments specific to the proposed Milford Flats South 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, the Southern Paiute have expressed concern over adverse effects on a wide range of resources. Geophysical features and physical cultural remains are listed in Section 13.2.17.1.4. 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 Milford Flats South SEZ are discussed in

TABLE 13.2.18.1-3 Animal Species Used by Native Americans as Food Whose Range Includes the Proposed Milford Flats South SEZ

Common Name	Scientific Name	Status
Mammals		
Black-tailed jack rabbit	*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
Red fox	*Vulpes vulpes*	All year
Ringtail	*Procyon lotor*	All year
Rock squirrel	*Spermophilus variegates*	All year
White-tailed jackrabbit	*Lepus townsendii*	All year
Woodrats	*Neotoma* spp.	All year
Birds		
Burrowing owl	*Athene cunicularia*	Summer
Common Raven	*Corvus corax*	All year
Ferruginous hawk	*Buteo regalis*	All year
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
Prairie falcon	*Falco mexicanus*	All year
Red-tailed hawk	*Buteo jamaicensis*	All year
Rough-legged hawk	*Buteo lagopus*	Winter
Sage grouse	*Centrocercus urophasians*	All year
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).

Section 3.2.18.1. Traditional plant knowledge is found most abundantly in Tribal elders, especially female elders (Stoffle et al. 1999).

The Escalante Desert appears to have been a no-man's-land that was not intensively used by the surrounding Native American groups. While it includes some plant species traditionally important to Native Americans, they appear to be relatively scant. The most important traditional resources are likely to have been black-tailed jackrabbit and pronghorn antelope. Development of utility-scale solar facilities within the SEZ would result in the loss of some plant species and the habitat of some animal species traditionally important to Native Americans. However, as discussed in Sections 13.2.10 and 13.2.11, overall impacts on plant and animal species are expected to be small because of the abundance of the same species outside the SEZ. The degree to which specific areas of plant and animal resources are important to Native Americans must be established through project-specific consultation.

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.

13.2.18.3 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 13.2.18.1-1.

Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 13.2.17.3, in addition to design features for historic properties discussed in Appendix A, Section A.2.2.

This page intentionally left blank.

13.2.19 Socioeconomics

13.2.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Milford Flats South SEZ. The ROI is a two-county area consisting of Beaver and Iron 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 nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility is expected to take place.

13.2.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 23,325 (Table 13.2.19.1-1). Over the period 1999 to 2008, annual average employment growth rates were higher in Iron County (3.4%) than in Beaver County (2.5%). At 3.3%, the employment growth rate in the ROI as a whole was higher than the average state rate for Utah (2.1%).

In 2006, the service sector provided the highest percentage (36.3%) of employment in the ROI, followed by the wholesale and retail trade at 19.5% (Table 13.2.19.1-2). Smaller employment shares were held by transportation and public utilities. Within the ROI, the distribution of employment across sectors varied compared with the ROI as a whole, with a higher percentage of employment in agriculture in Beaver County (41.7%), 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%) were slightly higher than in the ROI as a whole.

TABLE 13.2.19.1-1 ROI Employment for the Proposed Milford Flats South SEZ

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
ROI	16,940	23,325	3.3
Utah	1,080,441	1,336,556	2.1

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

TABLE 13.2.19.1-2 Employment, by Sector, in 2006,[a] in the ROI Surrounding the Proposed Milford Flats South SEZ

Industry	Iron County Employment	Iron County % of Total	Beaver County Employment	Beaver County % of Total	ROI Employment	ROI % of Total
Agriculture[a]	934	7.0	927	41.7	1,861	12.0
Mining	10	0.1	–[b]	NA[c]	70	0.5
Construction	1,829	13.8	60	2.7	1,889	12.2
Manufacturing	1,732	13.1	10	0.4	1,742	11.3
Transportation and public utilities	363	2.7	216	9.7	579	3.7
Wholesale and retail trade	2,650	20.0	368	16.5	3,018	19.5
Finance, insurance, and real estate	646	4.9	70	3.1	716	4.6
Services	5,068	38.2	551	24.8	5,619	36.3
Other	10	0.1	0	0.0	10	0.1
Total	13,250		2,225		15,475	

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

[b] A dash indicates county not included in the ROI.

[c] NA = data not available.

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

13.2.19.1.2 ROI Unemployment

Unemployment rates have varied slightly across the two counties in the ROI. Over the period 1999 to 2008, the average rate in Iron County over this period was 4.1%, with a slightly lower rate in Beaver County (3.9%) (Table 13.2.19.1-3). 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% in Beaver County. The average rates for the ROI (6.2%) and Utah (5.2%) were also higher during this period than the corresponding average rates for 2008.

13.2.19.1.3 ROI Urban Population

The population of the ROI from 2006 to 2008 was 83% urban, with a group of cities and towns centered around Cedar City in the southwestern portion of Iron 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 13.2.19.1-4). 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

TABLE 13.2.19.1-3 ROI Unemployment Rates for the Proposed Milford Flats South SEZ

Location	1999–2008 (average)	2008	2009[a]
Beaver County	3.9	3.4	5.5
Iron County	4.1	4.2	6.4
ROI	4.0	4.1	6.2
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).

TABLE 13.2.19.1-4 ROI Urban Population and Income for the Proposed Milford Flats South SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
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
Parowan	2,565	2,606	0.2	41,749	NA	NA
Beaver City	2,454	2,604	0.7	43,320	NA	NA
Milford	1,451	1,405	-0.4	46,105	NA	NA
Minersville	817	822	0.1	47,075	NA	NA
Paragonah	470	477	0.2	43,721	NA	NA
Kannaraville	311	314	0.1	44,258	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).

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

In addition to Beaver City, which had a 2008 population of 2,604, there are two urban areas in Beaver County—Milford (1,405) and Minersville (822). Population growth between 2000 and 2008 was 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.

13.2.19.1.4 ROI Urban Income

Median household incomes varied considerably across cities and towns in the ROI. One city in Iron County, Brian Head ($56,732), had median incomes in 1999 that were only slightly lower than the average for the state ($58,873), while median incomes elsewhere in the ROI were below the state average (Table 13.2.19.1-4). The cities of Parowan ($41,749) and Cedar City ($41,719) 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 incomes growth rate for the period 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%.

13.2.19.1.5 ROI Population

Table 13.2.19.1-5 presents recent and projected populations in the ROI surrounding the proposed SEZ and for the state as a whole for the period 2000 to 2008. Population in the ROI

TABLE 13.2.19.1-5 ROI Population for the Proposed Milford Flats South 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
ROI	39,784	50,376	3.0	78,566	81,385
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).

stood at 50,376 in 2008, having grown at an average annual rate of 3.0% since 2000. The growth rate for the ROI was higher than the rate for Utah (2.5%) over the same period.

Each county in the ROI has experienced growth in population since 2000. Iron County recorded a population growth rate of 3.4% between 2000 and 2008, while Beaver County grew by 0.4% over the same period. The ROI population is expected to increase to 78,566 by 2021 and to 81,385 by 2023 (Governor's Office of Planning and Budget 2009).

13.2.19.1.6 ROI Income

Personal income in the ROI stood at $1.1 billion in 2007 and has grown at an annual average rate of 3.2% over the period 1998 to 2007 (Table 13.2.10.1-6). ROI personal income per capita also rose over the same period at a rate of 0.4%, increasing from $21,725 to $22,688. Per-capita incomes were slightly higher in Beaver County ($28,154) in 2007 than in Iron County ($21,922). Personal income growth rates were higher in Iron County (3.5%) and lower in Beaver County (2.0%) 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 $44,476 in Beaver County (U.S. Bureau of the Census 2009d).

TABLE 13.2.19.1-6 ROI Personal Income for the Proposed Milford Flats South 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
ROI			
Total income[a]	0.8	1.1	3.2
Per-capita income	21,725	22,688	0.4
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).

13.2.19.1.7 ROI Housing

In 2007, nearly 21,000, housing units were located in the Milford Flats South ROI (Table 13.2.19.1-7). Owner-occupied units composed 63% of the occupied units.

The housing vacancy rate in 2007 in the ROI was 23.7% (the highest of the ROIs for the three proposed Utah SEZs). In 2007, an estimated 1,809 rental units would have been available to construction workers in the ROI surrounding the proposed Milford Flats South SEZ. There were 2,385 seasonal, recreational, or occasional-use units vacant at the time of the 2000 Census. Housing stock in the Milford Flats South ROI as a whole grew at the annual rate of 3.7% over the period 2000 to 2007.

The median value of owner-occupied housing in the ROI in 2000 varied between $89,200 in Beaver County and $112,200 in Iron County (U.S. Bureau of the Census 2009g).

TABLE 13.2.19.1-7 ROI Housing Characteristics for the Proposed Milford Flats South SEZ

Parameter	2000	2007[a]
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[b]
Total units	13,618	17,976
Beaver County		
Owner-occupied	1,566	1,691
Rental	416	449
Vacant units	678	732
Seasonal and recreational use	399	NA
Total units	2,660	2,872
ROI		
Owner-occupied	8,606	10,078
Rental	4,003	5,836
Vacant units	3,669	4,934
Seasonal and recreational use	2,385	NA
Total units	16,278	20,848

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

[b] NA = data not available.

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

13.2.19.1.8 Local Government Organizations

Table 13.2.19.1-8 lists the various local and county government organizations in Beaver and Iron Counties. 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.

13.2.19.1.9 ROI Community and Social Services

This section describes educational, health-care, law enforcement, and firefighting resources in the ROI for the proposed Milford Flats South SEZ.

Schools

In 2007, the two-county ROI had a total of 24 public and private elementary, middle, and high schools (NCES 2009). Table 13.2.19.1-9 provides summary statistics for enrollment, educational staffing, and two indices of educational quality—student teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Beaver County schools (22.3) is slightly higher than that for schools in Iron County (21.2), while the level of service is higher in Beaver County (11.6).

TABLE 13.2.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed Milford Flats South SEZ

Governments	
City	
Brian Head	Parowan
Cedar City	Beaver City
Enoch	Milford
Paragonah	Minersville
County	
Beaver 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 13.2.19.1-9 ROI School District Data for the Proposed Milford Flats South SEZ, 2007

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
ROI	10,090	472	21.4	9.6

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

Health Care

While it has many more 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) (Table 13.2.19.1-10). The smaller number of health-care professionals in Beaver County may mean that residents of these counties have poorer access to specialized health care; a substantial number of county residents might also travel to Iron County for their medical care.

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI. Beaver County has 16 officers and would provide law enforcement services to the SEZ (Table 13.2.19.1-11), while Iron County has 31 officers. There are currently eight professional firefighters in Iron County, and only volunteers in Beaver County (Table 13.2.19.1-11). Levels of service in police protection in Iron County (1.3) are significantly lower than for Beaver County (1.2).

13.2.19.1.10 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

TABLE 13.2.19.1-10 Physicians in the ROI for the Proposed Milford Flats South SEZ, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Beaver County	7	1.2
Iron County	55	1.3
ROI	62	1.3

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

TABLE 13.2.19.1-11 Public Safety Employment in the ROI Surrounding the Proposed Milford Flats South 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
ROI	47	1.0	8	0.2

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

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, 1983a, 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 13.2.19.1-12 and 13.2.19-1-13, respectively.

There is some variation in the level of crime across the ROI, with slightly higher rates of violent crime in Beaver County (1.5 per 1,000 population) than in Iron County (1.3), and slightly higher rates of property crime in Iron County (24.6) than in Beaver County (12.0) (Table 13.2.19.1-12). The overall crime rate in the ROI was 24.3 offenses per 1,000 population.

TABLE 13.2.19.1-12 County and ROI Crime Rates for the Proposed Milford Flats South SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
Location	Offenses	Rate	Offenses	Rate	Offenses	Rate
Beaver County	9	1.5	74	12.0	83	13.4
Iron County	56	1.3	1,085	24.6	1,141	25.8
ROI	65	1.3	1,159	23.0	1,224	24.3

[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 13.2.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Milford Flats South SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Utah Southwest Region (includes Beaver County and Iron 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 on or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 2007.

[d] A dash indicates data not available.

Sources: SAMHSA (2009); CDC (2009).

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located (Table 13.2.19.1-13).

13.2.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 13.2.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 2,549 people were employed in the ROI in the various sectors identified as recreation, constituting 10.9% of total ROI employment (Table 13.2.19.1-14). Recreation spending also produced $37.4 million in income in the ROI in 2007. The primary sources of recreation-related employment were eating and drinking places.

13.2.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of developments employing various solar energy technologies are analyzed in detail in subsequent sections.

TABLE 13.2.19.1-14 Recreation Sector Activity in the Proposed Milford Flats South SEZ ROI, 2007

ROI	Employment[b]	Income ($ million)
Amusement and recreation services	320	4.6
Automotive rental	7	0.3
Eating and drinking places	1,723	22.9
Hotels and lodging places	295	5.7
Museums and historic sites	0	0.0
Recreational vehicle parks and campsites	27	0.2
Scenic tours	24	1.4
Sporting goods retailers	153	2.2
Total ROI	2,549	37.4

Source: MIG, Inc. (2009).

13.2.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Milford Flats South SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy developments are discussed in detail in Section 5.17. These impacts 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 facilities in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodation otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of solar energy developments in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, and delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983a).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 2.3% in ROI population during construction of trough technology, with smaller increases for power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the lack of available housing to accommodate all in-migrating workers and families in smaller rural communities in the ROI and the insufficient range of housing choices to suit all solar occupations make it likely that many workers will commute to the SEZ from larger communities elsewhere in the ROI; thus, reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar development are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

Livestock Grazing Impacts

Cattle ranching and farming supported 82 jobs, and $1.4 million in income in the ROI in 2007 (MIG, Inc. 2010). The construction and operation of solar facilities in the proposed Milford Flats South 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 three jobs and $0.1 million in income in the ROI. There would also be a decline in grazing fees payable to the BLM and to the USFS by individual permittees based on the number of AUMs required to support livestock on public land. Assuming the 2008 fee of $1.35 per AUM, grazing fee losses would amount to $579 annually, on land dedicated to solar development in the SEZ.

