12 AFFECTED ENVIRONMENT AND IMPACT ASSESSMENT FOR PROPOSED SOLAR ENERGY ZONES IN NEW MEXICO

12.1 AFTON

12.1.1 Background and Summary of Impacts

12.1.1.1 General Information

The proposed Afton solar energy zone (SEZ) is located in Dona Ana County in southern New Mexico, 21 mi (34 km) north of the border with Mexico and 3 mi (5 km) southeast of the proposed Mason Draw SEZ (Figure 12.1.1.1-1). The SEZ has a total area of 77,623 acres (314 km^2). In 2008, the county population was 206,486. The towns of Las Cruces, Mesilla, Mesquite, University Park, and Vado are all within a 5-mi (8-km) radius of the SEZ. Las Cruces is the largest, with a population of approximately 90,000.

The nearest major road access to the SEZ is via Interstate-10 (I-10), which runs east–west along the northern border of the Afton SEZ. The Burlington Northern Santa Fe (BNSF) Railroad runs east of the SEZ with stops in Las Cruces, Mesilla Park, Mesquite, Vado, and Berino, all within about 1 to 5 mi (1.6 to 8 km) of the SEZ. The nearest public airport is Las Cruces International Airport located directly north of the SEZ and does not have regularly scheduled passenger service. The nearest larger airport, the El Paso International Airport, is approximately 58 mi (93 km) to the southeast of the SEZ.

A 345-kV transmission line passes through the SEZ. It is assumed that this existing transmission line could potentially provide access from the SEZ to the transmission grid (see Section 12.1.1.1.2).

There is one right-of-way (ROW) application for a solar project within the SEZ, and one ROW application for a wind project that would be located within 50 mi (80 km) of the SEZ. These applications are discussed in Section 12.1.22.2.1.

The proposed Afton SEZ is undeveloped and rural. The SEZ is located in the West Mesa of the Mesilla Basin bordered on the north by the Rough and Ready Hills and the Robledo Mountain; on the west by the Sleeping Lady Hills, Aden Hills, and the West Potrillo Mountains; and on the east by the Mesilla Valley. Land within the SEZ is undeveloped scrubland characteristic of a semiarid basin.

The proposed Afton SEZ and other relevant information are shown in Figure 12.1.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar energy development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In

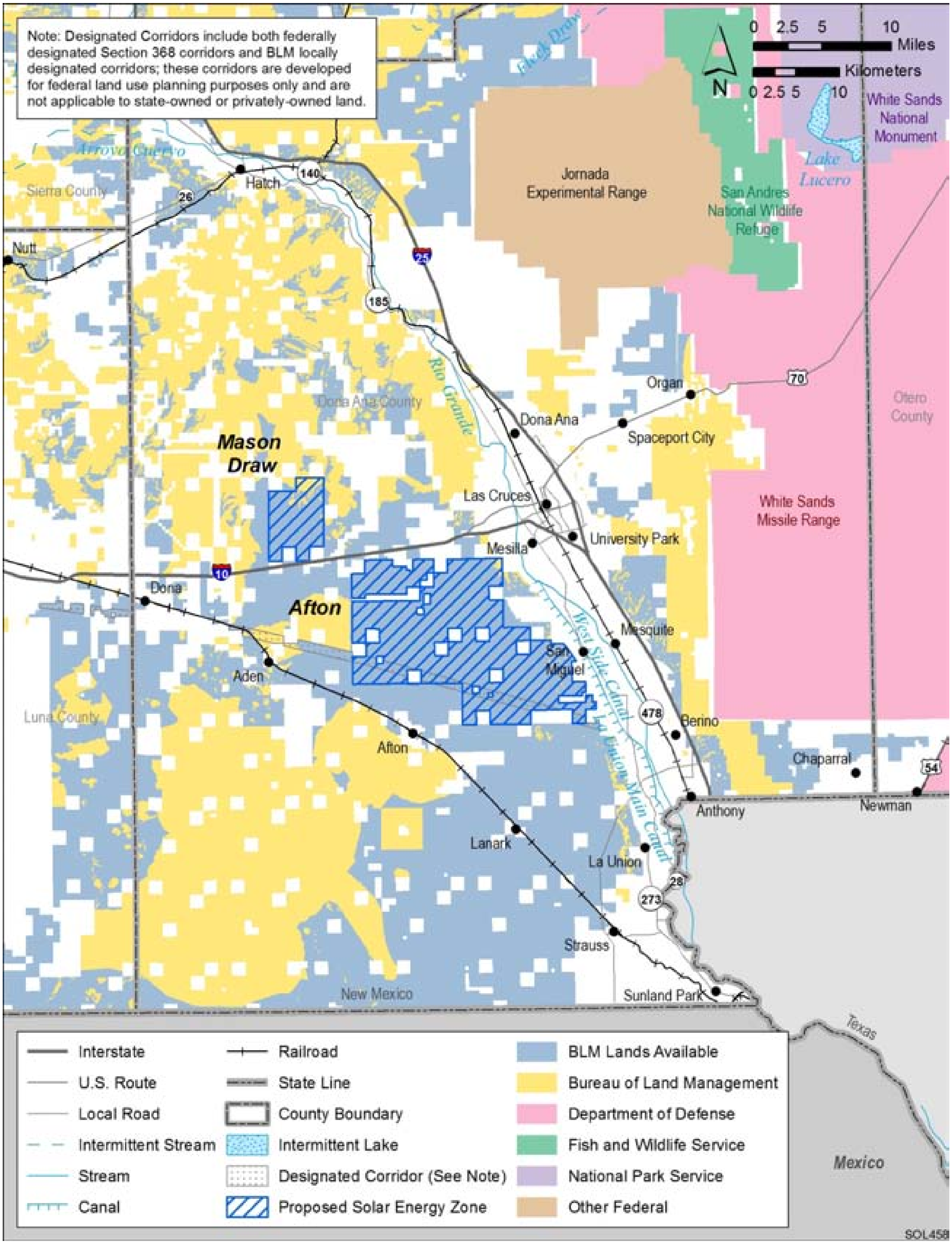

FIGURE 12.1.1.1-1 Proposed Afton SEZ

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

As initially announced in the *Federal Register* on June 30, 2009, the proposed Afton SEZ encompassed 55,810 acres (226 km^2). Subsequent to the study area scoping period, the boundaries of the proposed Afton SEZ were altered substantially after further observations by the U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) District Office indicating that the additional area met all criteria for solar development. The revised SEZ is approximately 21,813 acres (4 km^2) larger than the original SEZ as published in June 2009.

12.1.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the Afton SEZ is assumed to be 80% of the SEZ area over a period of 20 years, a maximum of 62,098 acres (251 km^2). These values are shown in Table 12.1.1.2-1, along with other development assumptions. Full development of the Afton SEZ would allow development of facilities with an estimated total of 6,900 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 12,420 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 345-kV line that runs through the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 345-kV capacity of that line would be inadequate for 6,900 to 12,420 MW of new capacity (a 500-kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Afton SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in the PEIS, it was assumed that the existing 345-kV transmission line which passes through the SEZ could provide initial access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed. Access to the existing transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission

TABLE 12.1.1.2-1 Proposed Afton SEZ—Assumed Development Acreages, Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S. or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Area of Assumed Transmission Line ROW and Road ROW	Distance to Nearest Designated Corridor[d]
77,623 acres and 62,098 acres[a]	6,900 MW[b] and 12,420 MW[c]	I-10 0 mi[e]	0 mi and 345 kV	0 acres; 0 acres	Adjacent

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

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

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

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

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

line were constructed in the future to connect facilities within the SEZ to a different, off-site, grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they are needed.

Existing road access to the proposed Afton SEZ should be adequate to support construction and operation of solar facilities, because I-10 runs from east to west along the northern border of the SEZ. Thus, no additional road construction outside of the SEZ is assumed to be required to support solar development.

12.1.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 12.1.2 through 12.1.21 for the proposed Afton SEZ are summarized in tabular form. Table 12.1.1.3-1 is a comprehensive list of impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 12.1.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Afton SEZ are included in Sections 12.1.2 through 12.1.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 12.1.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Afton SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ could disturb up to 62,098 acres (251 km^2). Development of the SEZ for utility-scale solar energy production would establish a very large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Utility-scale solar energy development would be a new and dominant land use in the area. The existing Section 368b corridor is heavily used and may need additional capacity in the future, and allowing solar facilities on both sides of the corridor development would limit the ability to add future corridor capacity.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	Wilderness characteristics in the Aden Lava Flow would be adversely affected. Wilderness characteristics in the Organ Mountains, Organ Needles, Pena Blanca, Robledo Mountains, and West Potrillo Mountains/Mount Riley WSAs would be adversely affected. Scenic values and recreation use in the Organ/Franklin SRMA/ACEC, Robledo Mountains ACEC, in Prehistoric Trackways National Monument, Mesilla Plaza, and along the El Camino Real and the El Camino Real de Tierra Adentro would be adversely affected.	Pending congressional review of the BLM recommendations for wilderness designations, restricting or eliminating solar development in portions of the visible area of the SEZ within 5 mi (8 km) of the Aden Lava Flow WSA is recommended to avoid impacts on wilderness characteristics in the WSA. The eastern boundary of the SEZ should be restricted to the top of West Mesa to avoid the area sloping to the east, which is more highly visible to the national historic trail, Mesilla Plaza, and to the scenic byway. The height of solar facilities in the SEZ should be restricted to reduce the adverse impact on the specially designated areas within the viewshed of the SEZ.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Rangeland Resources: Livestock Grazing	The grazing permits for the Black Mesa, Home Ranch, and Little Black Mountain allotments would be cancelled, and the permittees would be displaced.	None.
	The grazing permits for the Aden Hills, Corralitos Ranch, and La Mesa allotments would be reduced. A maximum of 5,841 AUMs would be lost among the six allotments.	Development of range improvements to mitigate the loss of AUMs in the Aden Hills, Corralitos Ranch, and La Mesa allotments should be considered. Consideration should also be given to adding portions of the Home Ranch and Black Mesa allotments outside of, and on the southwestern side of the SEZ, to the Aden Hills and West La Mesa allotments.
Rangeland Resources: Wild Horses and Burros	None.	None.
Recreation	Areas developed for solar energy production would be closed to recreational use.	None.
	Recreation resources and use in 6 WSAs within 25 mi (40 km) of the SEZ, the Organ/Franklin SRMA/ACEC, Robledo Mountains ACEC, and the Prehistoric Trackways National Monument likely would be adversely affected and would not be completely mitigated.	The height of solar facilities in the SEZ should be restricted to reduce the adverse impact on the specially designated areas within the viewshed of the SEZ.
Military and Civilian Aviation	*Military airspace*	None.
	Civilian aviation facilities	Because Las Cruces International Airport is within 3 mi (4.8 km) of the SEZ, project developers must provide necessary safety restriction information to the FAA addressing required distances from flight paths, hazard lighting of facilities, impacts on radar performance, and other requirements.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation).	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.
Water Resources	Ground-disturbance activities (affecting 11.6% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 5,372 ac-ft (6.6 million m^3) of water during the peak construction year. Construction activities would generate as high as 222 ac-ft (274,000 m^3) of sanitary wastewater. Assuming full development of the SEZ, operations would use the following amounts of water: • For parabolic trough facilities (12,420-MW capacity), 8,868 to 18,804 ac-ft/yr (10.9 million to 23.2 million m^3/yr) for dry-cooled systems; 62,272 to 186,469 ac-ft/yr (76.8 million to 230 million m^3/yr) for wet-cooled systems.	Water resource analysis indicates that wet-cooling and dry-cooling options would not be feasible; other technologies should incorporate water conservation measures. Land-disturbance activities should minimize impacts on ephemeral streams located within the proposed SEZ. Siting of solar facilities and construction activities should avoid the areas identified as within a 100-year floodplain that total 1,654 acres (6.7 km^2) within the proposed SEZ. Groundwater management/rights should be coordinated with the NMOSE with respect to the Lower Rio Grande AWRM priority basin.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	• For power tower facilities (6,900-MW capacity), 4,907 to 10,427 ac-ft/yr (6.1 million to 12.9 million m^3/yr) for dry-cooled systems; 34,576 to 103,575ac-ft/yr (42.6 million to 128 million m^3/yr) for wet-cooled systems. • For dish engine facilities (6,900-MW capacity), 3,527 ac-ft/yr (4.4 million m^3/yr). • For PV facilities (6,900-MW capacity), 353 ac-ft/yr (435,000 m^3/yr). Assuming full development of the SEZ, operations would generate up to 174 ac-ft/yr (215,000 m^3/yr) of sanitary wastewater, and as much as 3,528 ac-ft/yr (4.4 million m^3/yr) of blowdown water.	Groundwater monitoring and production wells should be constructed in accordance with state standards. Stormwater management BMPs should be implemented according to the guidance provided by the New Mexico Environment Department. Water for potable uses would have to meet or be treated to meet water quality standards as defined by the EPA.
Vegetation[b]	Approximately 80% of the SEZ (62,098 acres [251 km^2]) would be cleared of vegetation with full development of the SEZ; dune habitats would likely be affected; re-establishment of plant communities in disturbed areas would likely be very difficult because of the arid conditions. Indirect effects outside the SEZ boundaries would have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Grading could result in direct impacts on the wetlands within the SEZ and could potentially alter wetland plant communities and affect wetland function. In addition, project-related reductions in groundwater inflows to wetlands inside and outside the SEZ could alter wetland hydrologic	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of desert scrub, dune, steppe, grassland communities, and other affected habitats, and minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. All wetland, dry wash, playa, riparian, succulent, and dune communities within the SEZ should be avoided to the extent practicable, and any impacts minimized and mitigated. Any yucca, agave, ocotillo, cacti (including *Opuntia* spp., *Cylindropuntia* spp., and *Echinocactus* spp.) and other succulent plant species

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*	characteristics and plant communities. Grading could affect dry wash, dry wash woodland, and riparian communities within the SEZ. Alteration of surface drainage patterns or hydrology could adversely affect downstream communities.	that cannot be avoided should be salvaged. A buffer area should be maintained around wetland, dry wash, playa, and riparian habitats to reduce the potential for impacts. Appropriate engineering controls should be used to minimize impacts on wetland, dry wash, playa and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on groundwater-dependent communities, such as wetland or riparian communities associated with the Rio Grande floodplain.
Wildlife: Amphibians and Reptiles[b]	Direct impacts on representative amphibian and reptile species from SEZ development would be moderate (i.e., loss of >1.0 to ≤10% of potentially suitable habitats) for the red-spotted toad, long-nosed leopard lizard, western whiptail, common kingsnake, glossy snake, gophersnake, groundsnake, western diamond-backed snake, and western rattlesnake and small (i.e., loss of ≤1% of potentially suitable habitats) for all other representative amphibian and reptile species. With implementation of design features, indirect impacts would be expected to be negligible for all amphibian and reptile species.	Wash, riparian, playa, rock outcrop, and wetland habitats, which could provide more unique habitats for some amphibian and reptile species, should be avoided.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Wildlife: Birds[b]	Direct impacts on representative bird species would be moderate (i.e., loss of >1.0 to ≤10% of potentially suitable habitats) for the ash-throated flycatcher, common raven, greater roadrunner, lesser nighthawk, loggerhead shrike, phainopepla, sage sparrow, Scott's oriole, great horned owl, prairie falcon, turkey vulture, mourning dove, and wild turkey and small (i.e., loss of ≤1% of potentially suitable habitats) for all other representative bird species. Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the NMDGF. A permit may be required under the Bald and Golden Eagle Protection Act. Wash, riparian, playa, rock outcrop, and wetland habitats, which could provide more unique habitats for some bird species, should be avoided.
Wildlife: Mammals[b]	Direct impacts on representative mammal species would be moderate (i.e., loss of >1.0 to ≤10% of potentially suitable habitats) for the cougar, mule deer, coyote, desert cottontail, gray fox, kit fox, striped skunk, deer mouse, Merriam's kangaroo rat, northern grasshopper mouse, Ord's kangaroo rat, round-tailed ground squirrel, southern plains woodrat, and spotted ground squirrel. Loss of potentially suitable habitats for the other representative mammal species would be small (i.e., loss of ≤1% of potentially suitable habitats). Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. Playa, wash, wetland, and rock outcrop habitats should be avoided.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Wildlife: Mammals[b] *(Cont.)*	Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of design features.	
Aquatic Biota	No intermittent or perennial streams, water bodies, or springs are present on the proposed Afton SEZ. There are 20 wetlands present in the Afton SEZ, but they are ephemeral and do not contain aquatic habitat, although they may contain aquatic organisms for brief periods. More detailed information is required to determine the ecological significance of these ponds and to assess the impacts of solar energy development on these features. The Rio Grande River and associated canals and wetlands are located within the area of indirect effects associated with the SEZ. Disturbance of land areas within the SEZ for solar energy facilities could increase the transport of soil into the Rio Grande River and associated wetlands via airborne pathways, potentially increasing turbidity. There is the potential that groundwater withdrawals could reduce surface water levels in streams and wetlands outside of the proposed SEZ. Because of the lack of perennial or intermittent stream connections between the SEZ and the Rio Grande River and associated canals, the potential for introducing contaminants would be small.	Appropriate engineering controls should be implemented to minimize the amount of surface water runoff and fugitive dust that reaches the Rio Grande River and associated wetlands and canals. Wetlands and streams located within the SEZ should be avoided to the extent practicable.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Special Status Species[b]	A total of 35 special status species could occur in the affected area of the Afton SEZ (area of direct effects within SEZ and area of indirect effects up to 5 mi [8 km] beyond SEZ boundary), based on recorded occurrences or the presence of potentially suitable habitat in the area (Table 12.1.12.1-1). Based on NHNM records and information provided by the BLM Las Cruces District Office, occurrences of six of those species are known to intersect the affected area of the Afton SEZ: sand prickly-pear cactus, smallmouth buffalo, Texas horned lizard, eastern bluebird, fringed myotis, and Townsend's big-eared bat.	Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible for some species, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats, could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Consultation with the USFWS and NMDGF should be conducted to address the potential for impacts on the following species currently listed as endangered under the ESA: Sneed's pincushion cactus and northern aplomado falcon. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Coordination with the USFWS and NMDGF should be conducted to address the potential for impacts on the western yellow-billed cuckoo, a candidate species for listing under the ESA. Coordination would identify an appropriate survey protocol, and mitigation, which may include avoidance, minimization, translocation, or compensation.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Special Status Species[a] *(Cont.)*		Avoiding or minimizing disturbance to desert grasslands, sand dune habitat and sand transport systems, rocky slopes, cliffs, and outcrops on the SEZ could reduce or eliminate impacts on 18 special status species. Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NMDGF.
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for 24-hour and annual PM_{10} and $PM_{2.5}$ concentration levels at the SEZ boundaries and in the immediate surrounding area, including the closest residences adjacent to the northeastern SEZ boundary. Higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area (Gila WA). In addition, construction emissions (primarily NO_x emissions) from the engine exhaust from heavy equipment and vehicles has the potential to affect AQRVs (e.g., visibility and acid deposition) at the nearest federal Class I area. *Operations*: Positive impact due to avoided emission of air pollutants from combustion-related power generation: 35 to 64% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of New Mexico avoided (up to 19,527 tons/yr SO_2, 48,585 tons/yr NO_x, 0.71 ton/yr Hg, and 21,653,000 tons/yr CO_2).	None.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Visual Resources	The SEZ is in an area of low scenic quality, with cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. Solar development could produce large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape. The SEZ is located 6.2 mi (10.0 km) from Prehistoric Trackways National Monument. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by visitors. The SEZ is located 1.4 mi (2.3 km) from the Aden Lava Flow WSA. Because of the open views of the SEZ and its close proximity to the WSA, strong visual contrasts could be observed by WSA visitors. The SEZ is located 14.7 mi (23.7 km) from Organ Mountains WSA. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by WSA visitors. The SEZ is located 13.3 mi (21.4 km) from Organ Needles WSA. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by WSA visitors. The SEZ is located 12.9 mi (20.8 km) from the Pena Blanca WSA. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by WSA visitors.	Within the SEZ, in areas east of a line between the northwest corner of Section 5 of Township 024S Range 001E extending through and beyond the southeast corner of Section 24 of Township 025S Range 001E, visual impacts associated with solar energy development in the SEZ should be consistent with VRM Class II management objectives, as determined from KOPs to be selected by the BLM within the Mesilla Valley west of a line 0.25 mi (0.4 km) east of I-10 (for KOPs south of the I-10–I-25 interchange) or I-25 (for KOPs north of the I-10–I-25 interchange), and east of the toe of the slope of West Mesa. Within the SEZ, the height of power towers should be restricted such that the receiver and any navigation hazard lighting would not be directly visible from points within the Mesilla Valley west of a line 0.25 mi (0.4 km) east of I-10 (for points south of the I-10–I-25 interchange) or I-25 (for points north of the I-10–I-25 interchange), and east of the toe of the slope of West Mesa. Within the SEZ, in areas visible from and within 3 mi (5 km) of the Aden Lava Flow WSA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as determined from KOPs to be selected by the BLM within the WSA, and in areas visible from between 3 and 5 mi (5 and 8 km), visual impacts should be consistent with VRM Class III management objectives.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	The SEZ is located 8.3 mi (13.4 km) from the Robledo Mountains WSA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by WSA visitors. The SEZ is located 5.7 mi (9.2 km) from the West Potrillo Mountains/Mt. Riley WSA. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by WSA visitors. The SEZ is adjacent to the Aden Hills SRMA. Because of the open views of the SEZ, very strong visual contrasts could be observed by SRMA visitors. The SEZ is located 10.3 mi (16.6 km) from the Dona Ana Mountains SRMA. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by SRMA visitors. The SEZ is located 6.1 mi (9.8 km) from the Organ/Franklin Mountains SRMA. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by SRMA visitors. The SEZ is located 12.9 mi (20.8 km) from the Dona Ana Mountains ACEC. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by ACEC visitors. The SEZ is located 6.1 mi (9.8 km) from Organ/Franklin Mountains ACEC. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by ACEC visitors. The SEZ is located 8.5 mi (13.6 km) from the Robledo Mountains ACEC. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by ACEC visitors.	

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	The SEZ is located 2.7 mi (4.4 km) from the Mesilla Plaza NHL. Because of the open views of the SEZ along the rim of West Mesa, the elevated position of the SEZ with respect to the NHL, and the close proximity of the SEZ to the NHL, moderate to strong visual contrasts could be observed by NHL visitors. The SEZ is located 9.3 mi (15.0 km) from the Kilbourne Hole NNL. Because of the open views of the SEZ, moderate to strong visual contrasts could be observed by NNL visitors. Approximately 40 mi (64 km) of the El Camino Real de Tierra Adentro National Historic Trail are within the SEZ viewshed. Because of the open views of the SEZ along the rim of West Mesa, and the elevated position of the SEZ with respect to the trail, strong visual contrasts would be expected for some viewpoints on the trail. Approximately 48 mi (77 km) of the El Camino Real National Scenic Byway are within the SEZ viewshed. Because of the open views of the SEZ along the rim of West Mesa, and the elevated position of the SEZ with respect to the byway, strong visual contrasts would be expected for some viewpoints on the byway. Approximately 15 mi (24 km) of the Butterfield Trail are within the SEZ viewshed. Moderate visual contrast would be expected for some viewpoints on the Trail. Approximately 81 mi (130 km) of I-10 are within the SEZ viewshed. Because of the open views of the SEZ along the rim of West Mesa, and the elevated position of the SEZ with respect to the Mesilla Valley, as well as the close proximity of I-10 to the SEZ on West Mesa, strong visual contrast would be expected for some viewpoints on the I-10.	

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	Approximately 23 mi (37 km) of I-25 are within the SEZ viewshed. Because of the open views of the SEZ along the rim of West Mesa, and the elevated position of the SEZ with respect to the Mesilla Valley, strong visual contrast would be expected for some viewpoints on the I-25. Approximately 22 mi (35 km) of U.S. 70 (east of its junction with I-10) are within the SEZ viewshed. Moderate to strong visual contrasts would be expected for some viewpoints on the U.S. 70, east of its junction with I-10. The communities of Las Cruces, University Park, Mesilla (and smaller immediately surrounding communities), Dona Ana, Radium Springs, Organ, Spaceport City, San Miguel, La Mesa, La Union, Mesquite, Vado, Chamberino, Berino, Anthony, and El Paso (Texas) are located within the viewshed of the SEZ, although slight variations in topography and vegetation could provide some screening. Because of the open views of the SEZ along the rim of West Mesa, and the elevated position of the SEZ with respect to the Mesilla Valley, moderate or strong visual contrasts could be observed within Las Cruces, University Park, Mesilla and immediately surrounding communities; San Miguel; La Mesa; Mesquite; Vado; Berino; Dona Ana; and Anthony. Weak visual contrasts could be observed within the other communities.	
Acoustic Environment	*Construction*. For construction of a solar facility located near the northeastern SEZ boundary, estimated noise levels at the nearest residences (next to the northeastern SEZ boundary) would be about 74 dBA, which is well above the typical daytime mean rural background level of 40 dBA. In addition, an estimated 70 dBA L_{dn} at these residences is well above the EPA guidance of 55 dBA L_{dn} for residential areas.	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearby residences to the northeastern or southeastern SEZ boundary are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Acoustic Environment *(Cont.)*	*Operations*. For operation of a parabolic trough or power tower facility located near the northeastern SEZ boundary, the predicted noise level would be about 51 dBA at the nearest residences, which is higher than the typical daytime mean rural background level of 40 dBA. If the operation were limited to daytime, 12 hours only, a noise level of about 49 dBA L_{dn} would be estimated for the nearest residences, which is below the EPA guideline of 55 dBA L_{dn} for residential areas. However, in the case of 6-hour TES, the estimated nighttime noise level at the nearest residences would be 61 dBA, which is well above the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 63 dBA L_{dn}, which is above the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level at the nearest residences would be about 58 dBA, which is well above the typical daytime mean rural background level of 40 dBA. On the basis of 12-hour daytime operation, the estimated 55 dBA L_{dn} at these residences would be equivalent to the EPA guideline of 55 dBA L_{dn} for residential areas.	Dish engine facilities within the Afton SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearby residences (i.e., the facilities would be located anywhere within the SEZ, except the northeastern and southeastern portions of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at nearby residences.
Paleontological Resources	The potential for impacts on significant paleontological resources in the proposed Afton SEZ is relatively high, especially in the eastern portions of the SEZ along the edge of the mesa. A paleontological survey will be needed for the PFYC Class 4/5 areas.	The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations. Avoidance of the eastern edge of the SEZ may be warranted if a paleontological survey results in findings similar to those known south of the SEZ.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Cultural Resources	Direct impacts on significant cultural resources could occur in the proposed Afton SEZ, especially in dune areas and areas close to the Mesilla Valley; however, further investigation is needed. A cultural resources survey of the entire area of potential effects of any project proposed 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. Visual impacts on two trail systems, including a National Historic Trail, would occur. The trails would need to be evaluated for high potential segments to determine the level of impact. Visual impacts would also occur on a National Historic Landmark (Mesilla Plaza).	SEZ-specific design features would be determined during consultations with the New Mexico SHPO and affected Tribes and would depend on the results of future investigations. Coordination with trails associations and historical societies regarding impacts on El Camino Real de Tierra Adentro, the Butterfield Trail, and Mesilla Plaza, as well as other NRHP-listed properties is also recommended.
Native American Concerns	The proposed Afton SEZ falls primarily within the traditional use area of the Chiricahua Apache and elements of the Pueblo of Ysleta del Sur. The SEZ supports plants and habitat of animals traditionally important to these Tribes; however, these plants and habitats are abundant in surrounding areas. The adjacent Florida and Potrillo Mountains were home bases for some Chiricahua groups. Views from these mountains may be of cultural importance. The Pueblo of Ysleta del Sur has expressed a wish to be informed if human burials or other NAGPRA objects are encountered during development of the SEZ.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Socioeconomics	*Livestock grazing:* Construction and operation of solar facilities could decrease the amount of land available for livestock grazing in the SEZ, resulting in the loss of 102 jobs (total) and $1.9 million (total) in income in the ROI. *Construction:* A total 1,210 to 16,022 jobs would be added; ROI income would increase by $66.7 million to $883.4 million. *Operations:* A total of 192 to 4,513 annual jobs would be added; ROI income would increase by $6.2 million to $155.2 million.	
Environmental Justice	There are minority populations, as defined by CEQ guidelines, within the 50-mi (80-km) radius around the boundary of the SEZ. Therefore, any adverse impacts of solar projects, although likely to be small, could disproportionately affect minority populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. I-10 provides a regional traffic corridor that would experience small impacts for single projects that may have up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum). Such an increase in approximately 10% of the current traffic on I-10. However, the exits on I-10 might experience moderate impacts with some congestion. State Routes 28 or 478 could experience increased traffic flows and require potential road improvements, depending on the location of site access roads and the percentage of worker commuter traffic using those routes.	None.