Transmission Line Impacts

The impacts of transmission line construction could include the addition of 84 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 13.2.19.2-1). Construction activities in the peak year would constitute less than 1% of total ROI employment. A transmission line would also produce $3.4 million in ROI income. Direct sales taxes and direct income taxes would be $0.1 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 100 persons in-migrating into the proposed Milford Flats South 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 is not expected to be large, with 50 rental unit expected to be occupied in the proposed Milford Flats South 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 (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Total operations employment impacts in the ROI (including direct and indirect impacts) of a transmission line would be less than one job during the first year of operation (Table 13.2.19.2-1) and would also produce less than $0.1 million in income. Direct sales taxes would be less than $0.1 million in the first year, with direct income taxes of less than $0.1 million.

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.

Access Road Impacts

The impacts of construction of an access road connecting the proposed Milford Flats South SEZ could include the addition of 100 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 13.2.19.2-2). Construction activities in the peak year would constitute less than 1% of total ROI employment. Access road construction would also produce $2.8 million in ROI income. Direct income taxes and direct sales taxes would each be $0.1 million in the peak year.

TABLE 13.2.19.2-1 ROI Socioeconomic Impacts of a 230-kV Transmission Line at the Proposed Milford Flats South SEZ[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	39	<1
Total	84	<1
Income[b]		
Total	3.4	<0.1
Direct state taxes[b]		
Sales	0.1	<0.1
Income	0.1	<0.1
In-migrants (no.)	100	0
Vacant housing[c] no.)	50	0
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts assume 19 mi (30 km) of transmission line are required for the Milford Flats South 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.

Given the likelihood of local worker availability in the required occupational categories, construction of an access road would mean that some in-migration of workers and their families from outside the ROI would be required, with 64 persons in-migrating into the Milford Flats South 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 access road construction on the number of vacant rental housing units is not expected to be large, with 32 rental units expected to be occupied in the Milford Flats South 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,

TABLE 13.2.19.2-2 ROI Socioeconomic Impacts of an Access Road Connecting the Proposed Milford Flats South SEZ[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	58	<1
Total	100	<1
Income[b]		
Total	2.8	<0.1
Direct state taxes[b]		
Sales	0.1	<0.1
Income	0.1	<0.1
In-migrants (no.)	64	0
Vacant housing[c] (no.)	32	0
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts assume 5 mi (8 km) of access road are required for the Milford Flats South 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.

one new teacher would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Total operations (maintenance) employment impacts in the ROI (including direct and indirect impacts) of an access road would be less than one job during the first year of operation (Table 13.2.19.2-2) and would also produce less than $0.1 million in income. Direct sales taxes would be less than $0.1 million in the first year, with direct income taxes of less than $0.1 million.

Operation of an access road would not require the in-migration of workers and their families from outside the ROI; consequently, no impacts on housing markets in the ROI would be expected, and no new community service employment would be required to meet existing levels of service in the ROI.

13.2.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are 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 (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 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 2,856 jobs (Table 13.2.19.2-3). Construction activities would constitute 8.3% of total ROI employment. A solar facility would also produce $148.1 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 33.0% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly,

TABLE 13.2.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Milford Flats South SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	1,641	224
Total	2,856	337
Income[b]		
Total	148.1	10.2
Direct state taxes[b]		
Sales	0.1	0.1
Income	5.9	0.4
BLM payments ($ million 2008)		
Rental	NA[c]	0.8
Capacity[d]	NA	6.8
In-migrants (no.)	1,827	143
Vacant housing[e] (no.)	914	129
Local community service employment		
Teachers (no.)	17	1
Physicians (no.)	2	0
Public safety (no.)	2	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 600 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,037 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c NA = not applicable.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming a solar facility with no storage capability and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

e Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

17 new teachers, 2 physicians, and 2 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 2.3% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 337 jobs (Table 13.2.19.2-3). Such a solar facility would also produce $10.2 million in income. Direct sales taxes would be $0.1 million, and direct income taxes, $0.4 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $0.8 million, and solar generating capacity payments would total at least $6.8 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 143 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 129 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 1,137 jobs (Table 13.2.19.2-4). Construction activities would constitute 3.3% of total ROI employment. Such a solar facility would also produce $59.0 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 13.2% of the vacant rental units expected to be available in the ROI.

TABLE 13.2.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Milford Flats South SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	654	116
Total	1,137	156
Income[b]		
Total	59.0	4.6
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	2.4	0.2
BLM payments ($ million 2008)		
Rental	NA[c]	0.8
Capacity[d]	NA	3.8
In-migrants (no.)	728	74
Vacant housing[e] (no.)	364	66
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 576 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[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 (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 0.9% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 156 jobs (Table 13.2.19.2-4). 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 2010b), acreage rental payments would be $0.8 million, and solar generating capacity payments would total at least $3.8 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 74 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 66 owner-occupied units expected to be 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 meet existing levels of service in the provision of these services 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 462 jobs (Table 13.2.19.2-5). Construction activities would constitute 1.3% 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

TABLE 13.2.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Milford Flats South SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	266	113
Total	462	151
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[c]	0.8
Capacity[d]	NA	3.8
In-migrants (no.)	296	72
Vacant housing[e] (no.)	148	65
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 576 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

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 5.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, three new teachers would be required in the ROI. This increase would represent 0.4% 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 151 jobs (Table 13.2.19.2-5). 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 2010b), acreage rental payments would be $0.8 million, and solar generating capacity payments would total at least $3.8 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 72 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 65 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (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.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 216 jobs (Table 13.2.19.2-6). Construction activities would constitute 0.6 % 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, $0.4 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

TABLE 13.2.19.2-6 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Milford Flats South SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	124	11
Total	216	15
Income[b]		
Total	11.2	0.5
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	0.4	<0.1
BLM payments ($ million 2008)		
Rental	NA[c]	0.8
Capacity[d]	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 576 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming full buildout of the site.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

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 2.5% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.2% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 15 jobs (Table 13.2.19.2-6). Such a solar facility would also produce $0.5 million in income. Direct sales taxes would be less than $0.1 million, and direct income taxes, less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $0.8 million, and solar generating capacity payments would total at least $3.0 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with seven persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with six owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

13.2.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Milford Flats South 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.

This page intentionally left blank.

13.2.20 Environmental Justice

13.2.20.1 Affected Environment

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register*, Volume 59, page 7629, Feb. 11, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in *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) the issue of whether the impacts from construction and operation would produce impacts that are high and adverse is assessed; and (3) if impacts are high and adverse, a determination is made as to whether the impacts would disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed Milford Flats South SEZ could affect environmental justice if any adverse health and environmental impacts from either phase of development are significantly high, and if these impacts would 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 locations of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the proposed SEZs in Utah and an associated 50-mi (80-km) radius around the facility boundary. The geographic distribution of minority and low-income groups 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 origin. In addition, persons who classify themselves as being of multiple racial origins may choose up to six racial groups on the basis of their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50%, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or another 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 it is in the state (the reference geographic unit).

- **Low-Income.** Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

Data on the minority and low-income composition of the total population located in the proposed Milford Flats South SEZ based on 2000 Census data and CEQ guidelines are shown in Table 13.2.20.1-1. 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 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, within the Nevada portion, 13.5% of the population is classified as minority, and within the Utah portion 8.5% of the population is classified as minority. 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, the 50-mi (80-km) radius, in aggregate, these states do not have minority populations according to the 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, within the Nevada portion, 17.2% of the population is classified as low-income, and within the Utah portion 15.9% of the population is classified as low-income. Because the number of low-income individuals does not exceed the state average by 20 percentage points or more, and because it does not exceed 50% of the total population in either state, in aggregate, there are

TABLE 13.2.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius of the Proposed Milford Flats South SEZ

Parameter	Nevada	Utah
Total population	1,039	51,966
White, non-Hispanic	899	47,574
Hispanic or Latino	67	2,212
Non-Hispanic or Latino minorities	73	2,180
One race	64	1,605
Black or African American	50	146
American Indian or Alaskan Native	13	992
Asian	1	314
Native Hawaiian or other Pacific Islander	0	102
Some other race	0	51
Two or more races	9	575
Total minority	140	4,392
Total low-income	179	8,271
Percent minority	13.5	8.5
Percent low-income	17.2	15.9
State percent minority	34.8	14.7
State percent low-income	10.5	9.4

Source: U.S. Bureau of the Census (2009k,l).

no low-income populations within the 50-mi (80-km) radius of the proposed Milford Flats South SEZ according to 2000 Census data and CEQ guidelines.

Figure 13.2.20.1-1 shows the locations of the low-income population groups within the 50-mi (80-km) radius around the boundary of the SEZ.

At the individual block group level, there are low-income populations in specific census block groups within this area as shown in Figure 13.2.20.1-1. Low-income populations are located in two block groups in Iron County. One block group in Cedar City has more than 50% of the total population below the poverty line, while one block group to the west of Cedar City, including the towns of Newcastle and Modena, has a low-income population that is more than 20 percentage points higher than the state average. There are no minority populations that exceed 50% of the total population in the block group, and the number of minority individuals does not exceed the state average by 20 percentage points or more at the individual block group level.

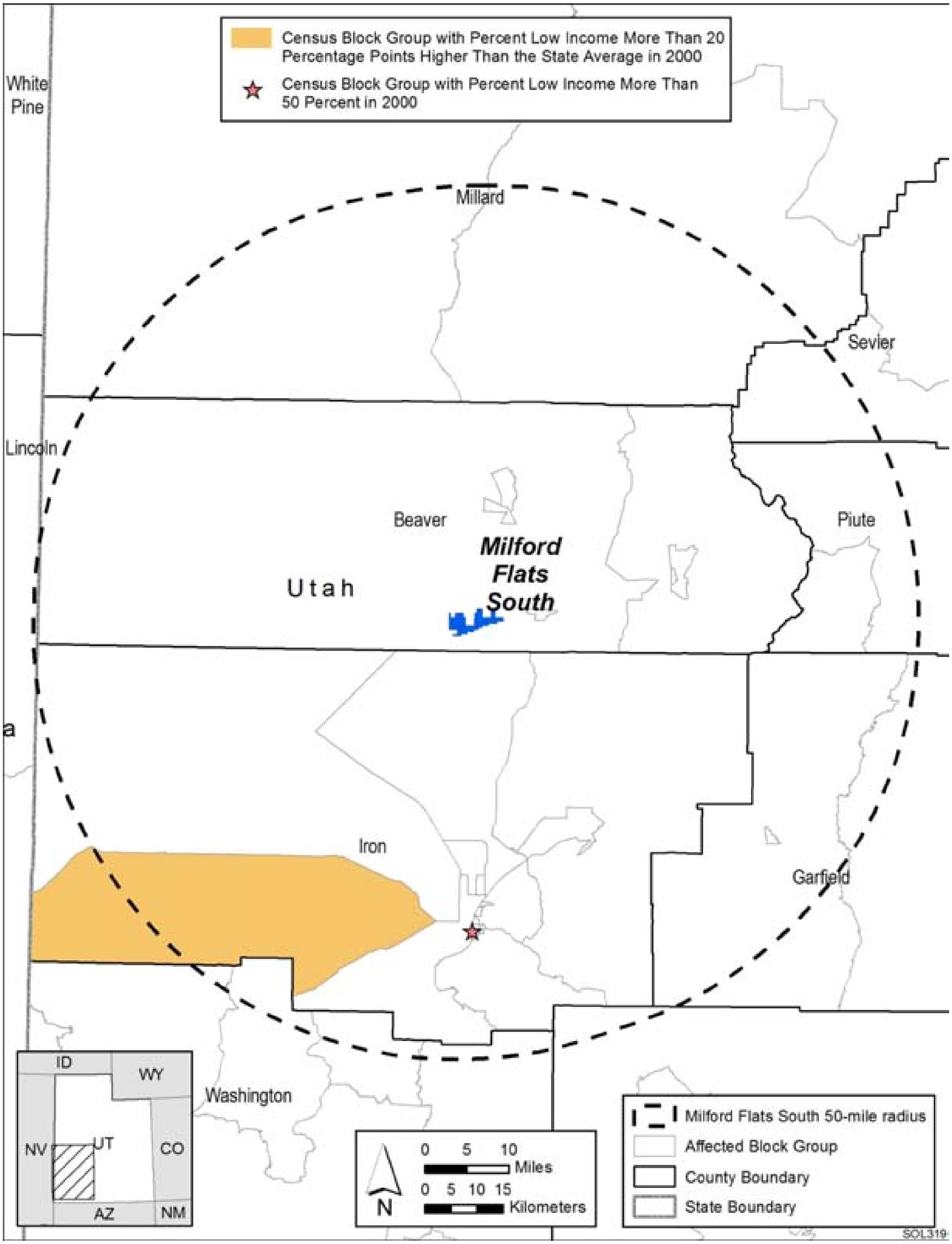


FIGURE 13.2.20.1-1 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Milford Flats South SEZ

13.2.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts would be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed Milford Flats South SEZ include noise and dust during construction; noise and EMF effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, and therefore unlikely to produce disproportionate impacts, there are low-income populations defined by CEQ guidelines (Section 13.2.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ, meaning that any adverse impacts of solar projects could disproportionately affect low-income populations. Because there are no minority populations within the 50-mi (80-km) radius, according to CEQ guidelines, there would be no impacts on minority populations.

13.2.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Milford Flats South 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.

This page intentionally left blank.

13.2.21 Transportation

The proposed Milford Flats South SEZ is accessible by road and by rail. Local roads and one major railroad, in addition to three small airports, serve the immediate area. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

13.2.21.1 Affected Environment

Thermal Road runs east–west along portions of the northern border of the proposed Milford Flats South SEZ, as shown in Figure 13.2.21.1-1. The small town of Minersville is approximately 5 mi (8 km) to the east of the SEZ along Thermal Road. Approximately 5 mi (8 km) to the west, Thermal Road connects with Beryl Milford Road, which parallels the UP Railroad tracks running from the southwest to the northeast between Beryl and Milford. Several unimproved dirt roads from Thermal Road to the north and Beryl Milford Road to the west pass through the western sections of the proposed Milford Flats South SEZ. 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. As listed in Table 13.2.21.1-1, the three closest state highways in the area, State Routes 21, 129, and 130, carry average traffic volumes of about 1,440, 600, and 900 vehicles per day, respectively.

The UP Railroad serves the area. The main line connecting Las Vegas and Salt Lake City passes within 2 mi (3 km) west of the SEZ. The rail stop in Lund is approximately 20 mi (32 km) southwest of the SEZ along Beryl Milford Road. The Milford rail stop is approximately 15 mi (24 km) to the northeast of the SEZ.