TABLE 12.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Afton SEZ	SEZ-Specific Design Features
Transportation *(Cont.)*	If construction of up to three large projects were to occur over the same period of time, there could be up to 6,000 additional vehicle trips per day, assuming no ride-sharing or other mitigation measures. If all site access were from I-10, this would result in a about a 35% increase in traffic on I-10 near the northern border of the SEZ. Such an increase could have a moderate impact on traffic flow during peak commute times.	

Abbreviations: AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; AQRV = Air Quality Related Value; AUM = animal unit month; AWRM = Active Water Resource Management; BLM = Bureau of Land Management; BMP = best management practice; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; dBA = A-weighted decibel; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; FAA = Federal Aviation Administration; Hg = mercury; KOP = key observation point; L_{dn} = day-night average sound level; NAGPRA = Native American Graves Protection and Repatriation Act; NHL = National Historic Landmark; NHNM = Natural Heritage New Mexico; NMDGF = New Mexico Department of Game and Fish; NMOSE = New Mexico Office of the State Engineer; NNL = National Natural Landmark; NO_x = nitrogen oxides; NRHP = *National Register of Historic Places*; PFYC = potential fossil yield classification; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 μm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 μm or less; PSD = prevention of significant deterioration; PV= photovoltaic; ROI = region of influence; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; SRMA = Special Recreation Management Area; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; VRM = Visual Resource Management; WA = Wilderness Area; WSA = Wilderness Study Area.

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

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 12.1.10 through 12.1.12.

This page intentionally left blank.

12.1.2 Lands and Realty

12.1.2.1 Affected Environment

The proposed Afton SEZ is large, rural, and generally undeveloped area located about 7 mi (11 km) west of Las Cruces, New Mexico. The SEZ is bordered on the north by several industrial facilities located on private lands fronting on I-10. There is a county juvenile detention facility in the north-central portion of the area and a state prison located on BLM-administered lands near the northwestern corner of the area. Combined with these developments, the presence of I-10 and interstate highway interchange, and the location of the Las Cruces Municipal Airport 3 mi (4.8 km) to the north, the general area along the northern border of the SEZ has an industrial character. There are several natural gas pipelines, water wells and pipelines, electric transmission lines, and a flood control project on public lands within the SEZ.

In the very southern portion of the SEZ, there is a 3,500-ft (1,067-m) wide multi-modal 368b transmission corridor that crosses the SEZ in a northwest-southeast direction, which contains numerous gas pipeline ROWs, a fiber optic line, and a county road. The county road transitions from a dirt road on the west side of the area to an asphalt road in the southeastern portion of the area. Just north of this corridor is a 345-kV power line and there are numerous additional powerline ROWs in the southern portion of the SEZ. There is a gas-fired electric generating station and a natural gas pumping station in the southeastern portion of the area on BLM-administered land in the study area. Just north of these facilities on state land is a very tall communications tower. Ranch buildings and facilities are found in two locations on private lands surrounded by the SEZ in the southern portion of the SEZ. There are approximately 18,128 acres (73 km^2) of state lands interspersed among and adjacent to the BLM-administered public lands within the SEZ. The interior of the SEZ is accessible via several dirt/gravel roads and four county roads. There are two natural gas pipelines that cross the SEZ in a northeasterly direction that also have roads associated with them.

As of February 2010, there was one ROW application for a solar energy facility utilizing concentrating solar trough technology within the SEZ (see Section 12.1.22.2).

12.1.2.2 Impacts

12.1.2.2.1 Construction and Operations

Full development of the proposed Afton SEZ could disturb up to 62,098 acres (251 km^2) of BLM-administered lands (Table 12.1.1.2-1) and would establish a very large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Although there is industrial development along the northern border of the SEZ and extensive ROW development in the southern portion of the SEZ, since the SEZ is so large, the overall appearance of the SEZ is rural and undeveloped, and utility-scale solar energy development would be a new and discordant land use in the area. It also is possible that the 18,128 acres (73 km^2) of state lands located within and adjacent to the SEZ would be developed in the same or a complementary manner as the public lands. Development of industrial or support activities could also be induced on private and additional state lands near the SEZ.

Current ROW authorizations in the SEZ would not be affected by solar energy development, since they are prior rights. The existing ROWs do remove land from potential solar development within the SEZ. Should the proposed SEZ be identified as an SEZ in the Record of Decision (ROD) for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development. It is not anticipated that approval of solar energy development within the SEZ would have a significant impact on the amount of public lands available for future ROWs near the area.

The designated Section 368 transmission corridor in the southern portion of the SEZ occupies about 5,216 acres (21 km^2) and would limit solar development in the SEZ, because, to avoid technical or operational interference between transmission and solar energy facilities, solar facilities cannot be constructed under transmission lines or over pipelines. Additionally, this corridor is already heavily used and may need additional capacity in the future, and allowing solar facility development on both sides of the corridor development would limit the ability to add future corridor capacity. Transmission capacity is becoming a more critical factor, and constraining future corridor capacity in this SEZ may have future, but currently unknown, consequences.

12.1.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 345-kV transmission line runs through the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

Road access to the SEZ is readily available from the I-10 interchange in the northern portion of the SEZ, so it is anticipated there would be no additional land disturbance outside the SEZ associated with road construction to provide access to the SEZ.

Roads and power collection lines would be constructed within the SEZ as part of the development of the area.

12.1.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

This page intentionally left blank.

12.1.3 Specially Designated Areas and Lands with Wilderness Characteristics

12.1.3.1 Affected Environment

There are 19 specially designated areas within 25 mi (40 km) of the proposed Afton SEZ that potentially could be affected by solar energy development within the SEZ, principally from impacts on scenic, recreation, and/or wilderness resources. Largely because of the proximity to the Las Cruces area, recreation use of many of these specially designated areas is an important attribute. Several of these areas overlap one another in various degrees; for example, the Organ/Franklin Mountains ACEC also is classified as a Special Recreation Management Area (SRMA), and contains three Wilderness Study Areas (WSAs). There are three ACECs—Los Tules, San Diego Mountain, and Uvas Valley—within 25 mi (40 km) of the SEZ that are not considered in this analysis, because they were designated to protect either cultural or biological resources and do not have a scenic component in their designation. Additionally, it is not anticipated that these areas would experience visitation impacts associated with SEZ development. The ACECs included below all have scenic values as one of the components supporting the designation (BLM 1993). The areas include (see Figure 12.1.3.1-1) the following:

- Wilderness Study Areas (WSAs)
  - Aden Lava Flow
  - Las Uvas Mountains
  - Organ Mountains
  - Organ Needles
  - Pena Blanca
  - Robledo Mountains
  - West Potrillo Mountains/Mt. Riley

- Areas of Critical Environmental Concern (ACEC)
  - Dona Ana Mountains
  - Organ/Franklin Mountains
  - Robledo Mountains

- Special Recreation Management Areas (SRMAs)
  - Aden Hills off-highway vehicle (OHV) Area
  - Butterfield Trail
  - Dona Ana Mountains
  - Organ/Franklin Mountains

- National Monument
  - Prehistoric Trackways

- National Natural Landmark
  - Kilbourne Hole

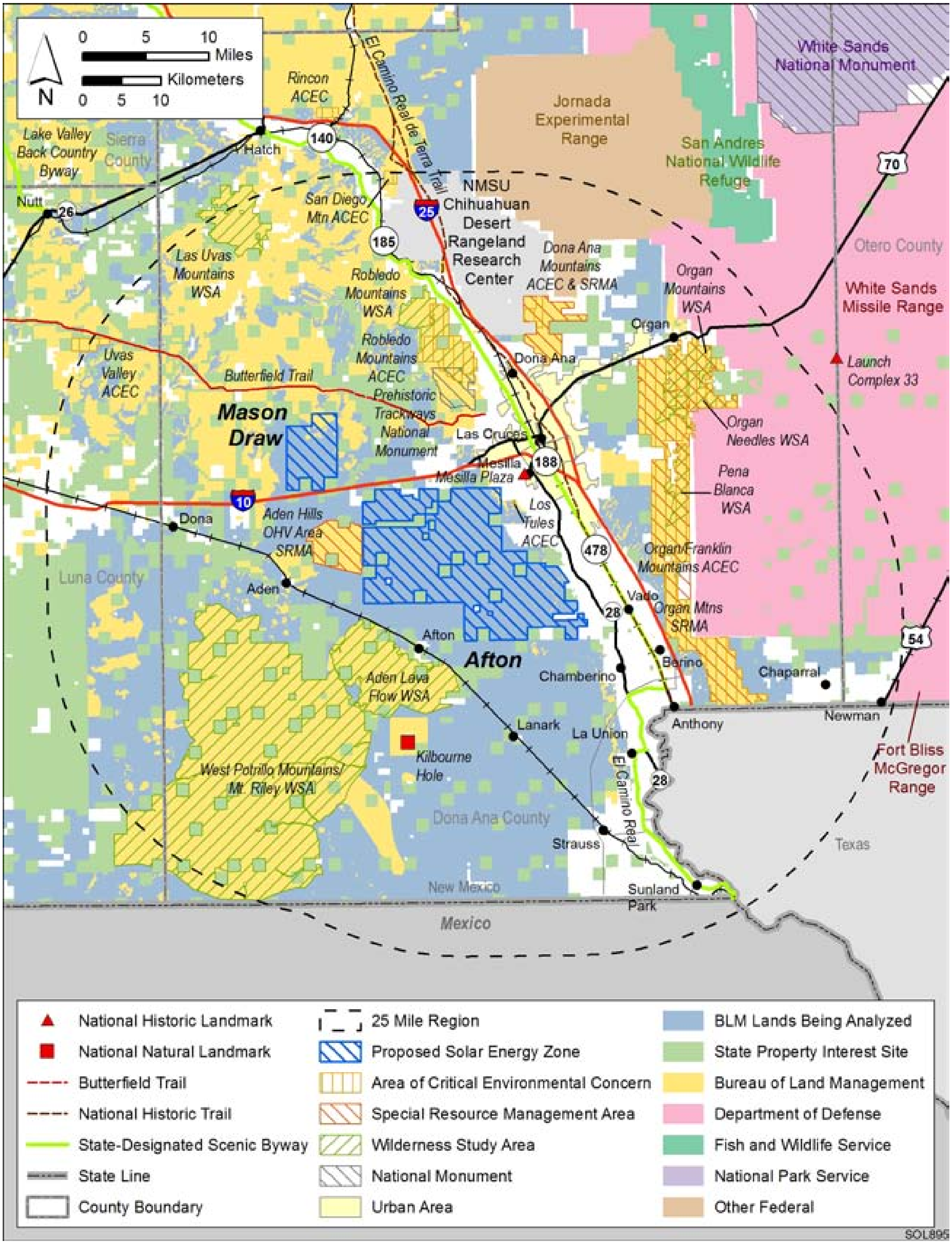

FIGURE 12.1.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Afton SEZ

- National historic Landmark
  - Mesilla Plaza

- National Historic Trail/Scenic Byway
  - El Camino Real de Tierra Adentro
  - El Camino Real de Tierra Adentro National Scenic Byway

While not "specially designated areas," because of their proximity and elevation relative to the SEZ, portions of Las Cruces and surrounding communities would have clear views of solar energy development in portions of the SEZ. Taller solar facilities would extend the area within which the SEZ would be visible from these communities.

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

12.1.3.2 Impacts

12.1.3.2.1 Construction and Operations

The primary potential impact on the specially designated areas from solar development within the SEZ would be from visual impacts that could affect scenic, recreation, or wilderness characteristics of the areas. The visual impact would be associated with direct views of the solar facilities and transmission facilities, glint and glare from reflective surfaces, steam plumes, hazard lighting of tall structures, and night lighting of the facilities. For WSAs, visual impacts from solar development could cause the loss of outstanding opportunities for solitude and primitive and unconfined recreation. While the visibility of solar facilities from specially designated areas is relatively easy to determine, the impact of this visibility is difficult to quantify and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing solar developments while recreating in areas within sight of the SEZ.

Development of the SEZ, especially full development, would be an important visual component in the viewshed from portions of some of these specially designated areas, as summarized in Table 12.1.3.2-1. The data provided in the table, which shows the area with visibility of development within the SEZ, assumes the use of power tower solar energy technology. Because of the potential height of power tower facilities, they could be the most visible of all the technologies being considered in the PEIS. Viewshed analysis for this SEZ has shown that shorter solar energy facilities would be considerably less visible in some areas than would power tower facilities (Section 12.1.14 provides detail on viewshed analyses discussed in this section). Potential impacts included below are general, and assessment of the visual impact of solar energy projects must be conducted on a site-specific and technology-specific basis to identify impacts accurately.

TABLE 12.1.3.2-1 Potentially Affected Sensitive Visual Resources within a 25-mi (40-km) Viewshed of the Proposed Afton SEZ[a]

		Feature Area or Linear Distance[b]		
			Visible between	
Feature Type	Feature Name (Total Acreage/Linear Distance)	Visible within 5 mi	5 and 15 mi	15 and 25 mi
WSAs	Aden Lava Flow (25,978 acres[a])	12,987 acres (50%)[c]	12,581 acres (48%)	0 acres
	Las Uvas Mountains (11,084 acres)	0 acres	0 acres	903 acres (8%)
	Organ Mountains (7,186 acres)	0 acres	185 acres (3%)	3,676 acres (51%)
	Organ Needles (5,936 acres)	0 acres	546 acres 9%	1,803 acres (30%)
	Pena Blanca (4,648 acres)	0 acres	3,734 acres (80%)	0 acres
	Robledo Mountains (13,049 acres)	0 acres	2,617 acres (20%)	0 acres
	West Potrillo Mountains/Mt. Riley (159,323 acres)	0 acres	46,922 acres (30%)	6,029 acres (4%)
SRMAs	Aden Hills OHV Area (8,054 acres)	7,681 acres (95%)	0 acres	0 acres
	Butterfield Trail	0 mi	14.6 mi[d]	0 mi
	Dona Ana Mountain (8,345 acres)	0 acres	5,226 acres (63%)	154 acres (2%)
	Organ/Franklin Mountains (60,793 acres)	0 acres	35,708 acres (59%)	7,611 acres (13%)
ACECs designated for outstanding scenic values	Dona Ana Mountains (1,427 acres)	0 acres	747 acres (52%)	0 acres
	Organ Mountains/Franklin Mountains (58,512 acres)	0 acres	33,503 acres (57%)	7,598 acres (13%)
	Robledo Mountains (8,659 acres)	0 acres	1,976 acres (23%)	0 acres

TABLE 12.1.3.2-1 (Cont.)

Feature Type	Feature Name (Total Acreage/Linear Distance)	Feature Area or Linear Distance[b]		
		Visible within 5 mi	Visible between 5 and 15 mi	Visible between 15 and 25 mi
National Monument	Prehistoric Trackways (5,280 acres)	0 acres	2,420 acres (46%)	2,420 acres (46%)
National Natural Landmark	Kilbourne Hole (5,480 acres)	0 acres	Yes	0 acres
National Historic Landmark	Mesilla Plaza	Yes		
National Historic Trail	El Camino Real de Tierra Adentro	12.6 mi	24.7 mi	4.6 mi (within U.S.)
National Scenic Byway	El Camino Real (299 mi)	0 mi	27.7 mi	20.0 mi

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

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

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

[d] This is the length of trail that may be visible within the specified distance interval. There are several separate segments, not a continuous stretch of trail.

In general, the closer a viewer is to solar development, the greater the effect on an individual's perception of impact. From a visual analysis perspective, the most sensitive viewing distances generally are from 0 to 5 mi (0 to 8 km), but could be farther, depending on other factors. The viewing height above or below a solar energy development area, the size of the solar development area, and the purpose for which people visit an area are also important. Individuals seeking a wilderness or scenic experience within these specially designated areas could be expected to be more adversely affected than those simply traveling along the highway with another destination in mind. In the case of the Afton SEZ, the low-lying location of the SEZ in relation to portions of some of the surrounding specially designated areas would highlight the industrial-like development in the SEZ. The potentially very large size of the area that could be developed for solar energy production would also add to the overall impact.

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

Wilderness Study Areas

Aden Lava Flow. The nearest boundary of the WSA is about 1.4 mi (2 km) from the SEZ, and all of the WSA is within about 9 mi (14 km). Solar energy facilities within the SEZ would be visible from almost all of the WSA, and 50% of the area is within 5 mi (8 km) of the SEZ. Because of the WSA's proximity to the SEZ, views from within the WSA would be dominated by the industrial-like development of the SEZ, and wilderness characteristics in the WSA would be adversely affected. Based on visual analysis, restricting the potential solar technologies to those of lower height would reduce, but not eliminate, this potential impact.

Las Uvas Mountains. The WSA is located about 21 mi (34 km) northwest of the SEZ, and is partially screened from the SEZ by intervening topography. Only a small percentage of the WSA would have distant views of development in the SEZ, and these would be restricted to the highest elevations in the WSA. Additionally, it is likely that only the tops of power towers would be visible from this area, which, during daylight hours, would show as distant points of light, and at night, flashing lights at the top of the towers would also be visible. None of the solar reflector fields would be visible. Because of the distance and the limited views of the SEZ, it is anticipated that there would be minimal to no impact on wilderness characteristics in this WSA. Based on visual analysis, restricting the solar technologies to those of lower height would eliminate any view of development in the SEZ.

Organ Mountains and Organ Needles. Because of their similar location relative to the SEZ, these areas are reviewed together. The WSAs are part of the Organ/Franklin Mountains complex and both of these WSAs are popular recreation destinations, especially in the spring and fall. The boundary of the Organ Mountains WSA is about 15 mi (24 km) from the nearest portion of the SEZ, and the SEZ's visibility extends to a little over 18 mi (29 km) outside the SEZ. Visibility of the SEZ is restricted to a total of about 3,861 acres (16 km^2) in the WSA located on the western side of the ridge of the Organ Mountains, and constitutes about 54% of the area. The nearest boundary of the Organ Needles WSA is located a little over 13 mi (21 km) from the SEZ and the visibility of the SEZ from this WSA extends to a little more than 17 mi (27 km). About 2,349 acres (10 km^2) or 39% of the WSA located on the western side of the ridge of the mountains has visibility of the SEZ.

In both WSAs, the higher elevations would have open and elevated views of the SEZ, although the distances are long. At these elevations, however, because of the large potential size of the industrial-like solar development, a large part of the horizontal field of view would be occupied by the development, and there would be moderate to strong visual contrasts from the solar energy facilities. Lower elevations within these areas would be partially screened from development in the SEZ, and even where visible, the lower viewing angle would reduce the level of contrast, resulting in less impact within these areas.

At full development, solar energy facilities would be conspicuous in the viewshed from higher portions of these areas, and it is likely that there would be an adverse effect on wilderness characteristics in these areas. The fact that there is extensive existing urban, agricultural, and commercial development in the Mesilla Valley along the Rio Grande between the WSAs and the SEZ may result in a reduction in the potential impact on wilderness characteristics in these areas. An adverse impact on wilderness characteristics may also result in a lower recreation use of the areas. Because of the elevation of the WSAs above the SEZ, restricting solar technologies to those of lower height would have only a minimal effect in reducing the impacts.

Pena Blanca. This WSA is situated largely on the western side of the Organ Mountains; and 3,734 acres (15 km^2) or about 80% of the area would have clear views of solar development within the SEZ. The nearest boundary of the WSA is located about 13 mi (21 km) from the SEZ, with the visibility of the SEZ extending to about 15 mi (24 km). The SEZ is visible from most of this WSA, at both higher and lower elevations.

Because of the large potential size of the industrial-like solar development in the SEZ, a large part of the horizontal field of view from the WSA would be occupied by the solar development, and there would be moderate to strong visual contrasts created by the solar energy facilities. For these reasons, it is likely that there would be an adverse impact on wilderness characteristics in this WSA. An adverse impact on wilderness characteristics may also result in a lower recreation use of the area. The fact that there is extensive existing urban, agricultural, and commercial development in the Mesilla Valley along the Rio Grande between the WSA and the SEZ may result in a reduction in the potential impact on wilderness characteristics in this area. Because of the elevation of the WSA over the SEZ, restricting solar technologies to those of lower height would have only a minimal effect in reducing the impacts on wilderness characteristics in this WSA.

Robledo Mountains. The southern boundary of the WSA is located about 8 mi (13 km) north of the SEZ, and the area of the WSA with visibility of the SEZ extends to about 14 mi (23 km) from the northern border of the SEZ. About 2,617 acres (11 km^2), or 20% of the WSA, located on the high peaks and south-facing slopes, would have visibility of solar development within the SEZ. Because of the large size of the SEZ, it would occupy most of the horizontal field of view from the WSA, and solar facilities within the SEZ would likely present strong visual contrasts, likely resulting in adverse impacts on wilderness characteristics, especially in the central and southwestern portions of the WSA. An adverse impact on wilderness characteristics may also result in lower recreation use of the area. Depending on the technology used in the Mason Draw SEZ that is located to the southwest, this WSA would also have views of development within that SEZ. Because of the elevation of the WSA over the Afton SEZ and the relatively flat intervening terrain between the WSA and SEZ, restricting solar technologies to those of lower height would have only a minor effect in reducing the impacts on wilderness characteristics in this WSA.

West Potrillo Mountains/Mt. Riley. At its closest point, this WSA is located 5.7 mi (9.2 km) from the southwestern border of the SEZ. Areas within the WSA that would have visibility of solar development within the SEZ extend out 22.9 mi (36.9 km) from the boundary of the SEZ. The area of the WSA that would be affected primarily is located in the northeastern corner of the area, and includes about 52,951 acres (214 km^2) or 33% of the WSA. Areas closest to the SEZ would be affected more profoundly than those at the farthest distance from the SEZ. However, because of the large size of the SEZ, the horizontal field of view from most of the areas in the viewshed would be filled by solar development, and would likely result in adverse effects on wilderness characteristics. An adverse impact on wilderness characteristics may also result in a lower recreation use of the areas. Portions of the WSA would also have views of solar development in the Mason Draw SEZ. Based on viewshed analysis, restricting solar technologies to those of lower height would reduce the acreage affected within the WSA by as much as 10%.

Special Management Areas

Aden Hills OHV Area. The area was established as an "open" area for OHV use and it abuts the western boundary of the SEZ. Most of the area is located at a higher elevation than the SEZ, and about 95% of the area would have good visibility of solar development within the SEZ. The area receives about 10,000 visitor days of use annually (Montoya 2010). Use of an OHV open area is not generally dependent upon scenic quality; rather, attributes like access, challenging terrain, and availability of trails are most important, therefore it is not anticipated that solar development in the SEZ would have any effect on the use of the OHV area. However, depending on the amount of dust generated by OHV activity, and because of the need to keep reflective surfaces of solar facilities clean, OHV use may be incompatible with solar development in portions of the SEZ. BLM does have the ability to close or relocate the open OHV area, or to modify the boundary of the SEZ, so that the impact of dust on solar facilities would be minimized.

Butterfield Trail. The Butterfield Overland Mail Route, which connected the eastern United States with San Francisco, was designated as a Special Management Area in the Mimbres Resource Management Plan (RMP) in 1993, and is currently being studied for possible designation as a National Historic Trail. The trail comes within 5 mi (8 km) of the northern border of the SEZ, and portions of the trail route would have visibility of solar facilities within the SEZ. The potential impact of solar energy development in the SEZ on the historic setting of the trail and on future management options is currently unknown, and would require site- and project-specific analyses. Portions of the trail also are within the viewshed of the Mason Draw SEZ, and views of solar development within both SEZs could occur.

Dona Ana Mountain Special Recreation Management Area (SRMA). This is an 8,345-acre (34-km^2) area with maintained trails used by a wide array of recreationists, including hikers, horseback riders, mountain bikers, and OHV enthusiasts. The SRMA's closest boundary is about 10.3 mi (16.6 km) northeast of the SEZ. The area of the SRMA with visibility of the SEZ extends out to about 15.7 mi (25.3 km) from the SEZ. About 65% of the SRMA has somewhat distant views of the SEZ, but because of the size of the SEZ, it would occupy almost the full horizontal field of view of the portions of the SRMA in view of the SEZ. Seen from the

SRMA, the amount of contrast that would be caused by solar facilities varies from low at lower elevations, to moderate at higher elevations. Because of the distance from SEZ, and the low to moderate levels of contrast, it is anticipated the impact on visitor use in the SRMA would be minimal.

O*rgan/Franklin Mountains SRMA.* The SRMA is a 60,793-acre (246-km^2) area that extends 29 mi (47 km) north to south along the western slope of the Organ Mountains, and includes the gap between the Organ and Franklin Mountains and all but the northernmost portions of the Franklin Mountains. The eastern border of the SRMA is the Ft. Bliss Military Reservation. The area is near Las Cruces and the communities of the Mesilla Valley, and it is a well-established and important recreation area for these communities, receiving about 102,000 visitors a year (Montoya 2010). The area contains developed camping and picnic areas, a visitor center, scenic roads, developed trails, and also includes the Organ, Organ Needles, and Pena Blanca WSAs described above. All but 2,281 acres (9 km^2) of the SRMA is also designated as an ACEC. About 71% of the SRMA is within the viewshed of the SEZ, and portions of the northern part of the SRMA rise over 3,000 ft (914 m) above the elevation of the nearest portion of the SEZ. The nearest boundary of the SRMA is 6.1 mi (9.8 km) east of the border of the SEZ, and the area of the SRMA within the viewshed of the SEZ extends to about 18 mi (24 km).

Visual analysis indicates that—depending on the solar technology employed within the SEZ, and the place within the SRMA from which development in the SEZ is viewed—most of the horizontal field of view from within the SRMA would be occupied by the SEZ, and moderate to strong visual contrast would be expected. While it is difficult to equate this visual impact with impact on recreation use of the SRMA, it is anticipated that because of the proximity and the very large size of the SEZ, recreation use of the SRMA could be reduced. The fact that there is existing urban, agricultural, and commercial development in the Mesilla Valley between the SRMA and the SEZ may result in a reduction in the perception of impact in this SRMA, because the population is already accustomed to the current level of development; however, because of the very large potential size of the industrial-like solar development, there would be a very large change in the character of the viewshed of the SRMA that is anticipated to lead to a reduced level of use. Visual analysis indicates that restricting solar technologies to those of lower height would have only a minimal effect in reducing the impacts on the SRMA.

Areas of Critical Environmental Concern

Dona Ana Mountains. This 1,427-acre (5.8-km^2) ACEC was designated to protect biological, cultural, scenic, and recreation resources. The ACEC is located 12.9 mi (20.8 km) north of the SEZ. The area within the viewshed of the SEZ extends to 14.7 mi (23.7 km) north of the SEZ and includes about 52% of the area. The scenic component of the ACEC described in the Mimbres RMP (BLM 1993) focuses almost solely on the scenic values as seen from outside the ACEC; however, the ACEC is included within the Dona Ana SRMA, which supports a variety of recreation uses and benefits from the scenic component of the ACEC. Impacts on the

ACEC would be similar to or slightly less than those identified in the earlier analysis of the SRMA, and are expected to be minimal.

Organ/Franklin Mountains. The ACEC consists of 58,512 acres (237 km^2) and was designated for the protection of a wide array of resources, including biological, scenic, cultural, special status species, riparian, and recreation resources (BLM 1993). This area is completely included within the boundaries of the SRMA discussed earlier, and the anticipated impacts on the scenic and recreation resources in the ACEC would be the same as those identified for the SRMA. The other resource values for which the area is designated would not be affected.