The nearest public airport is the Milford Municipal Airport, about a 20-mi (32-km) drive to the north–northeast of the SEZ. The airport has a 1,524-m (5,000-ft) 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 23 mi (37 km) and 45 mi (72 km) to the east–northeast and south, 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).

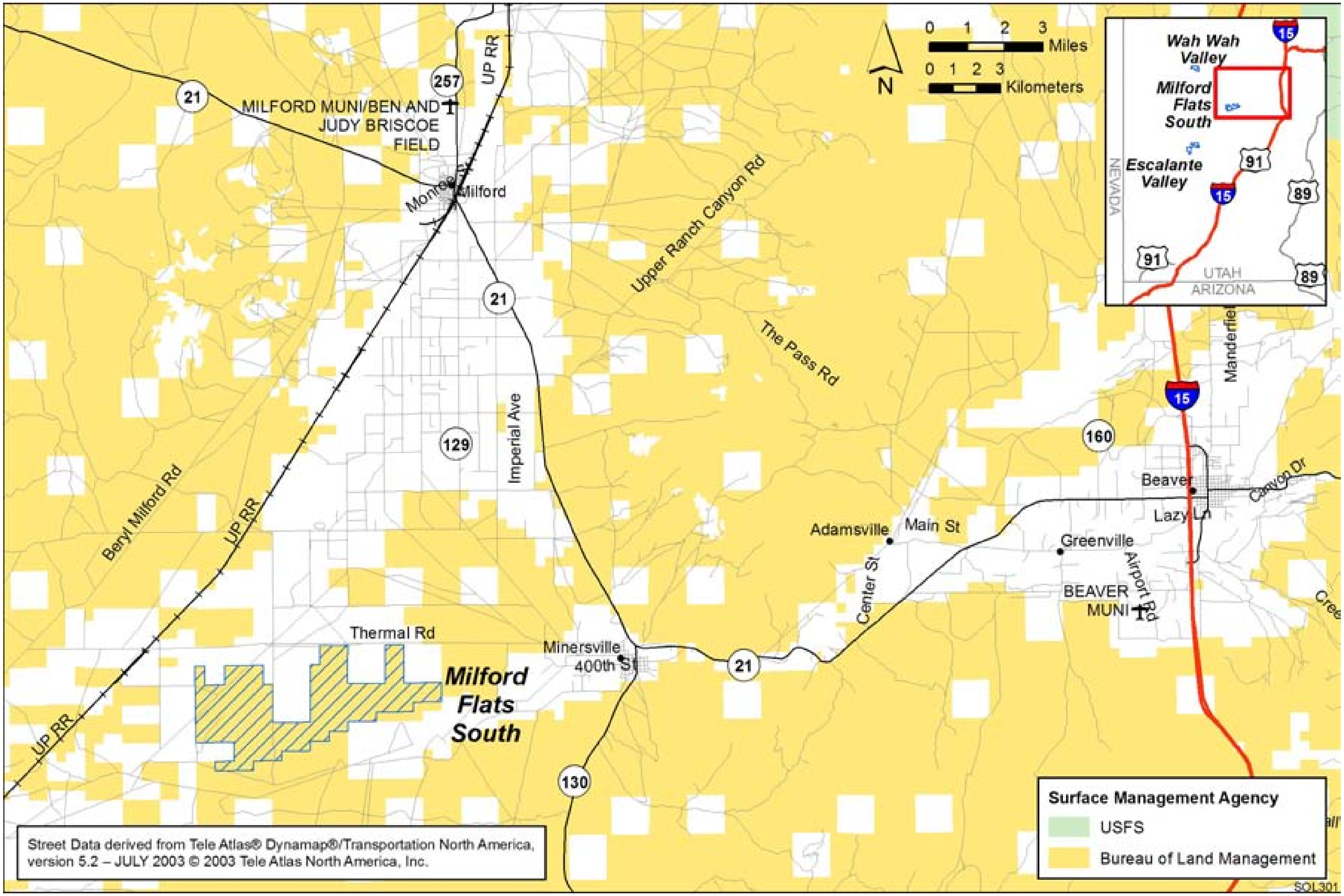


FIGURE 13.2.21.1-1 Local Transportation Network Serving the Proposed Milford Flats South SEZ

TABLE 13.2.21.1-1 AADT on Major Roads near the Proposed Milford Flats South SEZ for 2008

Road	General Direction	Location	AADT (Vehicles)
I-15	North–South	Junction with I-70	11,885
		South of Beaver	15,395
		Junction with State Route 130 North of Cedar City	18,255
		Intersection with State Route 56 in Cedar City	25,140
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).

13.2.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). The volumes of traffic on regional corridors would be more than double the current values in most cases. As seen above, Beryl Milford Road and State Routes 21, 129, and 130 provide regional traffic corridors near the proposed Milford Flats South SEZ. Local road improvements would be necessary on any portion of these roads that might be developed so as not to overwhelm the local access roads near any site access point(s). Thermal Road would also require upgrades. 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).

13.2.21.3 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 Milford Flats South 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.

13.2.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Milford Flats South 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 more than 5 to 10 years in the future.

The largest nearby town is Cedar City, located about 35 mi (56 km) south of the SEZ. Several small towns lie closer to the SEZ; Minersville is located about 5 mi (8 km) east and Milford is about 13 mi (21 km) north. The surrounding land is rural. A commercial hog-rearing operation is located on private land adjacent to the northern border of the SEZ. Irrigated farms are located to the east of the area. Farther away, the Fishlake National Forest is 25 mi (40 km) to the northeast and there are two sections of the Dixie National Forest, one about 30 mi (48 km) southwest and one about 40 mi (64 km) southwest. Tribal lands are 35 mi (56 km) and 40 mi (64 km) to the south. In addition, the Milford Flats South SEZ is located close to both the Escalante Valley SEZ and the Wah Wah Valley SEZ; and in some areas, impacts from the three SEZs would overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the proposed Milford Flats South SEZ is identified in Section 13.2.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 13.2.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 13.2.22.3. Cumulative impacts for each resource area are discussed in Section 13.2.22.4.

13.2.22.1 Geographic Extent of the Cumulative Impacts Analysis

Table 13.2.22.1-1 presents the geographic extent of the cumulative impacts analysis for potentially affected resources near the proposed Milford Flats South 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 about 54% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 13.2.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Milford Flats South SEZ

Resource Area	Geographic Extent
Lands and Realty	Northeastern Escalante Desert Valley
Specially Designated Areas and Lands with Wilderness Characteristics	Northeastern Escalante Desert Valley
Rangeland Resources	Northeastern Escalante Desert Valley
Recreation	Northeastern Escalante Desert Valley
Military and Civilian Aviation	Northeastern Escalante Desert Valley
Soil Resources	Areas within and adjacent to the Milford Flats South SEZ
Minerals	Northeastern Escalante Desert Valley
Water Resources	
Surface Water	Minersville Canal, Utopia Ditch, Beaver River
Groundwater	Milford area basin
Vegetation, Wildlife and Aquatic Biota, Special Status Species	Known or potential occurrences within a 50-mi (80-km) radius of the Milford Flats South SEZ
Air Quality and Climate	Northeastern Escalante Desert Valley and beyond
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Milford Flats South SEZ
Acoustic Environment (noise)	Areas adjacent to the Milford Flats South SEZ
Paleontological Resources	Areas within and adjacent to the Milford Flats South SEZ
Cultural Resources	Areas within and adjacent to the Milford Flats South SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Milford Flats South SEZ for other properties, such as historic trails and traditional cultural properties
Native American Concerns	Escalante Desert Valley; viewshed within a 25-mi (40-km) radius of the Milford Flats South SEZ
Socioeconomics	Beaver and Iron Counties
Environmental Justice	Beaver and Iron Counties
Transportation	Local roads (e.g., Thermal Road), and State Routes 21, 129, and 130

13.2.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable;" that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;

- Proposals in a detailed design phase;

- Proposals listed in formal NOIs published in the *Federal Register* or state publications;

- Proposals for which enabling 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 phases 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 13.2.22.2.1) and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 13.2.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

13.2.22.2.1 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 other states that have adopted RPSs; however, the Utah 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 within the proposed Milford Flats South SEZ are identified in Table 13.2.22.2-1 and described in the following sections. Renewable energy projects identified include wind and geothermal projects, but no foreseeable solar energy projects have been identified. Other energy-related projects include transmission lines and oil and gas leasing.

TABLE 13.2.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Milford Flats South 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) northeast of Milford Flats South SEZ (Beaver and Millard Counties)
Milford Wind Phase II (UTU 83073)	Underway	Land use, ecological resources, visual	About 25 mi (40 km) northeast of Milford Flats South SEZ (Beaver and Millard Counties)
Milford Wind Phases III–V (UTU 8307301)	Planned	Land use, ecological resources, visual	About 25 mi (40 km) northeast of Milford Flats South SEZ (Beaver and Millard Counties)
Geothermal Energy Project UTU 66583O	Authorized	Land use, terrestrial habitats, visual	About 20 mi (32 km) northeast of Milford Flats South SEZ (Beaver County)
Geothermal Energy Project UTU 66583X	Authorized	Land use, terrestrial habitats, visual	About 20 mi (32 km) northeast of Milford Flats South SEZ (Beaver County)
Geothermal projects: Several geothermal projects in the vicinity of the SEZ on both BLM-administered lands and state lands are either in the planning stages or under construction (see text).	Planned and Ongoing	Land use, water resources, ecological resources, socioeconomics, transportation	General vicinity of SEZ and north of Milford
Transmission and Distribution Systems			
Milford Wind Corridor Project	Ongoing	Land use, ecological resources, visual	Wah Wah Valley
Sigurd to Red Butte No. 2 345-kV Transmission Project	Planned	Land use, ecological resources, visual	East of Milford Flats South and Escalante Valley SEZs
Energy Gateway South 500 kV AC Transmission Line Project	Planned	Land use, ecological resources, visual	About 5 mi (8 km) southeast of the Escalante Valley SEZ and 3 mi (5 km) west of the Milford Flats South SEZ
TransWest Express 600 kV DC Transmission Line Project	Planned	Land use, ecological resources, visual	About 5 mi (8 km) southeast of the Escalante Valley SEZ and 3 mi (5 km) west of the Milford Flats South SEZ

TABLE 13.2.22.2-1 (Cont.)

Description	Status	Resources Affected	Primary Impact Location
UNEV liquid Fuel Pipeline (UTU-79766)	FEIS April 2010	Disturbed areas, terrestrial habitats along pipeline ROW	About 5 mi (8 km) southeast of the Escalante Valley SEZ and 3 mi (5 km) west of the Milford Flats South SEZ
Oil and Gas Leasing			
Oil and gas leasing	Planned	Land use, ecological resources, visual	Eastern portions of Iron and Beaver Counties.

Solar Energy Development

There are no existing solar energy facilities in the state of Utah. No applications have been filed for new solar energy facilities proposed to be located on BLM-administered lands.

Wind Energy Development

The Milford Wind Corridor Project, Phases I–V, which are either planned, under way, or ongoing, are currently the only reasonably foreseeable wind energy development within a 50-mi (80 km) radius of the proposed Milford Flats South SEZ. This development is administered under three BLM ROW applications, as listed in Table 13.1.22.2-1. The footprints of these and numerous other renewable energy ROW applications in various stages of authorization are shown in Figure 13.2.22.2-1. 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 the figure, 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 40 mi^2 (103 km^2) including 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. The Milford Wind Corridor Project 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, III, 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 undated).

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, six authorized for wind testing, and three pending authorization 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 2010b). Table 13.2.22.2-2 lists these applications and Figure 13.2.22.2-1 shows their locations.

TABLE 13.2.22.2-2 Pending Wind Energy Project ROW Applications on BLM-Administered Land within 50-mi (80-km) of the Milford Flats South 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, Fillmore
UTU 083001	Wind	Site testing	Cedar City, St. George
UTU 083062	Wind	Site testing	Cedar City, Fillmore
UTU 083063	Wind	Site testing	Cedar City
UTU 083210	Wind	Site testing	Cedar City, Fillmore
Pending Wind Development Facilities			
UTU 083061	Wind	Pending	Cedar City
UTU 083075	Wind	Pending	Cedar City
UTU 088017	Wind	Pending	Cedar City

[a] Pending wind applications information downloaded from GeoCommunicator (BLM and USFS 2010b)

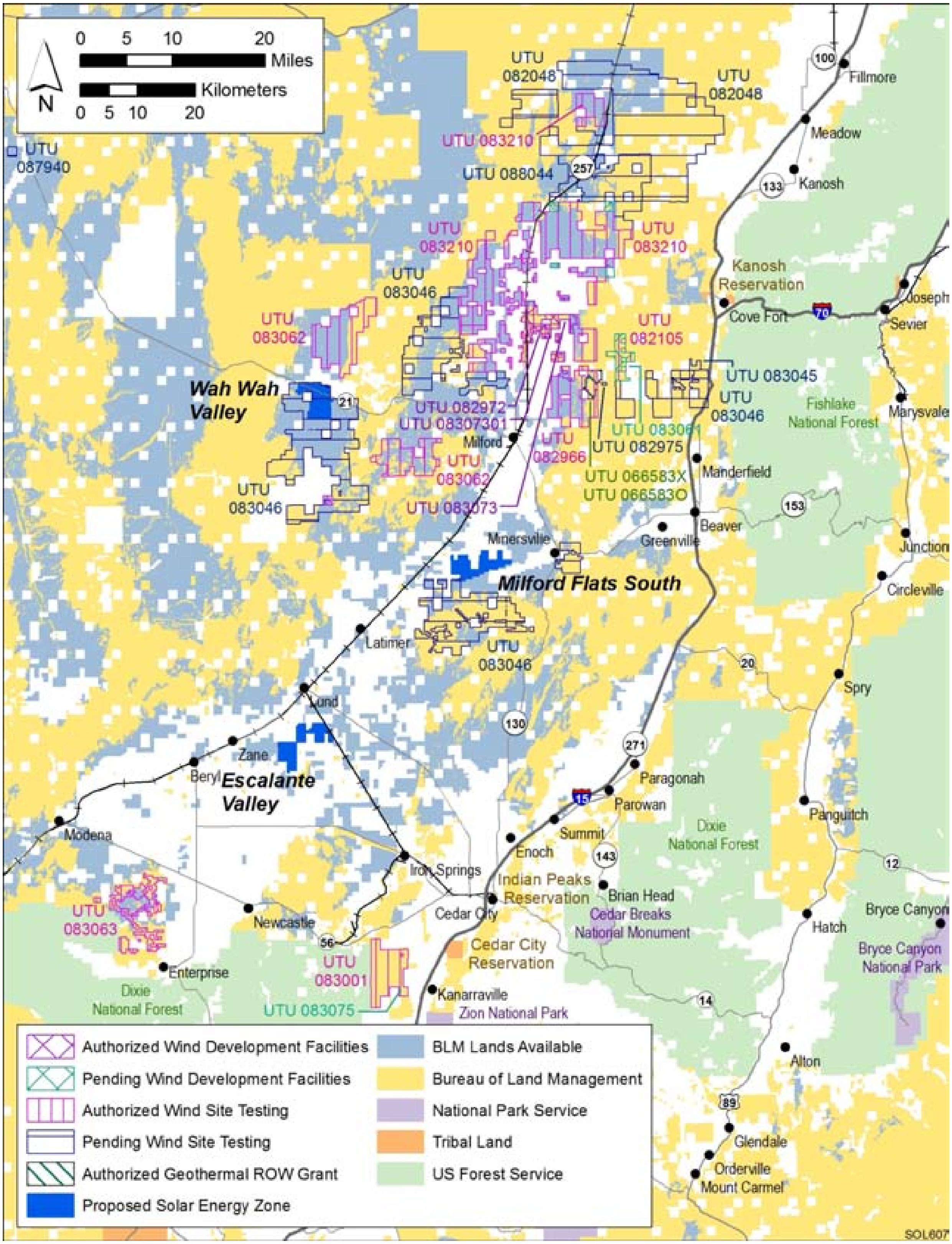


FIGURE 13.2.22.2-1 Locations of Reasonably Foreseeable Energy Projects in the Vicinity of the Proposed Milford Flats South SEZ

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 13.2.22.2-2 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.