Robledo Mountains. The 8,659-acre (35-km^2) ACEC was designated to protect biological, scenic, and recreation resources. The area is completely contained within the southern portion of the Robledo Mountains WSA and the adverse impacts on scenic resources of the ACEC would be similar to those discussed for the WSA. A reduction in the quality of the ACEC scenic resources could also result in a reduced level of recreation use. Biological resources within the ACEC would not be affected.

National Monument

Prehistoric Trackways. The BLM-administered National Monument was created in 2009 to conserve, protect, and enhance the unique and nationally important paleontological, scientific, educational, scenic, and recreational resources and values of the Robledo Mountains in southern New Mexico. The Monument includes a major deposit of Paleozoic Era fossilized footprint megatrackways within approximately 5,280 acres (21.4 km^2) (BLM 2010a). The monument also overlaps the southwestern portion of the Robledo Mountains WSA and ACEC. The monument receives about 3,000 visitors per year.

The southern boundary of the monument is 6.2 mi (10 km) from the northern boundary of the SEZ, and the viewshed that includes the SEZ within the monument extends to 9.6 mi (15 km) from the SEZ boundary. The area of the monument that would have extensive views of the SEZ includes 2,420 acres (10 km^2) or about 46% of the area. Because of the large size of the SEZ, it would occupy most of the horizontal field of view from the WSA, and solar facilities within the SEZ would likely present strong visual contrasts, resulting in adverse impacts on scenic values throughout the monument. An adverse impact on scenic values could also result in lower visitation to the area. Depending on the technology used in the Mason Draw SEZ that is located to the southwest, the monument could also have views of development within that SEZ. Because the monument is at a slightly higher elevation than the Afton SEZ and because of the relatively flat terrain between the WSA and SEZ, restricting solar technologies to those of a lower height would have only a minor effect in reducing the impacts on scenic values in the monument.

National Natural Landmark

Kilbourne Hole. The landmark was designated to protect geologic and recreation use of an area of about 5,480 acres (22.2 km^2) that surrounds Kilbourne Hole, a volcanic *maar*. The hole is a crater that formed when a volcanic bubble burst on the surface of the earth (BLM 1993). While the designated area surrounding the hole is within about 7 mi (11 km) of the SEZ and is within the viewshed of the SEZ, much of the extensive area in the bottom of the landmark is shielded from the view of the SEZ. However, a trail runs around much of the ridge that surrounds the crater and visitors on the trail would have visibility of the development within the SEZ. Development of the SEZ would not affect the geologic resource, which is the main attraction of the area, but it is anticipated that recreation use of the area may be adversely affected.

National Historic Landmark

Mesilla Plaza. The plaza is located about 2 mi (3 km) from the northeast corner of the SEZ and would have a clear view of some types of solar development in the eastern portions of the SEZ, especially any facilities developed in the northeastern portion of the area, where the West Mesa slopes to the east towards the community. The view of solar facilities at this distance from the plaza would detract from the setting of the historic site, but the potential impact of this on visitation to the historic plaza is unknown (See Section 12.1.17 for a more complete discussion of the Mesilla Plaza).

National Historic Trail

El Camino Real de Tierra Adentro. This congressionally designated trail stretches from Mexico City to Santa Fe, New Mexico, and in the vicinity of the SEZ, generally parallels the Rio Grande River. In use from 1598 to 1885, this was the oldest and longest continuously used road in the United States and portions of it are still used today (see Section 12.1.17 for a complete discussion of the NHT). At its nearest approach, the trail passes within 3 mi (5 km) east of the SEZ and within the 25-mi (40-km) zone surrounding the SEZ; people following the trail would have visibility of solar facilities within the SEZ for about 37 mi (60 km). Solar development within the SEZ would occupy an important portion of the viewshed of the trail where it is within 5 mi (8 km) of the SEZ, from the area of Las Cruces to about 18 mi (21 km) to the south. The route of the trail currently passes largely through lands developed for agriculture, residential, and commercial uses, and the scenic context of the trail has been degraded. Whether solar development would be viewed as a negative factor for future management of the trail is unknown. Restricting the height of solar facilities within portions of the SEZ within 5 mi (8 km) of the trail would have a minimal impact in reducing the visibility of solar facilities from the trail, but would reduce visibility in areas beyond that distance both to the north and the south.

National Scenic Byway

El Camino Real. The byway generally traces the route of the National Historic Trail described above in the United States for 299 mi (481 km) from the Mexican border to Santa Fe, New Mexico, and its nearest approach to the boundary of the SEZ is about 3 mi (5 km) in the area east of the SEZ. Within the 25-mi (40-km) zone surrounding the SEZ, the scenic byway would have visibility of solar facilities within the SEZ for about 57 mi (58 km). Solar development within the SEZ would be an important portion of the viewshed where it is within 5 mi (8 km) of the SEZ from the area of Las Cruces to about 20 mi (32 km) south. Whether solar development would be viewed as a negative factor by travelers on the scenic byway is unknown. Restricting the height of solar facilities within portions of the SEZ would reduce the visibility of solar facilities from the scenic byway along about 11 mi (18 km) in the southernmost portion of the byway.

12.1.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and I-10 on the northern edge of the SEZ, and assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of such activities outside of the SEZ was conducted (see Section 12.1.1.2). Should additional transmission lines or roads be required outside of the SEZ, there may be additional impacts on specially designated areas.

There would be construction of access roads and power lines within the SEZ as part of project development.

12.1.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions would be (1) wilderness characteristics in the Organ Mountains, Organ Needles, Pena Blanca, Robledo Mountains, and West Potrillo Mountains/Mt. Riley WSAs would be adversely affected; and (2) scenic values and recreation use in the Organ/Franklin SRMA/ACEC, Robledo Mountains ACEC, and Prehistoric Trackways National Monument would be adversely affected. Recreation use at Kilbourne Hole may also be adversely affected. These impacts could not be completely mitigated.

Proposed design features specific to the Afton SEZ include the following:

- Pending congressional review of the BLM recommendations for wilderness designations, restricting or eliminating solar development in portions of the visible area of the SEZ within 5 mi (8 km) of the Aden Lava Flow WSA is recommended to avoid impacts on wilderness characteristics in the WSA.

- The eastern boundary of the SEZ should be restricted to the top of West Mesa to avoid the area sloping to the east, which is more highly visible to the National Historic Trail, Mesilla Plaza, and the scenic byway.

- The height of solar facilities in the SEZ should be restricted to reduce the adverse impacts on the specially designated areas within the viewshed of the SEZ. See Section 12.1.14 for the analysis of the impacts of various height facilities.

This page intentionally left blank.

12.1.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros, both of which are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Afton SEZ are discussed in Sections 12.1.4.1 and 12.1.4.2.

12.1.4.1 Livestock Grazing

12.1.4.1.1 Affected Environment

There are seven grazing allotments that are overlain by the SEZ, but one of these, the West La Mesa allotment, has less than 20 acres (0.08 km^2) within the SEZ and is not considered further because there would be no impact caused by the loss of that portion of the allotment. See Table 12.1.4.1-1 for a summary of key allotment information.

TABLE 12.1.4.1-1 Grazing Allotments within the Proposed Afton SEZ

Allotment	Total Acres[a]	Percentage of Acres in SEZ[b]	Active BLM AUMs[c]	No. of Permittees
Aden Hills	20,534	31	1,310	1
Black Mesa	25,070	81	1,579	1
Corralitos Ranch	183,957	4	13,860	1
Home Ranch	35,931	77	2,149	1
La Mesa	34,720	15	1,782	1
Little Black Mountain	9,330	64	312	1

[a] Includes public, state, and private land included in the allotment based on the Allotment Master Reports included in the BLM's Rangeland Administration System (BLM 2008d), dated Mar. 16, 2010.

[b] This is the calculated percentage of public lands located in the SEZ of the total allotment acreage.

[c] This is the permitted use for the whole allotment including public, state, and private lands.

12.1.4.1.2 Impacts

Construction and Operations

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

The Black Mesa, Home Ranch, and Little Black Mountain allotments are largely contained within the area of the SEZ, and public lands in the SEZ make up 81%, 77%, and 64% of these allotments, respectively. If full solar development occurs, the federal grazing permits for these allotments would be canceled and the current permittees would be displaced, although grazing permits would be reviewed and revised as solar development proceeds. This would be a major impact on these individual permittees. In the case of the Home Ranch and Little Black Mountain allotments, even though almost 20% and 40% of the allotments, respectively, would remain, the public lands would be split by the solar energy development area, making it very difficult to continue operating. For the purposes of analysis, it is assumed that all of the 4,040 AUMs associated with these three allotments would be lost.

A quantification of the impact on the three remaining grazing allotments would require a specific analysis involving, at a minimum, the three factors identified at the beginning of this section; however, for purposes of this PEIS, a simplified assumption is made that the percentage reduction in authorized AUMs would be the same as the percentage reduction in land area. Using this assumption, there would be a reduction of a total of 1,801 AUMs among the allotments as follows: Aden Hills—446; Corralitos Ranch—792; and La Mesa—563. Among all six of the allotments, there would be a total reduction of 5,841 AUMs.

In the case of the Corralitos Ranch allotment, it is large enough that it likely would be possible to relocate the 4% loss elsewhere in the allotment, either through a change in grazing management, installation of new range improvements, or a combination of the two. The same may also be true for the La Mesa allotment. In the case of the Aden Hills allotment, the remaining land base likely would not be able to absorb all of the lost use, so there would be an undetermined net loss in AUMs. If it would not be possible to mitigate the anticipated losses, there would be a minor adverse impact on the Corralitos and La Mesa allotments, and a moderate impact on the La Mesa allotment.

Assuming the loss of a total of 5,841 AUMs as described above, there would be a minimal impact on livestock use within the Las Cruces District from the development of the proposed Afton SEZ. This conclusion is derived from comparing the loss of the 5,841 AUMs with the total BLM-authorized AUMs in the District for grazing year 2009, which totaled

413,702 AUMs (BLM 2008d). This represents a loss of about 1.4%. The actual level of impact on the three remaining allotments/permittees would be affected by any mitigation of the anticipated losses that could be accomplished on the remaining public lands in the allotment.

Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of a major transmission line in the SEZ, and I-10 near the SEZ, and assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of such activities outside of the SEZ was conducted (see Section 12.1.1.2). Should additional transmission lines or roads be required outside of the SEZ, there may be additional impacts on livestock grazing.

12.1.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts.

A proposed design feature specific to the Afton SEZ is the following:

- Development of range improvements to mitigate the loss of AUMs in the Aden Hills, Corralitos Ranch, and La Mesa allotments should be considered. Consideration should also be given to adding portions of the Home Ranch and Black Mesa allotments outside of, and on the southwestern side of the SEZ, to the Aden Hills and West La Mesa allotments.

12.1.4.2 Wild Horses and Burros

12.1.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Two wild horse and burro herd management areas (HMAs) occur within New Mexico (BLM 2010d). The Bordo Atravesado HMA in Socorro County, the closest HMA to the proposed Afton SEZ, is located about 125 mi (201 km) north of the SEZ.

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah, and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). USFS territories in New Mexico occur primarily in the northern portion of the state, 240 mi (386 km) or more from the proposed Afton SEZ region.

12.1.4.2.2 Impacts

Because the proposed Afton SEZ is about 125 mi (201 km) or more from any wild horse and burro HMA managed by BLM and about 240 mi (386 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly or indirectly affect wild horses and burros that are managed by these agencies.

12.1.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

12.1.5 Recreation

12.1.5.1 Affected Environment

The proposed SEZ is very large, with four county roads and other roads and trails providing ready access into and through the area. The area is close to Las Cruces and there is easy access to the area from both I-10 on the north and a county road on the south. The fact that it is public land that is available for recreation use is an important attribute. Although there are no estimates of the level of recreation use, the area supports backcountry driving, OHV use, hiking/walking, birdwatching, and small game hunting for rabbit, quail, and dove. The Aden Hills OHV area is located adjacent to the western boundary of the SEZ and receives about 10,000 visitor days of use per year (Montoya 2010). People using the OHV area also likely leave the designated OHV area and travel on the trails and roads within the SEZ. In the Mimbres RMP (BLM 1993) the area included in the SEZ is in the group of lands designated for OHV and vehicle uses as "Limited, existing roads and trails."

As described above in Section 12.1.3, areas such as the Organ/Franklin Mountains and the Robledo Mountains provide substantial recreation use and the designation of these areas in the Mimbres RMP (BLM 1993) reflects recreation use as one of the resource uses supporting the designations. The establishment of the Prehistoric Trackways National Monument in 2009 also includes recreation as one of the reasons for designation. Existing WSAs also provide extensive opportunities for wilderness recreation.

12.1.5.2 Impacts

12.1.5.2.1 Construction and Operations

Recreational users would lose the use of any portions of the SEZ developed for solar energy production. Public access, both vehicular and foot, through areas developed for solar power production, would be closed or rerouted. However, although there are no recreation statistics for this area, it is not anticipated that there would be a significant loss of recreation use caused by development of the proposed SEZ.

Based on viewshed analysis (see Section 12.1.14), the Afton SEZ would be visible from a wide area and at full development would become a dominating feature of the landscape from many important recreation areas and from within portions of Las Cruces and other adjacent communities. The viewshed analysis also shows that the SEZ would be visible from large portions of surrounding wilderness study areas. While it is difficult to equate the visibility of industrial-type developments such as solar energy facilities to a loss of recreation use, adverse impacts on recreation use within some of the specially designated areas described in Section 12.1.3 is anticipated. This includes the loss of outstanding opportunities for solitude and primitive and unconfined recreation in some wilderness study areas. The extent to which the presence of solar facilities within the viewshed of popular recreation areas would affect recreation use of these areas is unknown.

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

12.1.5.2.2 Transmission Facilities and Other Off-Site Infrastructure

No additional impact on recreation use associated with construction of transmission facilities or roads is anticipated. Should additional transmission lines be required outside of the SEZ, there may be additional recreation impacts. See Section 12.1.1.2 for the development assumptions underlying this analysis.