Wind testing will 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 13.2.22.2-1 and shown in Figure 13.2.22.2-1. The two applications are located in close proximity of each other and are located about 20 mi (32 km) northeast 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 2010b). Several other applications are under review for government approval of geothermal well drilling and testing on existing federal leases within BLM-administered lands and National Forest Land in Beaver County. All the applications are for geothermal projects within a 40- to 50-mi (64- to 80-km) radius of the proposed Milford Flats South SEZ. One operating facility, the Blundell Geothermal Power Station, lies about 20 mi (32 km) north of the SEZ and has been in operation since 1984.

- *Cove Fort/Sulphurdale Geothermal Production Wells.* Enel Cove Fort II, LLC, applied to the BLM for nine geothermal drilling permits in February 2009 to drill geothermal production test wells on federal lease UTU-085605 located in the Cove Fort/Sulphurdale geothermal resource area. The proposed well sites are within the Fishlake National Forest in Beaver County about 1 mi (1.6 km) south of Exit 1 off I-70 and 30 mi (48 km) east-northeast of Milford. The application for a geothermal drilling permit indicated Enel Cove Fort II, LLC, intended to start drilling in October 2009 subject to BLM approval (BLM 2009c).

- *Cove Fort/Sulphurdale Injection Well and Well Production Testing.* Enel Cove Fort II, LLC, would conduct the tests at these well sites located on the Fishlake National Forest, on BLM-administered land, and on private lands in Beaver County. The wells are located about 30 mi (48 km) east–northeast of Milford in the Cove Fort/Sulphurdale geothermal resource area on geothermal lease UTU-029557. Well testing applications have been filed with the USFS and the BLM for production testing to be conducted at an existing well, No. 44-7, and a new well, No. 51-7, both on National Forest land. Water produced from the testing will be cooled in ponds and injected into well B01-1 (on private land) and well 72-12 (on BLM-administered land) (BLM 2009d).

- *Blundell Geothermal Power Station*. Utah Power, a PacifiCorp company, has operated the power station since 1984. It is located 9 mi (14 km) north of Milford in Beaver County. The Blundell plant produces geothermal brine from wells that tap a geothermal resource in fractured, crystalline rock. The resource depths range generally between 2,100 and 6,000 ft (640 and 1,830 m). Resource temperatures are typically between 520 and 600°F (271 and 316°C).

  Wellhead separators are used to “flash” the geothermal fluid into liquid and vapor phases. The liquid phase, or geothermal brine, is channeled back into the reservoir through gravity-fed injection wells. The vapor phase, or steam fraction, is collected from the production wells and 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).

  The plant produces 26 MW gross (23 MW net), which equals the energy that would be produced by burning about 300,000 bbl (48,000 m^3) of oil annually (UGS undated).

- *Blundell Geothermal Plant Integration of Wells 58-3 and 71-10*. In August 2009, PacifiCorp filed a request with the BLM Cedar City Field Office to integrate two wells into the existing Blundell Geothermal Plant Unit 1 and Unit 2 operations. The project would consist of pipelines connecting wells 58-3 and 71-10 with the two geothermal plant units, the trenching of a 3-in. (7.6-cm) diameter brine line between well 58-3 Pond and an existing brine line, a new 4.16-kV overhead power line, and new access roads. The pipelines between wells 58-3 and 71-10 would run in a side-by-side configuration over a distance of about 1,150 ft (350.5 m). The power line would require eight wooden poles spaced at 240-ft (73.2-m) intervals over a distance of about 1,670 ft (509 m) (Lee 2009).

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 Milford Flats South SEZ.

- *Milford Wind Corridor Project.* A new 88-mi (142-km) 345-kV overhead transmission line was constructed to deliver power from the wind farm. It connects the Milford Wind facility to the existing Intermountain Power

Project substation near Delta, Utah, which then connects to southern California. The transmission line crosses predominantly public lands in Beaver and Millard Counties.

- *Geotechnical Investigations for the Sigurd to Red Butte 345-kV Transmission Line*. Rocky Mountain Power Company submitted an application in September 2009 to the BLM for approval to conduct geotechnical investigations on a proposed 345-kV transmission line planned to go into service by 2012. The investigations will consist of drilling about 235 boreholes along the proposed 160-mi (257-km) route and along another 400 mi (644 km) of alternatives to evaluate subsurface soil and rock to a maximum depth of 50 ft (15 m). Some access road construction will be needed in remote areas to allow drilling equipment to reach proposed sites. Information gathered from the borings will be factored into engineering design of the transmission tower foundations. The BLM intends to prepare an environmental assessment (EA) to address impacts of the geotechnical investigations. The proposed transmission line route will traverse portions of Beaver and Iron Counties and pass within 10 to 15 mi (16 to 24 km) east of the Milford Flats South and Escalante Valley SEZs. However, Rocky Mountain Power Company showed the proposed project study area as encompassing both SEZs to cover potential alternative routes being investigated (BLM 2009e).

- *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 (214 to 257 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 about 10 to 15 mi (16 to 24 km) east of the Milford Flats South and the Escalante Valley SEZs (BLM 2009e). The BLM plans to prepare an EIS to fulfill its NEPA responsibilities on a project of this magnitude.

- *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 (1,160 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 the BLM and the Western Area Power Administration is expected to be completed by 2013 and the line to be in-service in 2015 (TransWest 2010).

- *UNEV Pipeline Project.* Holly Energy Partners proposes to construct and operate a 399-mi (640-km), 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. The BLM issued a Final EIS for the project in April 2010 (BLM 2010c).

Oil and Gas Leasing

The BLM Cedar City Field Office prepared an environmental assessment (EA UT-040-08-036) in August 2008 that addressed the impacts of ongoing and new oil and gas leases in the eastern portions of Beaver and Iron Counties. The geographical area covered in the analysis extended from about 10 mi (16 km) north of Milford, south and east to New Harmony, 10 mi (16 km) south of Cedar City. A smaller area east of I-15, east and northeast of Cedar City, was also evaluated. A total of 960,000 acres (3,885 km^2) of federal mineral lands were considered in the EA. About half (374,000 acres [1,513.5 km^2]) have been leased or have been issued a lease but await protest resolution (108,000 acres [437.1 km^2). Of the remaining land (478,000 acres [1,934.4 km^2]), almost one-fourth (121,000 acres [489.7 km^2]) is being considered for development by industry. The intent of the proposed action is for the BLM to protect environmental resources in future leased areas by imposing additional resource protective measures.

13.2.22.2.2 Other Actions

Grazing Allotments

Grazing is a common use of the lands in the vicinity of the proposed Milford Flats South 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 BLM in the area include Milford Cattle; Minersville #1, #2, #4, #5, and #6; Shauntie; Paragonah Cattle; Parowan Stake; Stewart; and Cook (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 for BLM and USFS lands are under review or have received recent BLM approval for locations in Beaver, Iron, and Millard Counties. These projects include such initiatives 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). Three of the projects are summarized below. A list of additional projects is included in Table 13.2.22.2-3. 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 located about 33 mi (53 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 is planning to thin up to 3,180 acres

TABLE 13.2.22.2-3 Other Projects in the Vicinity of the Proposed SEZs in Utah

Project Name	Description	Status	County	Location
AirCell, LLC, Communication Site	Communication tower	Approved November 2009	Beaver	Frisco Peak, San Francisco Mountains
Utah Alunite, LLC, Potassium Prospecting Permit Applications	Request to conduct prospect mining for potassium minerals	Applications received September 2009; scoping December 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 January 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 January 2009, signed January 28, 2009	Beaver	About 7 mi (11 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 17,253-ft (5,258.7-m) long ROW across about 3,950 acres (16 km^2) of BLM lands	Approved August 7, 2008	Iron	Iron Springs/Big Hollow Wash about 10 mi (16 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

TABLE 13.2.22.2-3 (Cont.)

Project Name	Description	Status	County	Location
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
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 and Decision Record approved September 24, 2009	Beaver	Located about 4 mi (6 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 to 80 ft × 35 ft; internal building modifications; new 70-ft (21-m) tall steel lattice tower	Application to the BLM received in June 2009; EA checklist received in September 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 November 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

(12.9 km^2) of pinyon-juniper stands that surround the Blawn Mountain Chainings. All other actions will 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 areas. 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 10 mi

(16 km) northwest of the town of Modena, about 50 mi (80 km) southwest of the Wah Wah Valley SEZ and 20 mi (32 km) west of the Escalante Valley SEZ.

- *Lake Powell Pipeline.* Washington, Kane, and Iron Counties are pursuing the construction of a pipeline that would extend from Lake Powell, near Glen Canyon Dam, through Kane County, to Sand Hollow Reservoir, which is located about 10 mi (16 km) east of St. George. The pipeline would then extend parallel to I-15 into Iron County. The pipeline would be 158-mi (254-km) long and bring 70,000 ac-ft (86.3 million m^3) of water to Washington County, 10,000 ac-ft (12.3 million m^3) to Kane County, and 20,000 ac-ft (24.7 million m^3) to Iron County. The NEPA review could be completed by 2012 on the basis of the results of technical studies currently under way. Construction of the pipeline may begin as soon as 2015 and is estimated to take only three years. The pipeline would be located about 30 mi (48 km) south of the Milford Flats South SEZ (Utah Foundation 2008).

13.2.22.3 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 13.2.22.3-1 lists the relevant impacting factors for the trends.

13.2.22.3.1 Population Growth

Over the period 2000 to 2008, the population grew by 3.7% in the ROI for the Milford Flats South SEZ (see Section 13.2.10.1). The population growth rates for the ROIs for the proposed Escalante Valley and Wah Wah Valley SEZs in the same period were 5.7 and 3.2%, respectively. The growth rate for the State of Utah as a whole was 2.5%. Within each ROI, each county experienced growth in population since 2000, ranging from 1.4% in Millard County to 6.4% for Washington County. County populations are expected to continue to increase over the period 2010 to 2023 (Governor’s Office of Planning and Budget 2009). Most of the population growth in the Milford Flats South SEZ ROI over this period will be in Cedar City.

13.2.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in the three SEZ areas 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

TABLE 13.2.22.3-1 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

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).

13.2.22.3.3 Water Availability

As described in Section 13.2.9.1.2, the proposed Milford Flats South SEZ is located within the northern Escalante Desert Valley groundwater basin. Groundwater use in the Milford area of the Escalante Desert Valley 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. The Utah Division of Water Rights reports that 4,009 water rights have been approved in the Milford area of the Escalante Valley. Most all of the area is closed to new water appropriations (Utah DWR 2004). Groundwater extraction in the Beryl-Enterprise area located 40 mi (64 km) west of Cedar City averaged 80,000 ac-ft/yr (98.7 million m^3/yr) during the period 1989 to 1998 based on well pumping data (Utah Division of Water Resources 2001). In comparison, the Cedar Valley and Parowan Valley groundwater areas had withdrawal rates of 33,000 and 29,000 ac-ft/yr (40.7 million and 35.8 million m^3/yr), respectively, during this period. The groundwater withdrawal rate of 80,000 ac-ft/yr

(98.7 million m^3/yr) in the Beryl-Enterprise area caused a lowering of the groundwater table by 1.2 ft (0.4 m) per year during this 11-year period. Recent information reported by the USGS showed a continued increase in annual rate of groundwater withdrawal in the Beryl-Enterprise area to about 93,000 ac-ft/yr (114.7 million m^3/yr) in 2008, which was an increase of 1,000 ac-ft (1.2 million m^3) from 2007, and 8,000 ac-ft (9.9 million m^3) above the average annual withdrawal from 1998 to 2007. This increase was mostly the result of increased withdrawals for irrigation (Burden et al. 2009).

Water usage of the total groundwater withdrawals in the Milford area groundwater basin was primarily for agriculture (79%) in 2008 (Burden et al. 2009). This is slightly lower than the average agricultural water usage (89%) for Beaver County in 2005; the remaining water was used for domestic (2%), livestock (3%), thermoelectric energy production (6%), and industrial (2%) purposes (Kenny et al. 2009). The majority of the agricultural water use occurs between the towns of Milford and Minersville located east and northeast of the SEZ.