12.1.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. Recreation resources in most WSAs within 25 mi (40 km) of the SEZ, the Organ/Franklin SRMA, Robledo Mountains ACEC, and the Prehistoric Trackways National Monument, likely would be adversely affected and would not be completely mitigated.

The following is a proposed design feature specific to the proposed SEZ:

- The height of solar facilities in the SEZ should be restricted to reduce the adverse impact on the specially designated areas within the viewshed of the SEZ. See visual resources design features for the analysis of the impacts of various heights of facilities.

12.1.6 Military and Civilian Aviation

12.1.6.1 Affected Environment

There are no military training routes or any special use airspace over the proposed Afton SEZ.

The northern boundary of the SEZ is within 3 mi (5 km) of the Las Cruces International Airport.

12.1.6.2 Impacts

There would be no impact on military airspace uses.

While most of the SEZ could be developed for commercial solar energy production with no impacts on civilian aviation, because of the height of the power tower facilities, depending on their height and location in the SEZ these facilities could infringe on airspace required for airport operations. The same is true for any transmission facilities, should any be required in proximity to the airport. Federal Aviation Administration (FAA) regulations would be applicable to the construction and marking of facilities in the SEZ within approach zones to the airport and would prevent conflict with airport operation.

12.1.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

The programmatic design features described in Appendix A, Section A.2.2, would require early coordination with the U.S. Department of Defense (DoD) to identify and mitigate, if possible, potential impacts on the use of MTRs.

The following is a proposed design feature specific to the Afton SEZ:

- Because Las Cruces International Airport is within 3 mi (4.8 km) of the SEZ, project developers must provide necessary safety restriction information to the FAA addressing required distances from flight paths, hazard lighting of facilities, impacts on radar performance, and other requirements.

This page intentionally left blank.

12.1.7 Geologic Setting and Soil Resources

12.1.7.1 Affected Environment

12.1.7.1.1 Geologic Setting

Regional Setting

The proposed Afton SEZ is located on the West Mesa of the Mesilla Basin, an alluvium-filled structural basin within the Basin and Range physiographic province in south-central New Mexico (Figure 12.1.7.1-1). West Mesa is bordered on the north by the Rough and Ready Hills and the Robledo Mountains; on the west by the Sleeping Lady Hills, Aden Hills, and the West Potrillo Mountains; and on the east by the Mesilla Valley. The United States–Mexico border marks its southern boundary (Myers and Orr 1985).

The Mesilla Basin is an axial basin of the Rio Grande rift, a north-trending tectonic feature that extends from south-central Colorado to northern Mexico, crossing (and bisecting) the length of New Mexico. Basins in the rift zone generally follow the course of the Rio Grande (river) and are bounded by normal faults that occur along the rift zone margins. The Mesilla Basin extends about 60 mi (100 km) from the upper Mesilla Valley between the Robledo and Dona Ana Mountains to the U.S.–Mexico border just west of El Paso, Texas. It ranges in width from about 5 mi (8 km) at its northern end (north of Las Cruces) to 25 mi (40 km) in its central part (halfway between Las Cruces and the international border) (Hawley and Lozinsky 1992; Chapin 1988).

Basin fill consists of late Tertiary to Quaternary sediments of the Santa Fe Group, which are up to 3,800 ft (1,160 m) thick below the Afton SEZ, based on logs of oil test wells drilled in the area, and thin to the north and west (Figure 12.1.7.1-2). The lower and middle units of the Santa Fe Group were deposited during the development of the Rio Grande rift (Miocene to Pliocene), when the basin was an internally drained (bolson) environment; they are predominantly made up of eolian sands and fine-grained basin floor and playa lake sediments intertongued with alluvial fan deposits. The lower Santa Fe Group overlies middle Tertiary (Oligocene to Miocene) volcanic and volcaniclastic sedimentary rocks. Above the lower and middle units are the fluvial-deltaic sands of the upper Santa Fe Group (Pliocene to Pleistocene). These sediments were deposited on a broad plain by the braided channels of the ancestral Rio Grande, which spread across the basin floor and terminated in a large playa lake in north-central Mexico (Bolson de los Muertos). The main component of the upper Santa Fe Group is the Camp Rice Formation; it is well preserved throughout most of the Mesilla Basin, ranging in thickness from about 300 to 700 ft (90 to 215 m). Sediments of the Santa Fe Group, especially the unconsolidated sands and gravels of the middle and upper units, form the most extensive aquifers below the SEZ (Frenzel et al. 1992; Hawley and Lozinsky 1992; Myers and Orr 1985).

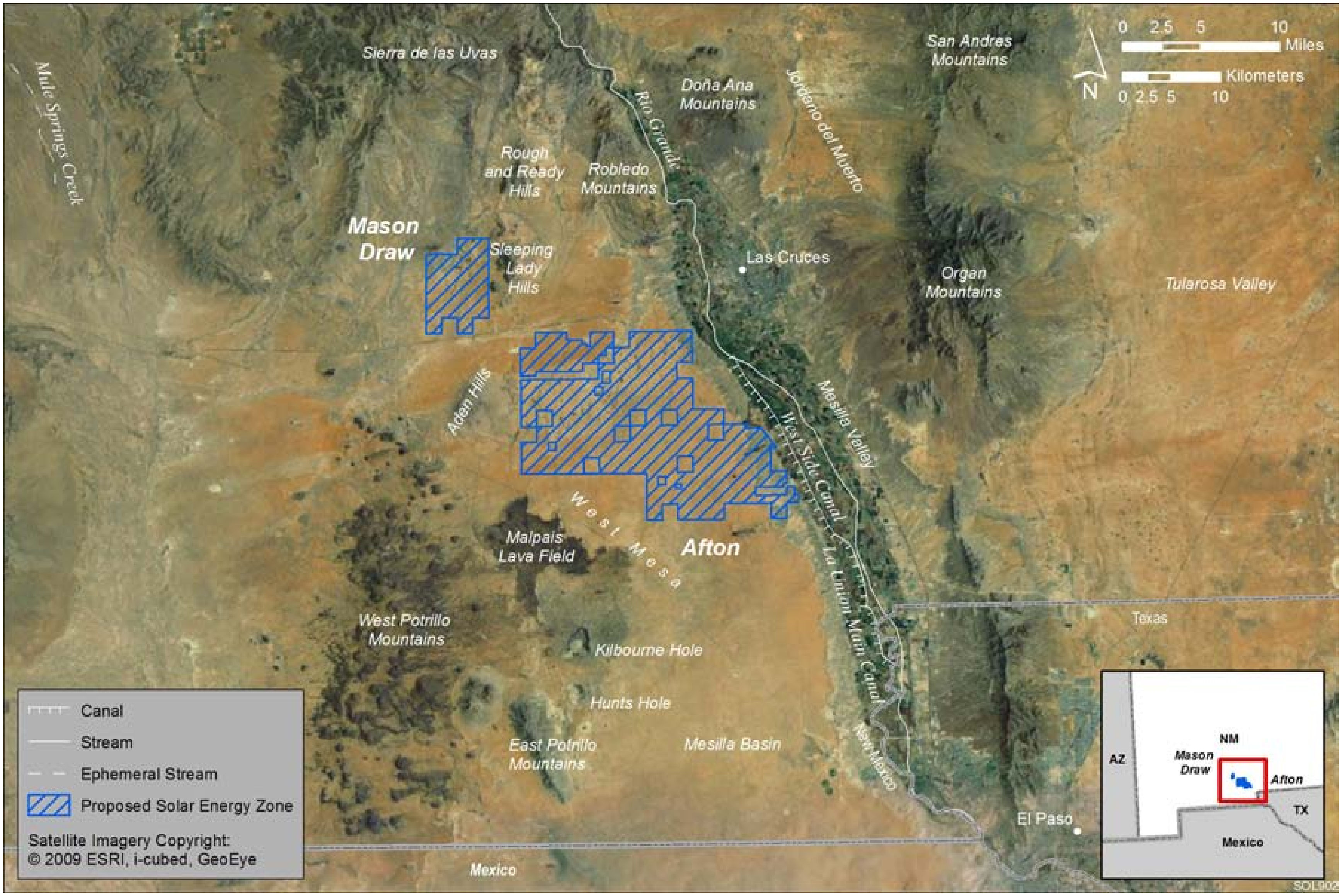

FIGURE 12.1.7.1-1 Physiographic Features of the Mesilla Basin

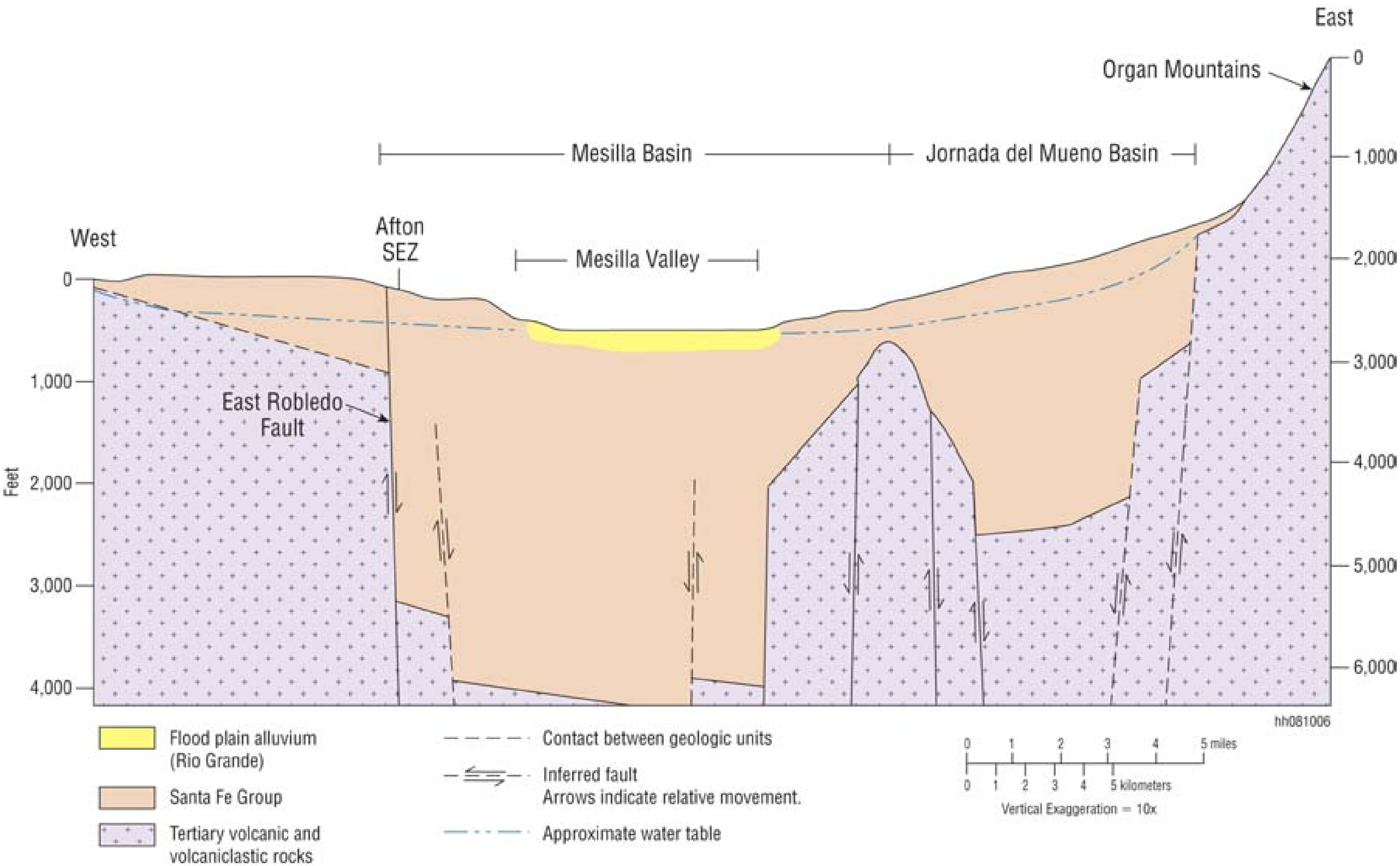

FIGURE 12.1.7.1-2 Generalized Geologic Cross Section (West to East) across Mesilla Basin (modified from Frenzel et al. 1992)

Exposed sediments on West Mesa consist mainly of basin fill deposits of the Upper Santa Fe Group (QTs) (Figure 12.1.7.1-3). Post-Santa Fe Group alluvial fan piedmont deposits (Qp) of silt, sand, and gravel occur mainly along mountain fronts and to the northeast of the Afton SEZ where the mesa surface has been cut by the Rio Grande. These sediments also occur along the northeast-trending ridge that cuts across the northwest corner of the SEZ. Tertiary volcanic rocks of basaltic to andesitic composition cap the East and West Potrillo Mountains to the southwest of the SEZ. The oldest rocks in the region are the Middle Proterozoic granitic rocks exposed in parts of the Organ Mountains to the northeast of the Rio Grande. These rocks have been intruded by Tertiary monzonitic and granitic plutons and dikes. Paleozoic sedimentary rocks (mainly carbonates) crop out in the Robledo Mountains to the north and the Organ and Franklin Mountains to the east (Hawley and Lozinsky 1992; Scholle 2003).

Topography

West Mesa is a broad plain with low topographic relief covering an area of about 480 acres (1,940 km^2). It lies immediately west of the broad Mesilla Valley of the Rio Grande, the primary surface water feature in the Mesilla Basin. The mesa surface sits about 300 to 350 ft (90 m to 110 m) above the river. The mesa (also referred to as "La Mesa") is an extensive remnant of the basin floor surface that existed before it was incised by the Rio Grande. The eastern edge of the mesa is marked by a steep slope that is heavily dissected by arroyos (ephemeral streams or gullies) that are tributaries to the Rio Grande (Hawley and Lozinsky 1992; Myers and Orr 1985).

The proposed Afton SEZ is located a few miles west of the Rio Grande in Dona Ana County (Figure 12.1.7.1-1). Its terrain is fairly flat, with a gentle slope to the southeast, toward the river (Figure 12.1.7.1-4). A northeast-trending ridge, with a maximum relief of about 250 ft (76 m), cuts across the northwest corner of the SEZ. Elevations across the SEZ range from about 4,420 ft (1,350 m) at the northwest corner of the site to about 3,830 ft (1,170 m) at its southeast corner. The eastern edge of the southeastern portion of the site, however, has a fairly steep grade and is cut by gullies draining to the Rio Grande.

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Section 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Afton 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 design features to minimize their risk.

Seismicity. Seismicity in New Mexico is concentrated in the Rio Grande rift valley near Socorro, an area referred to as the Socorro Seismic Anomaly (SSA). The SSA covers an area of about 1.2 million acres (5,000 km^2) and accounts for about 23% of earthquakes in New Mexico with magnitudes greater than 2.0. The SSA is thought to be caused by crustal extension

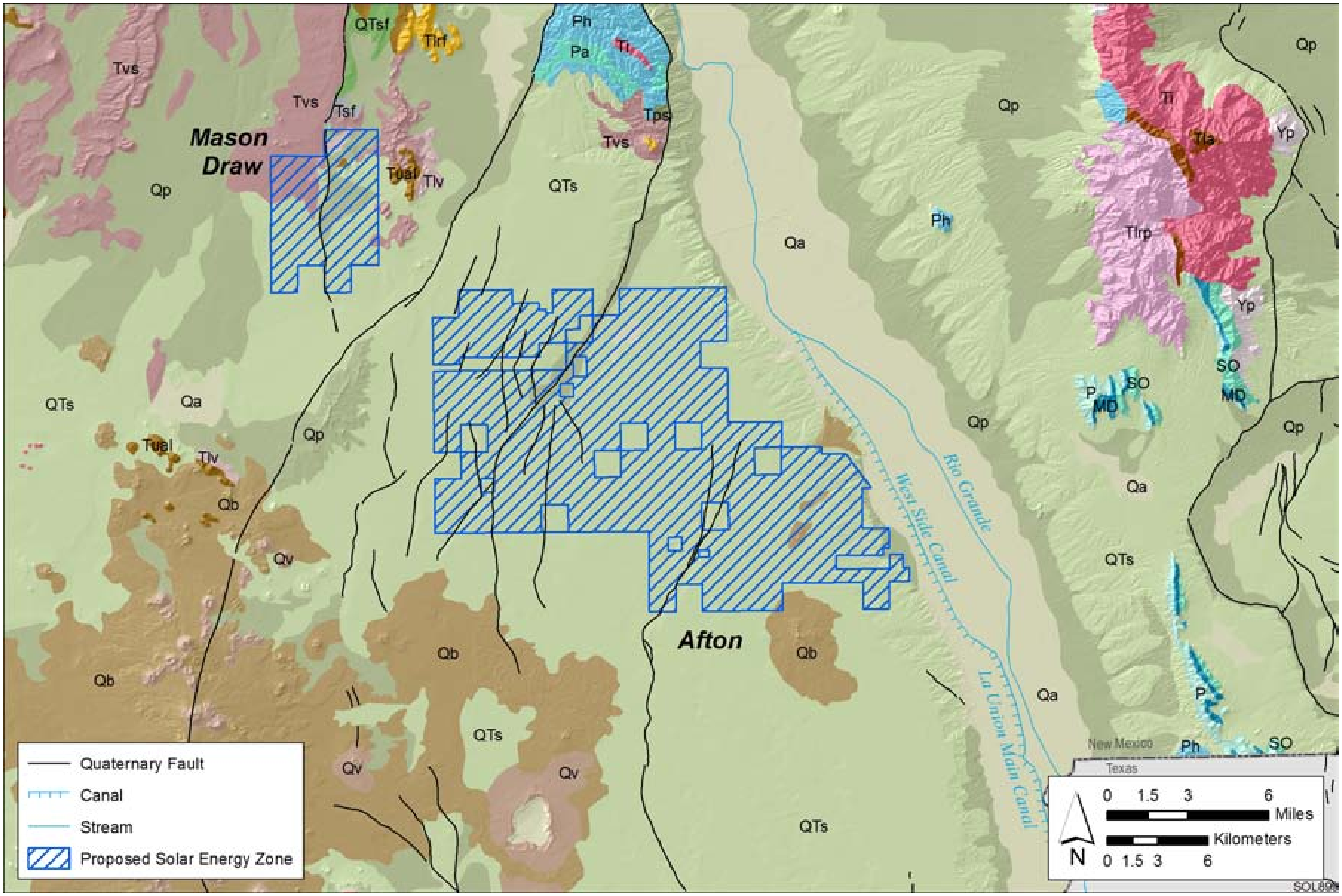

FIGURE 12.1.7.1-3 Geologic Map of the Mesilla Basin (Stoeser et al. 2007; Scholle 2003)

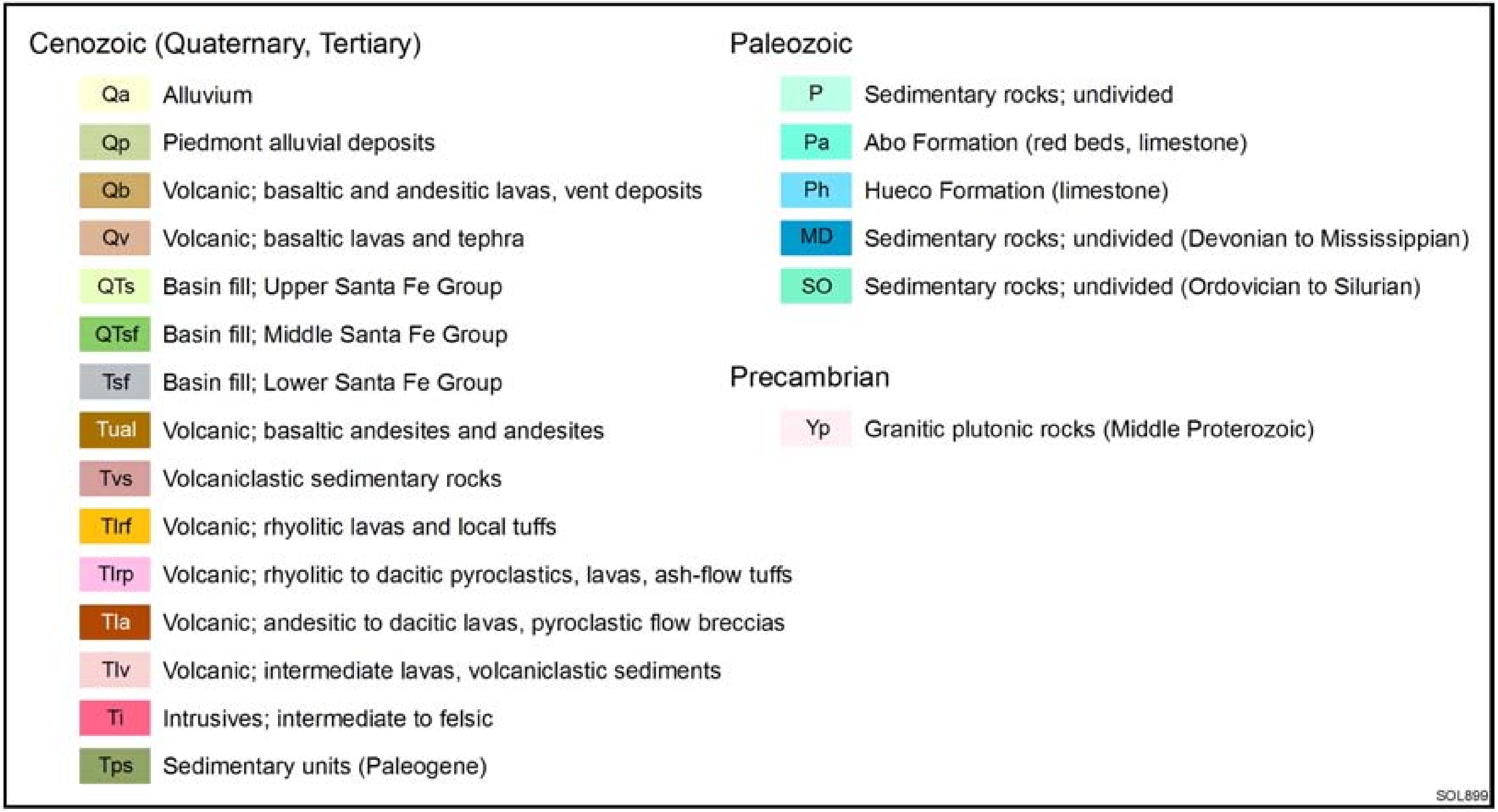

FIGURE 12.1.7.1-3 (Cont.)

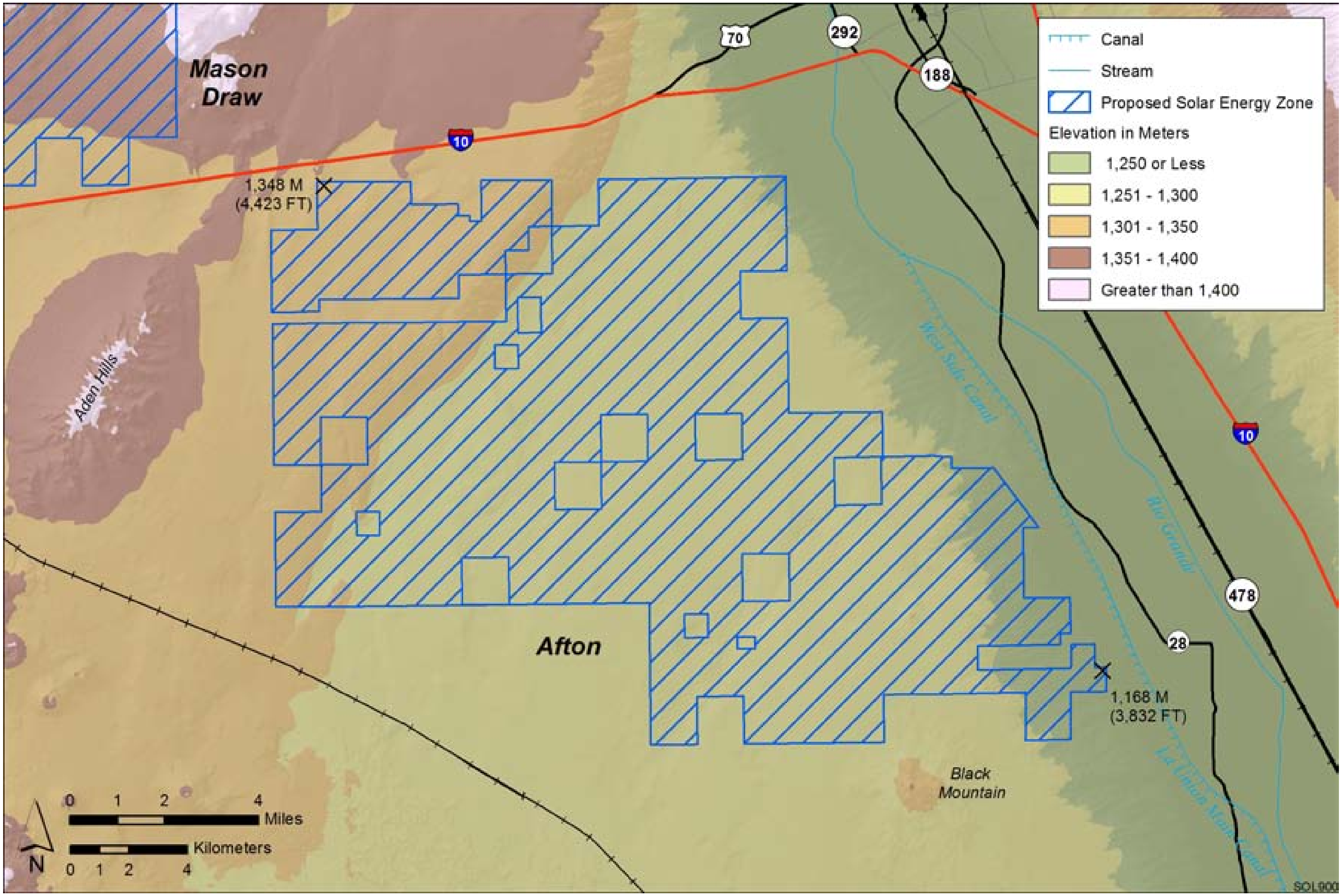

FIGURE 12.1.7.1-4 General Terrain of the Proposed Afton SEZ

occurring above an upwelling magma body about 12 mi (19 km) below the ground surface. Seismic activity outside of the SSA shows some concentration of earthquakes along a prominent topographic lineation (the Socorro fracture zone) that extends from the SSA to the north-northeast into eastern New Mexico. The strongest earthquakes in New Mexico tend to occur near Socorro along the rift valley (Sanford et al. 2002; Sanford and Lin 1998; Balch et al. 2010).

Several Quaternary faults occur within and adjacent to the proposed Afton SEZ (USGS and NMBGMR 2010). These include the East Robeldo and Fitzgerald faults, extending across parts of the SEZ; the Ward Tank fault, to the northwest; the West Robledo and unnamed faults, to the west; and the East Potrillo fault, to the south-southwest (Figure 12.1.7.1-5). The East Robledo fault is a north-northeast–trending normal fault that bounds the western edge of the Mesilla Basin (Figure 12.1.7.1-2) and crosses the western portion of the site. To the north, the fault bounds the east side of the Robledo Mountains, an uplifted block (horst) west of the Rio Grande Valley, with offsets of about 294 ft (90 m). It splays to the south, where displacements of the upper Camp Rice Formation of the Santa Fe Group (early to middle Pleistocene), the upper and lower West Mesa (referred to as "La Mesa" in earlier reports) piedmont surfaces (middle Pleistocene), and older alluvial fan and terrace deposits (middle Pleistocene) place movement along the fault at less than 750,000 years ago. The Fitzgerald fault crosses the southeastern portion of the site and extends to the south. Its strike is inferred from small west-facing scarps and from a linear series of closed basins. Scarp heights on the lower West Mesa surface are estimated to be as much as 65 ft (20 m) in discrete locales, but most of the fault trace is buried by thick eolian deposits. As with the East Robledo fault, displacements of lower West Mesa surface (middle Pleistocene) indicate that movement along the Fitzgerald fault occurred less than 750,000 years ago (Machete 1996a,b).