The depth to groundwater records in wells within the northern Escalante Desert Valley have shown a groundwater table falling at a rate of 0.4 to 2.5 ft/yr (0.1 to 0.8 m/yr); the larger rates are concentrated just to the south of the town of Milford, which is 10 mi (16 km) northwest of the proposed Milford Flats South SEZ (Burden et al. 2009). Groundwater elevations have been observed to drop approximately 40 ft (15 m) between 1950 and 2009 in wells within 2 mi (3.2 km) of the proposed Milford Flats South SEZ (Burden et al. 2009; USGS 2010b). Fracturing and land subsidence due to aquifer overdraft has been observed in the area of the highest groundwater withdrawals at a rate of less than 0.6 in./yr (1.5 cm/yr) (Mower and Cordova 1974; Forster 2006).

To meet future increases in water demand, Washington, Iron, and Kane Counties in southwestern Utah are studying the feasibility of an agreement to obtain water from Lake Powell on the Lower Colorado River via a pipeline. Despite water conservation efforts, this area of Utah may begin to experience water shortfalls by 2012. Washington, Kane, and Iron Counties are pursuing the construction of a pipeline that would extend from Lake Powell, near Glen Canyon Dam, through Kane County, to Sand Hollow Reservoir, which is about 10 mi (16 km) east of St. George. The pipeline would then extend parallel to I-15 into Iron County. The pipeline would be 158 mi (254 km) long and bring 70,000 ac-ft (86.3 million m^3) of water to Washington County, 10,000 ac-ft (12.3 million m^3) to Kane County, and 20,000 ac-ft (24.7 million m^3) to Iron County. It would tap into Utah's unused portion of the Upper Colorado River, which was defined as belonging to Utah in the 1922 Colorado River Compact. The pipeline would cross both private and BLM-administered lands in Iron County and would be about 30 mi (48 km) south of the Milford Flats South SEZ. Construction could begin in 2015 and be completed in three years (Utah Foundation 2008).

13.2.22.3.4 Climate Change

A study of climate change and its effects on Utah was conducted by the Governor's Blue Ribbon Advisory Council on Climate Change (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 CO2 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 than now.

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.

13.2.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Milford Flats South 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 5,184 acres (21 km^2) (80% of the entire proposed SEZ). For purposes of analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. In addition, it is assumed that a 19-mi (31-km) long transmission line would be constructed from the proposed SEZ to the nearest available existing transmission line. The new transmission line would disturb an additional 576 acres (2.3 km^2) (Table 13.2.1.2-1). Regarding site access, it may be necessary to construct a new access road to the proposed SEZ to support construction and operation of solar facilities there. The nearest major road is State Route 21, which is approximately 5 mi (8 km) from the SEZ. Currently, the SEZ is accessed by county and local roads. Access to the interior of the SEZ is by dirt roads.

Cumulative impacts in each resource area that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section are discussed below. At this stage of development, because of the uncertainties 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 in relation to all other existing and proposed projects in the geographic areas would be performed in the environmental reviews for specific projects.

13.2.22.4.1 Lands and Realty

The area covered by the proposed Milford Flats South SEZ is largely undeveloped. In general, the areas surrounding the SEZ are rural. Numerous dirt/ranch roads provide access throughout the SEZ.

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. Utility-scale solar energy development would be a new and discordant land use in the area. 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 Milford Flats South SEZ. As shown in Table 13.2.22.2-1 and Figure 13.2.22.2-1, in addition to the ongoing Milford Wind Corridor Project, there are six pending authorization for wind site testing, six authorized for wind testing, and three pending authorization for development of wind facilities within this distance. The majority of these wind applications are 9 to 50 mi (14 to 80 km) from the SEZ; the nearest application authorized for wind site testing is about 9 mi (14 km) northwest, while the nearest pending wind site testing application lies immediately south. An operating geothermal facility and two authorized geothermal leases are located about 20 mi (32 km) to the northeast. There are currently no solar applications within 50 mi (80 km) of the SEZ (Figure 13.2.22.2-1), but the proposed Wah Wah Valley SEZ is about 20 mi (32 km) to the northwest, and the proposed Escalante Valley SEZ is about the same distance to the southwest.

The cumulative effects on land use of development of utility-scale solar projects on public lands on the proposed Milford Flats South 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 size 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.

13.2.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

Specially designated areas exist within or within 25 mi (40 km) of the proposed Milford Flats South SEZ include Granite Peak, about 12 mi (19 km) to the northeast and the Old Spanish Historic Trail, about 25 mi (40 km) to the southeast. While the range of potential visual impacts from the SEZ could range out to 25 mi (40 km) from the SEZ, because affected resources are 12 mi (19 km) or more away from the SEZ and a similar distance or farther from other foreseeable development, at most, only small cumulative impacts would be expected on specially designated areas from the construction of utility-scale solar energy facilities within the SEZ.

13.2.22.4.3 Rangeland Resources

Currently, three grazing allotments are located in the proposed Milford Flats South SEZ. If utility-scale solar facilities are constructed on the SEZ, those areas occupied by the solar projects would be excluded from grazing. Depending on the number and sizes of potential projects, the impact on the rangers who currently utilize the same lands could be significant. If water rights supporting agricultural use are purchased to support solar development, some areas that are currently farmed by using that water would be converted to dryland uses. The effects of other renewable energy projects within the geographic extent of effects, including the Milford Wind Corridor Project, an ongoing geothermal project, and two authorized geothermal applications within 50 mi (80 km) of the SEZ, could result in small to moderate cumulative impacts due to the relative proximity, number, and size of authorized and pending wind applications on public land, especially north of the SEZ. Wind facilities, however, are generally compatible with grazing and would therefore have low impacts on grazing individually. Additional pending or authorized wind applications fall within this distance, the closest lying immediately south of the SEZ (Figure 13.2.22.2-1).

Because the proposed SEZ is more than 13.5 mi (21.7 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.

13.2.22.4.4 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. Since the area of the proposed SEZ has low current recreation use and the surrounding area holds similar or better opportunities for recreation, while major foreseeable actions, primarily wind projects clustered to the north, would similarly affect areas of low recreational use, cumulative impacts on recreation within the geographic extent of effects, would be small.

13.2.22.4.5 Military and Civilian Aviation

The proposed Milford Flats South SEZ is located more than 100 mi (161 km) away from any military installation. The closest civilian municipal airports are the Milford and Beaver Municipal Airports, about 17 mi (28 km) and 23 mi (37 km), respectively. Recent information from 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.

13.2.22.4.6 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 mills, the main foreseeable development within the geographic extent of effects, and the distance to the authorized wind leases.

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.

13.2.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 13.2.8, currently oil and gas leases cover the entire SEZ; however, there are no producing oil and gas facilities. There are no mining claims or proposals for geothermal energy development in the SEZ. However, geothermal resources are known to exist in the general vicinity of the SEZ. If the proposed SEZ is approved for solar energy development, conflicts would have to be resolved with existing oil and gas lease holders and potential geothermal energy developers. 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 facilities, cumulative impacts on mineral resources would be small.

13.2.22.4.8 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 Sections 13.2.9.2. If the SEZ was 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 874 to 1,244 ac-ft (1.1 million to 1.5 million m^3). During operations, the amount of water needed for all evaluated solar technologies would range from 29 to 15,567 ac-ft/yr (36,000 to 19 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 13.2.22.2.3, the amount of groundwater extracted in the Milford area of the Escalante Valley in 2008 was 51,000 ac-ft/yr (62.9 million m^3/yr). Therefore, the additional water resource needed for solar facilities during operations would constitute from a relatively small (0.06%) to a very large (28%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in the Milford area), depending on the solar technology used (PV technology at the low end and the wet-cooled parabolic technology at the high end). Since the water resources in the area are fully appropriated, any new uses would simply replace an existing use, and no net increase or decrease would occur in the total amount of water used. However, the currently appropriated water exceeds the basin safe yield, as evidenced by declining groundwater levels and supported by the analysis conducted by Mower and Cordova (1974). If water is continued to be withdrawn at this rate, the aquifer could incur continued permanent damage—loss of storage capacity from compaction. In addition, land disturbance from agricultural and other activities in the vicinity of the proposed Milford Flats South SEZ could combine with those from developments on the SEZ to potentially affect natural drainage patterns and natural groundwater recharge and discharge properties. Any groundwater quality impacts from activities on the SEZ could combine with any caused by nearby agricultural activities, especially those from hog farms.

Sanitary wastewater generated would range from 9 to 74 ac-ft (11,000 to 91,000 m^3) during the peak construction year and would range from less than 1 up to 15 ac-ft/yr (1,200 up to 18,000 m^3/yr) during operations of utility-scale solar energy facilities. Such volumes would not strain available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that use conventional wet or dry-cooling systems, there would also be from 164 to 295 ac-ft/yr (200,000 to 360,000 m^3) of blowdown water from cooling towers. This water would be treated on-site (e.g., in settling ponds) and injected into the ground, released to surface water bodies, or reused; and thus, would not contribute to cumulative effects on treatment systems. 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.

13.2.22.4.9 Vegetation

The proposed SEZ is located mostly within the shadscale-dominated Saline Basins ecoregion, which primarily supports a sparse saltbush-greasewood shrub community. Livestock grazing, which has occurred in the area for a very long period, likely has affected the plant communities present in the SEZ. 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. Facility construction would primarily affect Semi-Desert Shrub Steppe, Mixed Salt Desert Scrub, or Big Sagebrush Shrubland, which are relatively common within the Escalante Desert Valley area. 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 groundwater withdrawal or other 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. Mitigation measures would be used to reduce the impacts on plant communities from solar energy projects. 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 of other major actions, mainly wind energy facilities, on vegetation. A number of habitats potentially affected by development within the SEZ are relatively uncommon in the region, and cumulative impacts on these habitats from other major actions could potentially be large.

13.2.22.4.10 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, and aquatic species. The construction of utility-scale solar energy projects in the SEZ and any associated transmission line connections and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, and wildlife injury or mortality. In general, impacted species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a limited area. 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., greater sage-grouse brood rearing areas and 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 energy projects (Section 13.2.22.2). The majority of these projects are 9 to 0 mi (14 to 80 km) north (Figure 13.2.22.2-1). The Escalante Valley and Wah Wah Valley 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, wind facilities, 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. Where projects are closely spaced, the cumulative impact on a particular species could be moderate to large.

Surface water within the proposed Milford Flats South 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 its boundaries. Similarly, wetlands are uncommon on the proposed SEZ (Section 13.2.11.1). The closest approach of a perennial stream to the SEZ is the Beaver River, about 4 mi (6 km) northeast of the SEZ. Thus, potential contributions to cumulative impacts on aquatic biota and habitats resulting groundwater drawdown or soil transport to surface streams from solar facilities within the SEZ would be minimal. Further, of the other foreseeable major actions within the geographic extent of effects, proposed wind and geothermal facilities, only geothermal facilities would possibly use groundwater for operations. Thus, cumulative impacts on aquatic species would be small.

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

As many as 20 special status species could occur within the Milford Flats South SEZ based on suitable habitat. Eight of these species have been recorded within or near the SEZ: ferruginous hawk, greater sage-grouse, short-eared owl, western burrowing owl, dark kangaroo mouse, kit fox, Townsend's big-eared bat, and Utah prairie dog. The Utah prairie dog is listed as threatened under the ESA. Numerous additional species listed as threatened or endangered by the states of Utah and Nevada or listed as a sensitive species by the BLM (see Section 13.2.12.1) are known to occur within 50 mi (80 km) of the proposed SEZ. 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 projects 9 to 50 mi (14 to 80 km) to the north. Many of the special status species present on the SEZ are also likely to be present at the locations of proposed wind projects where the same habitats exist. Wind projects, however, would be generally less disruptive to habitats than would solar projects. 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.

13.2.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and engine exhaust emissions from vehicles and construction equipment. When these emissions are combined with those from other projects near solar energy developments 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, particulate matter (dust) concentration at or near the SEZ boundaries could at times exceed national ambient air quality standards. Dust generation by 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 13.2.22.2. Because the major other foreseeable actions that could produce fugitive dust emissions are located 9 mi (14 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 AQRVs by offsetting the need for energy production that results in higher levels of emissions, such as use of coal, oil, and natural gas to generate electricity. As discussed in Section 13.2.13, 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 relative large. For example, if the Milford Flats South SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 4.9% of all emissions from the current electric power systems in Utah.

13.2.22.4.13 Visual Resources

The proposed SEZ is within a relatively flat, treeless valley floor. The SEZ is visible from upper elevations of the Black Mountains to the south and the Mineral Mountains to the northeast. The area is sparsely inhabited, remote, and rural in character. Other than 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 of the landscape. Construction of utility-scale solar facilities on the SEZ would significantly alter the natural scenic quality of the area. If other reasonably foreseeable activities as described in Section 13.2.22.2 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. In addition, the Milford Wind Corridor Project, an operating geothermal project, and two authorized geothermal applications lie within 50 mi (80 km), while six applications pending authorization for wind site testing, six 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 9 to 50 mi (14 to 80 km) north (Figure 13.2.22.2-1). The Escalante Valley and Wah Wah Valley SEZs are also located within 50 mi (80 km) of the Milford Flats South SEZ. While proposed and potential facilities would be some distance from the SEZ and their contribution to cumulative impacts in the area would depend on the number of projects 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. 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 in succession, as viewers move through the landscape, such as driving on local roads. In general, the new facilities 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.

13.2.22.4.14 Acoustic Environment

The areas around the proposed Milford Flats South SEZ are relatively quiet. The existing noise sources include road traffic, railroad traffic, aircraft flyover, agricultural activities, commercial hog production facilities, and occasional community activities and events. 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 3 years per facility, but there would be minor noise impacts during operation of solar facilities, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES, which could affect nearby residences.

Other ongoing and reasonably foreseeable future activities in the general vicinity of the SEZs are described in Section 13.2.22.2. Because proposed projects are far from the SEZ, the area is sparsely populated, and noise seldom exerts its influence over several miles; cumulative noise effects during the construction or operation of solar facilities are unlikely.

13.2.22.4.15 Paleontological Resources

The proposed Milford Flats South SEZ has low potential for the occurrence of significant fossil material (Section 13.2.16). 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.

13.2.22.4.16 Cultural Resources

The Escalante Desert is rich in cultural history with settlements dating as far back as 12,000 years. The area covered by the proposed Milford Flats South 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 potentially projects likely to occur in the area, could contribute cumulatively to cultural resource impacts occurring in the region. However, only the Milford Wind Corridor Project, one operating geothermal facility, and two authorized geothermal applications lie within the 25-mi (40-km) geographic extent of effects, while several pending wind applications lie within this distance. The proposed Escalante Valley SEZ also lies about 25 mi (40 km) to the southwest, and the proposed Wah Wah Valley SEZ lies a similar distance to the northwest, 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.

13.2.22.4.17 Native American Concerns

Government-to-government consultation is under way with federally recognized Native American Tribes with possible traditional ties to the Milford Flats 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 Milford Flats South SEZ have been raised to the BLM. 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. Continued government-to-government consultation with the Tribes listed in Table 13.2.18.1-1 is necessary to effectively consider and address the Tribes' concerns relative to solar energy development in the Escalante Desert Valley.

13.2.22.4.18 Socioeconomics

Solar energy development projects in the proposed Milford Flats South SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services in combination with temporary workers involved in other new developments in the area, including other renewable energy developments. The number of workers involved in the construction of solar projects in the peak construction year 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 220 (solar PV) to as high as 3,000 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar, wind, or geothermal 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 occasionally would occur within a 50-mi (80-km) radius of the SEZ over the 20-year or longer period of solar development.

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 220, with approximately 15 to 340 total jobs created in the region (Section 13.2.19.2.2). Population increases would contribute to general upward population growth 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.

13.2.22.4.19 Environmental Justice

Low-income populations have been identified within 50 mi (80 km) of the proposed SEZ; 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 9 mi (14 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. Because the overall scale and environmental impacts of potential developments within the ROI are expected to be generally low, it is not expected that the proposed Milford Flats South SEZ would contribute to cumulative impacts on low-income populations.

13.2.22.4.20 Transportation

A major local road (Thermal Road) extends east-west along portions of the northern border of the SEZ. The three closest highways are State Routes 21, 129, and 130. A major railroad extends southwest–northeast to the west of the SEZ. The nearest public airports are in Milford and Beaver. The annual average daily traffic (AADT) on the State Routes 21, 129, and 130 are currently about 1,440, 600, and 900, respectively. 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 vehicles. This increase in highway traffic from construction workers could have moderate cumulative impacts in combination with existing traffic levels and increases from construction traffic from other major future actions, should construction schedules overlap. Local road improvements may be necessary so as not to overwhelm the local roads near site access points. Any impacts during construction activities would be temporary. The impacts could also be mitigated to some degree by staggering work schedules and implementing 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.

This page intentionally left blank.

13.2.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

AECOM (Architectural Engineering, Consulting, Operations and Maintenance), 2009, *Project Design Refinements*. Available at http://energy.ca.gov/sitingcases/beacon/documents/applicant/refinements/002_WEST1011185v2_Project_Design_Refinements.pdf. Accessed Sept. 2009.

AMA (American Medical Association), 2009, *Physician Characteristics and Distribution in the U.S.*, Chicago, Ill. Available at http://www.ama-assn.org/ama/pub/category/2676.html.

Anderson, R.E., and G.E. Christenson, 1989, *Quaternary Faults, Folds, and Selected Volcanic Features in the Cedar City 1° X 2° Quadrangle, Utah*, Utah Geological and Mineral Survey, Miscellaneous Publication 89-6.

Beacon Solar, LLC, 2008, *Application for Certification for the Beacon Solar Energy Project, submitted to the California Energy Commission*, March. Available at http://www.energy.ca.gov/sitingcases/beacon/index.html.

Beaver, 2009, *Beaver Municipal Airport*. Available at http://www.beaverutah.net/airport.htm. Accessed Nov. 12, 2009.

Beranek, L.L., 1988, *Noise and Vibration Control*, rev. ed., Institute of Noise Control Engineering, Washington, D.C.

Black, B.D., and S. Hecker, 1999, "Fault Number 2485, Wah Wah Mountains (South End near Lund) Fault," in *Quaternary Fault and Fold Database of the United States*, U.S. Geological Survey. Available at http://earthquakes.usgs.gov/regional/qfaults. Accessed Dec. 1, 2009.

BLM (Bureau of Land Management), *1980, Green River—Hams Fork Draft Environmental Impact Statement: Coal*, Denver, Colo.

BLM, 1983a, *Final Supplemental Environmental Impact Statement for the Prototype Oil Shale Leasing Program*, Colorado State Office, Denver, Colo., Jan.

BLM, 1983b, *Pinyon Management Framework Plan*, Cedar City District, Utah, June.

BLM, 1984, *Visual Resource Management*, BLM Manual Handbook 8400, Release 8-24, U.S. Department of the Interior.

BLM, 1986a, *Visual Resource Inventory*, BLM Manual Handbook 8410-1, Release 8-28, U.S. Department of the Interior, Jan.

BLM, 1986b, *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1, Release 8-30, U.S. Department of the Interior, Jan.

BLM, 1996, *White River Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement*, Colorado State Office, White River Resource Area, Craig District, Colo., June.

BLM, 2001, *Utah Water Rights Fact Sheet*. Available at http://www.blm.gov/nstc/WaterLaws/pdf/Utah.pdf.

BLM, 2007, *Proposed Oil Shale and Tar Sands Resource Management Plan Amendments to Address Land Use Allocations in Colorado, Utah, and Wyoming and Programmatic Environmental Impact Statement*, FES 08-2, Sept.

BLM, 2008, *Special Status Species Management*, BLM Manual 6840, Release 6-125, U.S. Department of the Interior, Dec. 12.

BLM, 2009a, *Rangeland Administration System*. Available at http://www.blm.gov/ras/index.htm. Accessed Nov. 24, 2009.

BLM, 2009b, *Herd Management Areas Utah*, Washington, D.C. Available at http://www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and_Renewable_Resources/wild_horses_and_burros/tatistics_and_maps/new_hma_state_maps.Par.73653.File.dat/HMA_Utah.pdf. Accessed Oct. 20, 2009.

BLM, 2009c, *Geothermal Drilling Permit*. Available at http://www.blm.gov/ut/enbb/view_project.php. Accessed Nov. 11, 2009.

BLM, 2009d, *Production/Injection Testing of Wells 51-7, 44-7, 72-12, and B01-1 at Enel's Cove Fort/Sulphurdale Geothermal Well Field*. Available at http://www.blm.gov/ut/enbb/view_project.php. Accessed Nov. 17, 2009.

BLM, 2009e, *Environmental Notification Bulletin Board*. Available at http://www.blm.gov/ut/enbb/view_project.php. Accessed Nov. 17, 2009.

BLM, 2010a, *Draft Visual Resource Inventory*, prepared for the U.S. Department of Interior, Bureau of Land Management Cedar City Field Office, Cedar City, Utah, by Otak, Inc., March.

BLM, 2010b, *Solar Energy Interim Rental Policy*, U.S. Department of the Interior. Available at http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos and Bulletins/national instruction/2010/IM_2010-141.html.

BLM, 2010c, *Proposed Pony Express RMP Amendment and Final EIS for the UNEV Pipeline*, April. Available at http://www.blm.gov/pgdata/etc/medialib/blm/ut/lands_and_minerals/lands/major_projects/unev_pipeline.Par.73184.File.dat/01_UNEV%20FEIS%20Front%20Matter_FINAL%20508%20&%20BM.pdf.

BLM and USFS (Bureau of Land Management and U.S. Forest Service), 2010a, *GeoCommunicator: Mining Map*. Available at http://www.geocommunicator.gov/GeoComm/index.shtm. Accessed June 10, 2010.

BLM and USFS, 2010b, *GeoCommunicator: Energy Map.* Available at http://www.geocommunicator.gov/GeoComm/index.shtm. Accessed May 27, 2010.

BRAC (Blue Ribbon Advisory Council on Climate Change), 2007, *Report to Governor Jon M. Huntsman Jr*., Final BRAC Report, Utah Department of Environmental Quality, Oct. 3. Available at http://www.deq.utah.gov/BRAC_Climate/final_report.htm. Accessed Dec. 3, 2009.

BTS (Bureau of Transportation Statistics), 2008, *Air Carriers: T-100 Domestic Segment (All Carriers)*, Research and Innovative Technology Administration, U.S. Department of Transportation, Dec. Available at http://www.transtats.bts.gov/Fields.asp?Table_ID=311. Accessed June 23, 2009.

Burden, C. B., et al., 2009, *Ground-Water Conditions in Utah Spring 2009*, U.S. Geological Survey, Cooperative Investigations Report No. 50. Available at http://ut.water.usgs.gov/publications/GW2009.pdf. Accessed Dec. 8, 2009.

Callaway, D., et al., 1986, "Ute," pp. 336–367 in *Handbook of North American Indians, Vol. 11, Great Basin*, W.L. d'Azevedo (editor), Smithsonian Institution, Washington, D.C.

Carr, S.L., 1972, *The Historic Guide to Utah Ghost Towns*, Western Epics, Salt Lake City, Utah.

CDC (Centers for Disease Control and Prevention), 2009, *Divorce Rates by State: 1990, 1995, 1999–2007*. Available at http://www.cdc.gov/nchs/data/nvss/Divorce%20Rates%2090%2095%20and%2099-07.pdf.

CDOW (Colorado Division of Wildlife), 2009, *Natural Diversity Information Source, Wildlife Species Page,* Colorado Division of Wildlife, Denver, Colo. Available at http://ndis.nrel.colostate.edu/wildlife.asp. Accessed Aug. 29, 2009.

Cedar City, 2009, *Cedar City, Utah, Airport*. Available at http://ut-cedarcity.civicplus.com/index.aspx?NID=76. Accessed Aug. 13, 2009.

CEQ (Council on Environmental Quality), 1997, *Environmental Justice Guidance under the National Environmental Policy Act*, Executive Office of the President, Washington, D.C., Dec. Available at http://www.whitehouse.gov/CEQ.

Christenson, G.E. (editor), 1995, *The September 2, 1992 ML 5.8 St. George Earthquake, Washington County, Utah*, Utah Geological Survey Circular 88.

Connelly, J.W., et al., 2000, *Guidelines to Manage Sage Grouse Populations and Their Habitats*, Wildlife Society Bulletin 28(4):967–985.

Cowherd, C., et al., 1988, *Control of Open Fugitive Dust Sources*, EPA 450/3-88-008, U.S. Environmental Protection Agency, Research Triangle Park, N.C.

Crum, S.J., 1994, Po'I Pentun Tammen Kummappeh *The Road on Which We Came: A History of the Western Shoshone,* University of Utah Press, Salt Lake City, Utah.

Dalley, G., 2009, personal communication from Dalley (Bureau of Land Management, Cedar City Field Office, Cedar City, Utah) to B. Verhaaren (Argonne National Laboratory, Argonne, Ill.), May 26.

Defa, D.R., 2010, "The Goshute Indians of Utah," Chapter 3 in *Utah's Native Americans*, State of Utah. Available at http://historytogo.utah.gov/people/ethnic_cultures/the_history_of_utahs_american_indians/chapter3.html.

Diefenbach, A.K., et al., 2009, *Chronology and References of Volcanic Eruptions and Selected Unrest in the United States, 1980–2008*, U.S. Geological Survey Open File Report 2009-1118.

DOE (U.S. Department of Energy), 2009, *Report to Congress, Concentrating Solar Power Commercial Application Study: Reducing Water Consumption of Concentrating Solar Power Electricity Generation*, Jan. 13.

Duncan, C., 2010, "The Northern Utes of Utah," Chapter 5 in *Utah's Native Americans*, State of Utah. Available at http://historytogo.utah.gov/people/ethnic_cultures/the_history_of_utahs_american_indians/chapter5.html.

EIA (Energy Information Administration), 2009, *Annual Energy Outlook 2009 with Projections to 2030*, DOE/EIA-0383, March.

Eldred, K.M., 1982, "Standards and Criteria for Noise Control—An Overview," *Noise Control Engineering* 18(1):16–23, Jan.–Feb.

EPA (U.S. Environmental Protection Agency), 1974, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, EPA-550/9-74-004, Washington, D.C., March. Available at http://www.nonoise.org/library/levels74/levels74.htm. Accessed Nov. 17, 2008.

EPA, 2009a, *Energy CO_2 Emissions by State*. Available at http://www.epa.gov/climatechange/emissions/state_energyco2inv.html, last updated June 12, 2009. Accessed Sept. 11, 2009.

EPA, 2009b, *AirData: Access to Air Pollution Data.* Available at http://www.epa.gov/oar/data/. Accessed Nov. 18, 2009.

EPA, 2009c, *Preferred/Recommended Models—AERMOD Modeling System.* Available at http://www.epa.gov/scram001/dispersion_prefrec.htm. Accessed Nov. 8, 2009.

EPA, 2009d, *eGRID.* Available at http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html. Accessed Jan. 12, 2009.

EPA, 2010, *National Ambient Air Quality Standards (NAAQS)*. Available at http://www.epa.gov/air/criteria.html. Last updated June 3, 2010. Accessed June 4, 2010.

FAA (Federal Aviation Administration), 2009, *Airport Data (5010) & Contact Information, Information Current as of 07/02/2009*. Available at http://www.faa.gov/airports/airport_safety/airportdata_5010. Accessed Aug. 13, 2009.

FEMA (Federal Emergency Management Agency), 2009, *FEMA Map Service Center*. Available at http://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1. Accessed Nov. 20, 2009.

Fire Departments Network, 2009, *Fire Departments by State*. Available at http://www.firedepartments.net.

First Wind, undated, *First Wind Projects Building Energy Independence*. Available at http://www.firstwind.com/projects/index.cfm. Accessed Nov. 13, 2009.

First Wind, 2009, *Milford Wind Corridor Project Is Completed; Largest Wind Facility in Utah and One of the Largest in the West*, press release, Nov. 10. Available at http://www.firstwind.com/aboutFirstWind/news.cfm?ID=db580938%2Da4e6%2D4521%2Da81a%2Dff33cd51251b. Accessed Nov. 13, 2009.

Forster, R.R., 2006, *Land Subsidence in Southwest Utah from 1993 to 1998 Measured with Interferometric Synthetic Aperture Radar (InSAR)*, Utah Geological Survey Miscellaneous Publication 06-5, ISBN 1-55791-754-X.

Fowler, C.S., 1986, “Subsistence,” pp. 64–97 in *Handbook of North American Indians, Vol. 11, Great Basin*, W.L. d’Azevedo (editor), Smithsonian Institution, Washington, D.C.

Galloway, D., et al., 1999, *Land Subsidence in the United States*, U.S. Geological Survey Circular 1182.

Gerston, R.C., and R.B. Smith, 1979, *Interpretation of a Seismic Refraction Profile across the Roosevelt Hot Springs, Utah and Vicinity*, U.S. Department of Energy, Report No. ADO/78-1701.a.3.

Giffen, R., 2009, “Rangeland Management Web Mail,” personal communication from Giffen (U.S. Forest Service, Rangelands Management, Washington, D.C.) to W. Vinikour (Argonne National Laboratory, Argonne, Ill.), Sept. 22.

Governor’s Office of Planning and Budget, 2009, *Demographic and Economic Projections.* Available at http://www.governor.utah.gov/dea/projections.html. Accessed Dec. 3, 2009.

Hanson, C.E., et al., 2006, *Transit Noise and Vibration Impact Assessment*, FTA-VA-90-1003-06, prepared by Harris Miller Miller & Hanson Inc., Burlington, Mass., for U.S. Department of Transportation, Federal Transit Administration, Washington, D.C., May. Available at http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf.

Hecker, S., 1993, *Quaternary Tectonics of Utah with Emphasis on Earthquake-Hazard Characterization*, Utah Geological Survey Bulletin 127.

Hill, D.P., et al., 1998, *Future Eruptions in California's Long Valley Area—What's Likely?* U.S. Geological Survey Fact Sheet 073-97, Nov.

Hill, D.P., et al., 2000, *Living with a Restless Caldera—Long Valley California*, U.S. Geological Survey Fact Sheet 108-96, Version 2.1, May.

Hintze, L., 1980, *Geologic Map of Utah (Scale 1:500,000)*, Utah Geological and Mineral Survey.

Iron County, 2009, "Solar Power Plant," Chapter 17.33 in *Title 17 Zoning*. Available at http://planning.utah.gov/Library/Index_files/PDFs/Iron17.33.pdf. Accessed Nov. 13, 2009.

Kelly, I.T., 1934, "Southern Paiute Bands," *American Anthropologist* 36(4):548–560.

Kelly, I., and C. Fowler, 1986, "Southern Paiute," pp. 368–397 in *Handbook of North American Indians,* Vol. 11, *Great Basin*, W.L. d'Azevedo (editor), Smithsonian Institution, Washington, D.C.

Kenny, J.F., et al., 2009, *Estimated Use of Water in the United States in 2005*, U.S. Geological Survey, Circular 1344. Available at http://pubs.usgs.gov/circ/1344.

Klauk, R.H., and C. Gourley, 1983, *Geothermal Assessment of a Portion of the Escalante Valley, Utah*, Utah Geological and Mineral Survey, Special Study 63, Dec.

Lee, H., 2009, "Description of Proposed PacifiCorp Action for Integration of 58-3 and 71-10," personal communication from Lee (CH2M HILL, Salt Lake City, Utah) to C. Hite (BLM Cedar City Field Office), Aug. 7.

Lee, J.M., et al., 1996, *Electrical and Biological Effects of Transmission Lines: A Review*, Bonneville Power Administration, Portland, Ore., Dec.

Lovich, J., and D. Bainbridge, 1999, "Anthropogenic Degradation of the Southern California Desert Ecosystem and Prospects for Natural Recovery and Restoration," *Environmental Management* 24(3):309–326.

Ludington, S., et al., 2007, *Preliminary Integrated Geologic Map Databases for the United States—Western States: California, Nevada, Arizona, Washington, Oregon, Idaho, and Utah*, U.S. Geological Survey Open File Report 2005-1305, Version 1.3, original file updated in December 2007. Available at http://pubs.usgs.gov/of/2005/1305/index.htm.

Lund, W.R., 2005, *Earth Fissures near Beryl Junction in the Escalante Desert*, Technical Report, Special Study 115, Utah Geological Survey, Jan. 26. Available at http://ugs.utah.gov/utahgeo/hazards/ground_cracks/fissures.htm. Accessed Dec. 3, 2009.

Lund, W.R., et al., 2005, *The Origin and Extent of Earth Fissures in Escalante Valley, Southern Escalante Desert, Iron County, Utah*, Utah Geological Survey, Special Study 115.

Lund, W.R., et al., 2007, *Paleoseismic Investigation and Long-Term Slip History of the Hurricane Fault in Southwestern Utah*, Utah Geological Survey, Special Study 119.

Madsen, D.B., 2000, *Late Quaternary Paleoecology in the Bonneville Basin*, Utah Geological Survey Bulletin 130.

Mason, J.L., 1998, *Ground-Water Hydrology and Simulated Effects of Development in the Milford Area, an Arid Basin in Southwestern Utah*, U.S. Geological Survey, Professional Paper 1409-G.

Maung, M., 2009, personal communication from Maung (Utah Department of Environmental Quality, Division of Air Quality, Salt Lake City, Utah) to A. Smith (Argonne National Laboratory, Argonne, Ill.), Nov. 18.

MIG, Inc. (Minnesota IMPLAN Group), 2010, *State Data Files*, Stillwater, Minn.

Milford, 2009, *Airport, City of Milford, Utah*. Available at http://www.milfordut.com/departments.airport.html. Accessed Nov. 12, 2009.

Miller, C.D., 1989, *Potential Hazards from Future Volcanic Eruptions in California*, U.S. Geological Survey Bulletin 1847.

Miller, N.P., 2002, "Transportation Noise and Recreational Lands," in *Proceedings of Inter-Noise 2002*, Dearborn, Mich., Aug. 19–21. Available at http://www.hmmh.com/cmsdocuments/N013.pdf. Accessed Aug. 30, 2007.

Milligan, M., 2009, *What Are Those Crunchy Crusts Found on Some Utah Soils?,* Utah Geological Survey. Available at http://ugs.utah.gov/surveynotes/gladasked/gladcrusts.htm. Accessed Dec. 1, 2009.

Mower, R.W., and R.M. Cordova, 1974, *Water Resources of the Milford Area, Utah, with Emphasis on Ground Water*, U.S. Geological Survey, Technical Publication 43.

Mower, R.W., and G.W. Sandberg, 1982, *Hydrology of the Beryl-Enterprise, Escalante Desert, Utah, with Emphasis on Ground Water*, U.S. Geological Survey, Open File Report 81-533.

Murphey, P.C., and D. Daitch, 2007, "Figure D4, Utah-PFYC," in *Paleontological Overview of Oil Shale and Tar Sands Areas in Colorado, Utah, and Wyoming*, prepared for U.S. Department of the Interior, Bureau of Land Management, Dec.

National Research Council, 1996, *Alluvial Fan Flooding*, Committee on Alluvial Fan Flooding, Water Science and Technology Boar, and Commission on Geosciences, Environment, and Resources, National Academy Press, Washington, D.C.

NatureServe, 2010, *NatureServe Explorer: An Online Encyclopedia of Life (Web Application)*, Version 7.1., Arlington, Va. Available at http://www.natureserve.org/explorer. Accessed Oct. 1, 2010.

NCDC (National Climatic Data Center), 1989, *1988 Local Climatological Data Annual Summary with Comparative Data, Milford, Utah*, National Oceanic and Atmospheric Administration. Available at http://www7.ncdc.noaa.gov/IPS/lcd/lcd.html. Accessed Nov. 9, 2009.

NCDC, 2009a, *Climates of the States (CLIM60): Climate of Utah*, National Oceanic and Atmospheric Administration, Satellite and Information Service. Available at http://cdo.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl. Accessed Nov. 9, 2009.

NCDC, 2009b, *Integrated Surface Data (ISD), DS3505 Format*, database, Asheville, N.C. Available at ftp://ftp3.ncdc.noaa.gov/pub/data/noaa. Accessed Nov. 9, 2009.

NCDC, 2010, *Storm Events*, National Oceanic and Atmospheric Administration, Satellite and Information Service. Available at http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms. Accessed Oct. 23, 2010.

NCES (National Center for Education Statistics), 2009, *Search for Public School Districts*, U.S. Department of Education. Available at http://www.nces.ed.gov/ccd/districtsearch.

NRCS (Natural Resources Conservation Services), 2005, *Beaver County, Utah Resource Assessment*, U.S. Department of Agriculture, Aug. Available at http://www.ut.nrcs.usda.gov/technical/nri/RA-data/Beaver_Res_Assmnt.pdf. Accessed Nov. 20, 2009.

NRCS, 2008, *Soil Survey Geographic (SSURGO) Database for Beaver County, Nevada*. Available at http://SoilDataMart.nrcs.usds.gov.

NRCS, 2009a, *Major Land Resource Area 28A—Great Salt Lake Area Fact Sheet*. Available at http://www.ut.nrcs.usda.gov/technical/technology/range/mlra28a.html. Accessed Dec. 1, 2009.

NRCS, 2009b, *Web Soil Survey*, U.S. Department of Agriculture, Washington, D.C. Available at http://websoilsurvey.nrcs.usda.gov. Accessed Nov. 30, 2009.

NRCS, 2010, *Custom Soil Resource Report for Beaver County (covering the proposed Milford Flats South SEZ), California*, U.S. Department of Agriculture, Washington, D.C., Oct. 7.

PacifiCorp, 2010, *Bringing New Transmission to the West*. Available at http://www.pacificorp.com/tran/tp/eg.html.

Pederson, J., undated, *Mountain Lion (Felis concolor)*, Wildlife Notebook Series No. 5, Utah Division of Wildlife Resources, Salt lake City, Utah. Available at http://wildlife.utah.gov/publications/pdf/newlion.pdf. Accessed Nov. 25, 2009.

Prey, D., 2009, personal communication from Prey (Utah Department of Environmental Quality, Division of Air Quality, Salt Lake City, Utah) to Y.-S. Chang (Argonne National Laboratory, Argonne, Ill.), Nov. 17.

Robson, S.G., and E.R. Banta, 1995, *Ground Water Atlas of the United States: Arizona, Colorado, New Mexico, Utah*, U.S. Geological Survey, HA 730-C.

Roe, S., et al., 2007, *Final Utah Greenhouse Gas Inventory and Reference Case Projections, 1990–2020*, prepared by Center for Climate Strategies, Washington, D.C., for Utah Department of Environmental Quality, Salt Lake City, Utah, Feb. Available at http://www.deq.utah.gov/BRAC_Climate/docs/fdocs/Final_Utah_GHG_I&F_Report_3-29-07.pdf. Accessed Nov. 19, 2009.

Romin, L.A., and J.A. Muck, 1999, *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances*, U.S. Fish and Wildlife Service, Utah Field Office, Salt Lake City, Utah. May. Available at https://fs.ogm.utah.gov/pub/coal_related/MiscPublications/USFWS_Raptor_Guide/RAPTORGUIDE.PDF. Accessed Oct. 25, 2010.

Royster, J., 2008, "Indian Land Claims," pp. 28-37 in *Handbook of North American Indians,* Vol. 2, *Indians in Contemporary Society,* G.A. Bailey (editor), Smithsonian Institution, Washington, D.C.

SAMHSA (Substance Abuse and Mental Health Services Administration), 2009, *National Survey on Drug Use and Health, 2004, 2005 and 2006*, Office of Applied Studies, U.S. Department of Health and Human Services. Available at http://oas.samhsa.gov/substate2k8/StateFiles/TOC.htm#TopOfPage.

SES (Stirling Energy Systems) Solar Two, LLC, 2008, *Application for Certification*, submitted to the Bureau of Land Management, El Centro, Calif., and the California Energy Commission, Sacramento, Calif., June. Available at http://www.energy.ca.gov/sitingcases/solartwo/documents/applicant/afc/index.php. Accessed Oct. 1, 2008.

Smith, M., et al., 2001, "Growth, Decline, Stability and Disruption: A Longitudinal Analysis of Social Well-Being in Four Western Communities," *Rural Sociology* 66:425–450.

Stebbins, R.C., 2003, *A Field Guide to Western Reptiles and Amphibians*, Houghton Mifflin Company, New York, N.Y.

Stoffle, R.W., and H.F. Dobyns, 1983, *Nuvagantu: Nevada Indians Comment on the Intermountain Power Project, Cultural Resources Series No. 7*, Nevada State Office of the Bureau of Land Management, Reno, Nev.

Stoffle, R.W., et al., 1997, “Cultural Landscapes and Traditional Cultural Properties: A Southern Paiute View of the Grand Canyon and Colorado River,” *American Indian Quarterly* 21(2):229–249.

Stoffle, R., et al., 1999, “*Puchuxwavaats Uapi* (To know about plants): Traditional Knowledge and the Cultural Significance of Southern Paiute Plants,” *Human Organization* 58(4): 416–429.

Stout, D., 2009, personal communication from Stout (U.S. Fish and Wildlife Service, Acting Assistant Director for Fisheries and Habitat Conservation, Washington, D.C.) to L. Jorgensen (Bureau of Land Management, Washington, D.C.) and L. Resseguie (Bureau of Land Management Washington, D.C.), Sept. 14, 2009.

TransWest, 2010, *Delivering Wyoming Wind Energy to the West,* TransWest Express, LLC. Available at http://www.transwestexpress.net/index.shtml.

UBWR (Utah Board of Water Resources), 1995, *Utah State Water Plan, Cedar/Beaver Basin*, April 1995.

UDA (Utah Department of Agriculture), 2008, *Utah Noxious Weed List*, October. Available at http://ag.utah.gov/divisions/plant/noxious/documents/noxUtah.pdf. Accessed May 26, 2010.

UDA, 2009, *County Declared Noxious Weeds in Utah*, August. Available at http://ag.utah.gov/divisions/plant/noxious/documents/noxCounty.pdf. Accessed May 26, 2010.

UDEQ (Utah Department of Environmental Quality), 2009, *Windblown Dust*, Division of Air Quality. Available at http://www.airquality.utah.gov/Public-Interest/Public-Commen-Hearings/Exceptional_Events/EE_Wind.htm. Accessed Nov. 19.

UDOT (Utah Department of Transportation), 2009, *Traffic on Utah Highways, 2008*, Systems Planning and Programming Division, Traffic Analysis Section. Available at http://www.udot.utah.gov/main/uconowner.gf?n=5829020562213603. Accessed Aug. 15, 2009.

UDWQ (Utah Division of Water Quality), 2008. *Authorization to Discharge under the Utah Pollutant Discharge Elimination System, Storm Water General Permit for Construction Activities Permit No. UTR300000*, June 2008.

UDWR (Utah Division of Wildlife Resources), 2003, *Vertebrate Information Compiled by the Utah Natural Heritage Program: A Progress Report*, Utah Department of Natural Resources. Available at http://dwrcdc.nr.utah.gov/ucdc/ViewReports/UNHPVertReport.pdf. Accessed Oct. 25, 2010.

UDWR, 2006a, *UDWR Habitat Coverages*, Utah Department of Natural Resources, Salt Lake City, Utah. Available at http://dwrcdc.nr.utah.gov/ucdc/ downloadgis/disclaim.htm. Accessed Nov. 4, 2009.

UDWR, 2006b, *Big Trout Are Back at Minersville Reservoir.* Available at http://wildlife.utah.gov/news/06-05/minersville.php.

UDWR, 2008, *Utah Statewide Management Plan for Mule Deer*, Utah Department of Natural Resources, Salt Lake City, Utah. Available at http://wildlife.utah.gov/hunting/biggame/pdf/mule_deer_pla%20approved_12_4_2008.pdf. Accessed Nov. 2, 2009.

UDWR, 2009a, *Utah Conservation Data Center*. Available at http://dwrcdc.nr.utah.gov/ucdc/default.asp. Accessed Nov. 3, 2009.

UDWR, 2009b, *Utah Cougar Management Plan V. 2.0, 2009–2021*, DWR Publication No. 09-15, Utah Department of Natural Resources, Salt Lake City, Utah. Available at http://wildlife.utah.gov/pdf/cmgtplan.pdf. Accessed Nov. 2, 2009.

UDWR, 2009c, *Utah Pronghorn Statewide Management Plan*, Utah Department of Natural Resources, Salt Lake City, Utah. Available at http://wildlife.utah.gov/hunting/biggame/pdf/Statewide_prong_mgmt_2009.pdf. Accessed Nov. 2, 2009.

UDWR, 2009d, *Utah Greater Sage-grouse Management Plan*, Utah Department of Natural Resources, Publication 09-17, Salt Lake City, Utah.

UDWR, 2010a, *Utah Elk Statewide Management Plan*. Utah Department of Natural Resources, Salt Lake City, Utah. Available at http://wildlife.utah.gov/hunting/biggame/pdf/elk_plan.pdf. Accessed Oct. 11, 2010.

UDWR, 2010b, *Utah Sensitive Species List*, Utah Department of Natural Resources, Salt Lake City, Utah, May.

UGS (Utah Geological Survey), undated, *Power Plants: Roosevelt Hot Springs, Beaver County*. Available at http://geology.utah.gov/emp/geothermal/powerplants.htm. Accessed Dec. 8, 2009.

UGS, 2009, *Quaternary Faults*. Available at http://geology.utah.gov/emp/geothermal/quaternary_faults.htm. Accessed Dec. 3, 2009.

UGS, 2010, *Lake Bonneville: PI-39 Commonly Asked Questions about Utah's Great Salt Lake and Ancient Lake Bonneville*. Available at http://geology.utah.gov/online/PI-39/pi39pg01.htm. Accessed May 18, 2010.

University of Utah, 2009, *Utah History Encyclopedia*. Available at http://www.media.utah.edu/UHE/indeex_frame.html. Accessed Dec. 3, 2009.

UNPS (Utah Native Plant Society), 2009, *Utah Rare Plants Guide*. Available at http://www.utahrareplants.org/. Accessed Nov. 3, 2009.

URS Corporation, 2006, *Aquatic Communities of Ephemeral Stream Ecosystems*, Arid West Water Quality Research Project, prepared for Pima County Wastewater Management Department, with funding by EPA Region IX, Assistance Agreement X97952101.

U.S. Bureau of the Census, 2009a, *County Business Patterns*, *2006*. Washington, D.C. Available at http://www.census.gov/ftp/pub/epcd/cbp/view/cbpview.html.

U.S. Bureau of the Census, 2009b, *GCT-T1, Population Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009c, *QT-P32, Income Distribution in 1999 of Households and Families: 2000. Census 2000 Summary File (SF 3)—Sample Data*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009d, *S1901, Income in the Past 12 Months. 2006–-2008 American Community Survey 3-Year Estimates.* Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009e*, GCT-PH1, GCT-PH1, Population, Housing Units, Area, and Density: 2000. Census 2000 Summary File (SF 1)—100-Percent Data*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009f, *T1, Population Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009g, *GCT2510, Median Housing Value of Owner-Occupied Housing Units (Dollars). 2006–2008 American Community Survey 3-Year Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009h, *QT-H1, General Housing Characteristics, 2000. Census 2000 Summary File 1 (SF 1) 100-Percent Data*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009i, *GCT-T9-R, Housing Units, 2008. Population Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009j, *S2504, Physical Housing Characteristics for Occupied Housing Units. 2006–2008 American Community Survey 3-Year Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009k, *Census 2000 Summary File 1 (SF 1) 100-Percent Data*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009l, *Census 2000 Summary File 3 (SF 3)—Sample Data.* Available at http://factfinder.census.gov/.

USDA (U.S. Department of Agriculture), 1998, *Soil Survey of Iron-Washington Area, Utah, Parts of Iron, Kane and Washington Counties*, Natural Resources Conservation Service in cooperation with the Utah Agricultural Experiment Station and the Bureau of Land Management.

USDA, 2004*, Understanding Soil Risks and Hazards—Using Soil Survey to Identify Areas with Risks and Hazards to Human Life and Property*, G.B. Muckel (editor).

USDA, 2009a, *Western Irrigated Agriculture, Data Sets*. Available at http://www.ers.usda.gov/data/westernirrigation. Accessed Nov. 20, 2009.

USDA, 2009b, *2007 Census of Agriculture: Utah State and County Data, Volume 1, Geographic Area Series,* National Agricultural Statistics Service, Washington, D.C. Available at http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Utah/index.asp.

USDA, 2010, *United States Department of Agriculture Plants Database*. Available at http://plants.usda.gov/index.html. Accessed May 20, 2010.

U.S. Department of Commerce, 2009, *Local Area Personal Income*, Bureau of Economic Analysis. Available at http://www.bea.doc.gov/bea/regional/reis.

U.S. Department of Justice, 2008, *Crime in the United States: 2007*. Available at http://www.fbi.gov/ucr/cius2006/about/table_title.html.

U.S. Department of Justice, 2009a, "Table 8: Offences Known to Law Enforcement, by State and City," *2008 Crime in the United States*, Federal Bureau of Investigation, Criminal Justice Information Services Division. Available at http://www.fbi.gov/ucr/cius2008/data/table_08.html.

U.S. Department of Justice, 2009b, "Table 10: Offences Known to Law Enforcement, by State and by Metropolitan and Non-metropolitan Counties," *2008 Crime in the United States*, Federal Bureau of Investigation, Criminal Justice Information Services Division. Available at http://www.fbi.gov/ucr/cius2008/data/table_08.html.

U.S. Department of Labor, 2009a, *Local Area Unemployment Statistics: States and Selected Areas: Employment Status of the Civilian Noninstitutional Population, 1976 to 2007, Annual Averages*, Bureau of Labor Statistics. Available at http://www.bls.gov/lau/staadata.txt.

U.S. Department of Labor, 2009b, *Local Area Unemployment Statistics: Unemployment Rates by State,* Bureau of Labor Statistics. Available at http://www.bls.gov/web/laumstrk.htm.

U.S. Department of Labor, 2009c, *Local Area Unemployment Statistics: County Data,* Bureau of Labor Statistics. Available at http://www.bls.gov/lau.

U.S. Department of Labor, 2009d, *Consumer Price Index, All Urban Consumers—(CPI-U) U.S. City Average, All Items*, Bureau of Labor Statistics. Available at ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt.

U.S. Department of the Interior, 2010, Native American Consultation Database. National NAGPRA Online Databases. National Park Service. Available at http://grants.cr.nps.gov/nacd/index.cfm.

USFS (U.S. Forest Service), 2007, *Wild Horse and Burro Territories*, Rangelands Management, Washington, D.C. Available at http://www.fs.fed.us/rangelands/ecology/wildhorseburro//territories/index.shtml. Accessed Oct. 20, 2009.

USFWS (U.S. Fish and Wildlife Service), 2009, *National Wetlands Inventory*. Available at http://www.fws.gov/wetlands.

USGS (U.S. Geological Survey), 2004, *National Gap Analysis Program, Provisional Digital Land Cover Map for the Southwestern United States*. Version 1.0. RS/GIS Laboratory, College of Natural Resources, Utah State University. Available at http://earth.gis.usu.edu/swgap/landcover.html. Accessed March 15, 2010.

USGS, 2005a, *National Gap Analysis Program, Southwest Regional GAP Analysis Project—Land Cover Descriptions*, RS/GIS Laboratory, College of Natural Resources, Utah State University. Available at http://earth.gis.usu.edu/swgap/legend_desc.html. Accessed March 15, 2010.

USGS, 2005b*, Southwest Regional GAP Analysis Project,* U.S. Geological Survey National Biological Information Infrastructure. Available at http://fws-nmcfwru.nmsu.edu/swregap/habitatreview/Review.asp.

USGS, 2007, *National Gap Analysis Program, Digital Animal-Habitat Models for the Southwestern United States*, Version 1.0. Center for Applied Spatial Ecology, New Mexico Cooperative Fish and Wildlife Research Unit, New Mexico State University. Available at http://fws-nmcfwru.nmsu.edu/swregap/HabitatModels/default.htm. Accessed March 15, 2010.

USGS, 2008, *National Seismic Hazard Maps—Peak Horizontal Acceleration (%g) with 10% Probability of Exceedance in 50 Years (Interactive Map)*. Available at http://gldims.cr.usgs.gov/nshmp2008/viewer.htm. Accessed Aug. 4, 2010.

USGS, 2010a, *Water Resources of the United States—Hydrologic Unit Maps*. Available at http://water.usgs.gov/GIS/huc.html. Accessed April 27, 2010.

USGS, 2010b, *Active Groundwater Level Network*. Available at http://groundwaterwatch.usgs.gov. Accessed May 10, 2010.

USGS, 2010c, *National Earthquake Information Center (NEIC)—Circular Area Database Search (within 100-km of the center of the proposed Escalante Valley SEZ)*. Available at http://earthquake.usgs.gov/earthquakes/eqarchives/epic/epic_circ.php. Accessed Aug. 5, 2010.

USGS, 2010d, *Glossary of Terms on Earthquake Maps—Magnitude*. Available at http://earthquake.usgs.gov/earthquakes/glossary.php#magnitude. Accessed Aug. 8, 2010.

USGS and UGS (Utah Geological Survey), 2009, *Quaternary Faults*. Available at http://geology.utah.gov/emp/geothermal/quaternary_faults.htm. Accessed Dec. 3, 2009.

Utah Division of Water Resources, undated, *2003 Water Use Comparison and Summary*. Available at http://www.conservewater.utah.gov/success/. Accessed Dec. 3, 2009.

Utah Division of Water Resources, 2001, *Utah's Water Resources: Planning for the Future*, May. Available at http://www.water.utah.gov/waterplan/SWP_pff.pdf. Accessed Dec. 3, 2009.

Utah DWR (Utah Division of Water Rights), undated, *2003 Water Use Comparison and Summary*. Available at http://www.conservewater.utah.gov/success/. Accessed Dec. 3, 2009.

Utah DWR, 2004, *Escalante Valley Area 71*, July 27. Available at http://www.waterrights. utah.gov/wrinfo/policy/wrareas/area71.html. Accessed Dec. 3, 2009.

Utah DWR, 2005, *Water Right Information*. Available at http://www.waterrights.utah.gov/ wrinfo/default.asp.

Utah DWR, 2008, *State of Utah Water Well Handbook*. Available at http://www.waterrights. utah.gov/wellinfo/handbook.pdf.

Utah DWR, 2010, *Querying Water Right Records*, Utah Division of Water Rights. Available at http://www.waterrights.utah.gov/wrinfo/query.asp. Accessed Oct. 14, 2010.

Utah Foundation, 2008, *The Impacts of Utah's Population Growth*, Research Brief, Oct. 9. Available at http://www.utahfoundation.org/reports/?page_id=270#_edn29. Accessed Dec. 2, 2009.

Utah Ornithological Society, 2007, *Bird List for Beaver County, Utah*, Utah Ornithological Society, Provo, Utah. Available at http://www.utahbirds.org/counties/xChecklists/ BeaverCoChecklist.pdf. Accessed Oct. 23, 2009.

Utah SHPO (Utah State Historic Preservation Office), 2009, data on file at the Utah Division of State History, Salt Lake City, Utah, Nov. 19.

Utah State Legislature, 2010, *S.B. 20: Local District Amendments*, 2010 General Session, State of Utah.

White, W.N., 1932, *A Method of Estimating Groundwater Supplies Based on Discharge by Plants and Evaporation from Soil—Results of Investigations in Escalante Valley*, U.S. Geological Survey Water Supply Paper 659-A.

Wolfe, E.W., and T.C. Pierson, 1995, *Volcanic-Hazard Zonation for Mount St. Helens, Washington, 1995*, U.S. Geological Survey Open File Report 95-497.

Woods, A.J., et al., 2001, *Ecoregions of Utah (color poster with map, descriptive text, summary tables, and photographs)*, U.S. Geological Survey, Reston, Va. Available at http://www.epa.gov/wed/pages/ecoregions/ut_eco.htm. Accessed Nov. 24, 2009.

WRAP (Western Regional Air Partnership), 2009, *Emissions Data Management System (EDMS)*. Available at http://www.wrapedms.org/default.aspx. Accessed June 4, 2009.

WRCC (Western Regional Climate Center), 2010a, *Period of Record Monthly Climate Summary, Milford, Utah (425654)*. Available at http://www.wrcc.dri.edu/cgi-bin/cliRECtM.pl?ut5654. Accessed May 3, 2010.

WRCC, 2010b, *Average Pan Evaporation Data by State*. Available at http://www.wrcc.dri.edu/htmlfiles/westevap.final.html. Accessed Jan. 19, 2010.

WRCC, 2010c, *Western U.S. Climate Historical Summaries.* Available at http://www.wrcc.dri.edu/Climsum.html. Accessed Oct. 23, 2010.