The north-trending Ward Tank fault is located about 7 mi (11 km) to the northwest of the Afton SEZ (and crosses the proposed Mason Draw SEZ) (Figure 12.1.7.1-5). Most of the movement along the high-angle normal fault occurred in the Tertiary, but offsets of Quaternary surfaces suggest it was reactivated less than 750,000 years ago. The Ward Tank fault bounds the east side of the Sierra de las Uvas Mountains; movement along the fault uplifted and tilted the mountains. Stratigraphic offsets of 2,000 to 2,490 ft (610 to 760 m) occur near Rattlesnake Hills (Machete 1996c).

The West Robledo fault and a group of unnamed faults and folds (monoclines) occur immediately to the west of the SEZ (crossing portions of the northwest corner of the site). The northeast-trending West Robledo fault extends southwestward from the northern edge of the Robledo Mountains along the west side past Aden Hills and then south through the basalt hills of the West Potrillo Mountains on into Mexico (Figure 12.1.7.1-5). The unnamed faults are high-angle normal faults located within the down-dropped basin between the East and West Robledo faults. There are no detailed studies of these faults, but offsets of the upper West Mesa surface suggest movement along them has not occurred since the early Quaternary, less than 1.6 million years ago (Machete 1996d,e).

The East Potrillo fault is located about 13 mi (21 km) to the south-southwest of the Afton SEZ. The high-angle normal fault bounds the east side of the East Potrillo Mountains and forms east-facing intrabasin scarps on sediment of the Camp Rice Formation (Santa Fe Group) and

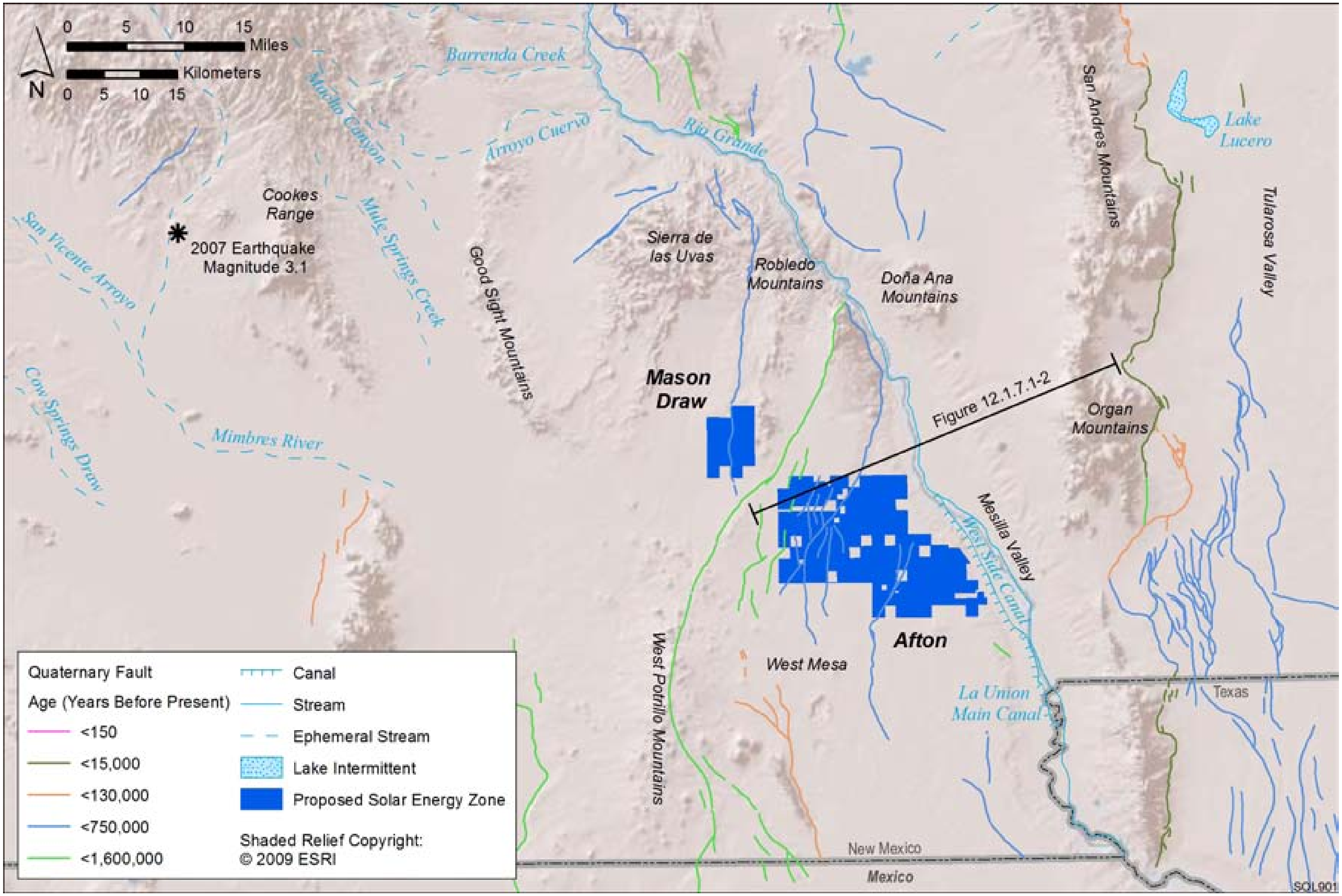

FIGURE 12.1.7.1-5 Quaternary Faults in the Mesilla Basin (USGS and NMBMMR 2010; USGS 2010f)

younger alluvial fan and piedmont slope deposits on the West Mesa surface. Such displacements place the most recent movement along the fault at less than 130,000 years ago (Machete 1996f).

From June 1, 2000, to May 31, 2010, only one earthquake was recorded within a 61-mi (100-km) radius of the proposed Afton SEZ (USGS 2010f). The earthquake occurred on November 3, 2007. It was located about 60 mi (100 km) northwest of the SEZ, west of the Cookes Range near the Mimbres River, and registered a Richter magnitude[1] (ML) of 3.1 (Figure 12.1.7.1-5). The largest earthquake in the region occurred on April 1, 1977 about 6 mi (10 km) north of the Afton SEZ. The earthquake registered a magnitude of 3.2. Four other earthquakes have occurred in the region since 1977; only the 2007 earthquake had a magnitude greater than 3.0 (USGS 2010f).

Liquefaction. The proposed Afton SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.04 and 0.05 g. Shaking associated with this level of acceleration is generally perceived as moderate; however, potential damage to structures is very light (USGS 2008). Given the very low intensity of ground shaking estimated for the area and the low incidence of historical seismicity in the region, the potential for liquefaction in sediments within and around the Afton SEZ is also likely to be low.

Volcanic Hazards. The major volcanic fields in New Mexico are associated with mantle upwelling within two zones of crustal weakness: the Jemez lineament and the Rio Grande rift. The Jemez lineament is defined by a series of Tertiary to Quaternary volcanic vents with a northeast alignment in northern New Mexico. These include the Zuni-Bandera volcanic field, Mount Taylor, the Jemez volcanic field, and the Raton-Clayton volcanic field). Eruptions from vents along the Jemez lineament have occurred within the past 10,000 years. The Jemez Mountains (near Los Alamos) are located at the intersection of the Jemez lineament and the north-trending Rio Grande rift. Rift valley vents nearest the Afton SEZ include Sierra Blanca on the eastern edge of the Tularosa Basin near Mescalero about 100 mi (160 km) to the northeast; and Jornado del Muerto, near Socorro about 130 mi (210 km) to the north. The Mogollon-Datil volcanic field is about 105 mi (170 km) to the northwest. Except for the Valles caldera in the Jemez Mountains, all these volcanoes are considered extinct and unlikely to erupt again. The most likely location of new volcanism in New Mexico is near Socorro, where an extensive magma body 12 mi (19 km) below the ground surface has created a zone of intense seismic activity (the Socorro Seismic Anomaly) (NMBGMR 2006; Wolf and Gardner 1995).

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

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

flat terrain of valley floors such as the West Mesa, if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

There has been no land subsidence monitoring on the West Mesa to date; however, earth fissures have been documented in the Mimbres Basin about 43 mi (70 km) to the west of the proposed Afton SEZ. The fissures are likely the result of land subsidence caused by compaction of unconsolidated alluvial sediments due to groundwater withdrawal. The maximum subsidence measured was about 14 in. (36 cm) in areas where groundwater levels had declined at least 98 ft (30 m) (Contaldo and Mueller 1991).

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

Alluvial fan surfaces, such as those found on the West Mesa, can be the sites of damaging high-velocity "flash" floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow fans) will depend on the specific morphology of the fan (National Research Council 1996). Section 12.1.9.1.1 provides further discussion of flood risks within the Afton SEZ.

12.1.7.1.2 Soil Resources

Soils within the Afton SEZ are predominantly loamy fine sands and fine sands of the Wink-Pintura complex and Onite-Pajarito, Wink-Harrisburg, and Simona-Harrisburg associations, which together make up about 82% of the soil coverage at the site (Figure 12.1.7.1-6). Soil map units within the proposed Afton SEZ are described in Table 12.1.7.1-1. These nearly level to gently undulating soils are derived from eolian sediments and mixed alluvium, typical of soils on the fan piedmonts of the West Mesa. They are characterized as deep and well to excessively drained. Most of the soils on the site have moderate surface runoff potential and moderately rapid to rapid permeability. The water erosion potential is very low to low for all soils at the site except those of the Tencee-Upton association that occur along the steep and dissected slopes of the Rio Grande Valley and the northeast-trending ridge that cuts across the site's northwest corner (covering about 1.4% of the site). The susceptibility to wind erosion is very high for most soils, with as much as 134 tons (122 metric tons) of soil eroded by wind per acre (4,000 m^2) each year. All soils within the SEZ have features that are favorable for fugitive dust formation. Outcrops of basalt (AL) cover about 150 acres (0.61 km^2), less than 1% of the site (NRCS 2010). Biological soil crusts and desert pavement have not been documented in the SEZ, but may be present.

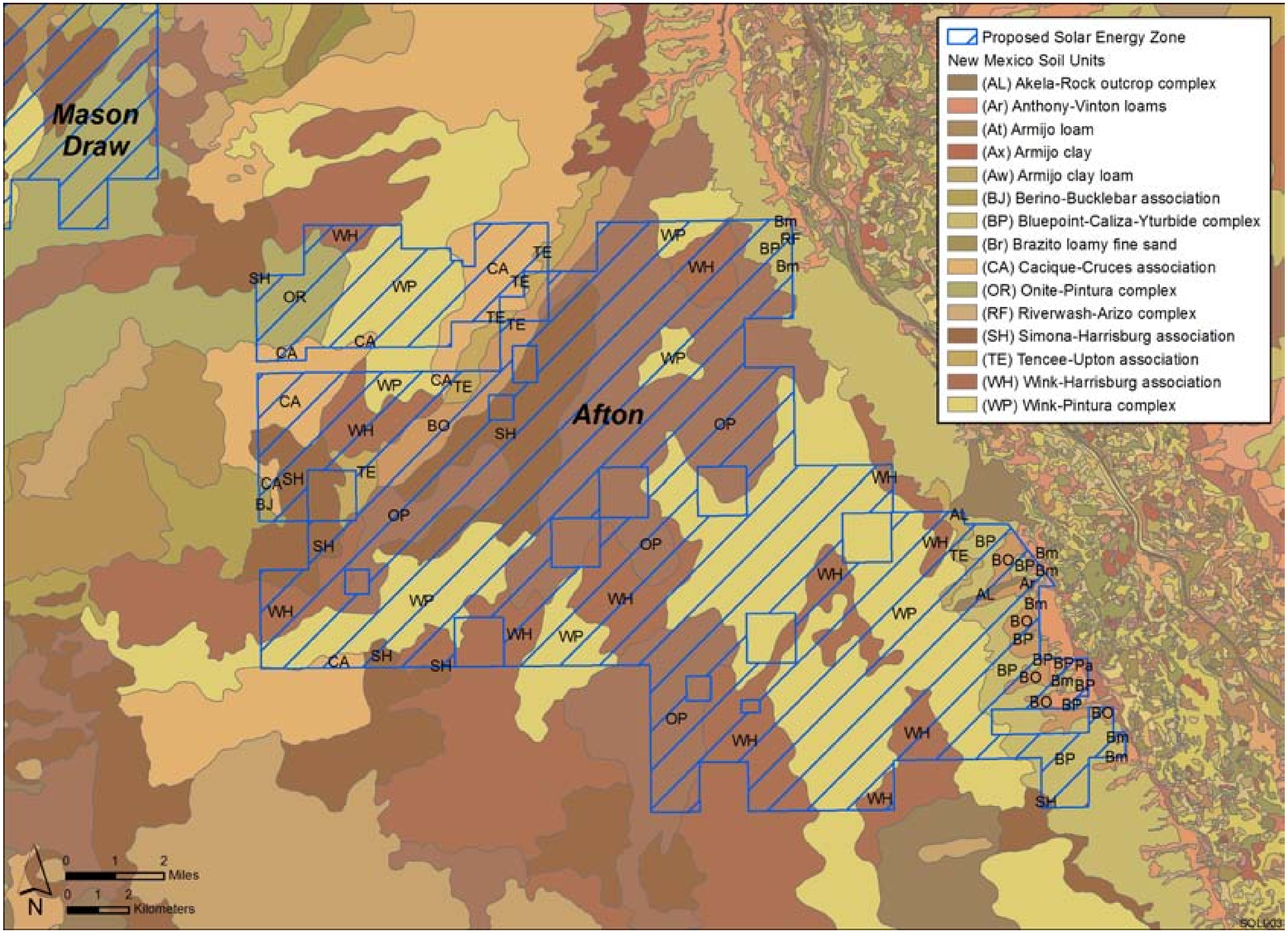

FIGURE 12.1.7.1-6 Soil Map for the Proposed Afton SEZ (NRCS 2008)

1 **TABLE 12.1.7.1-1 Summary of Soil Map Units within the Proposed Afton SEZ**

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Acres (% of SEZ)
WP	Wink-Pintura complex (1 to 5% slope)	Very low	Very high (WEG 2)[c]	Consists of about 45% Wink loamy fine sand and 35% Pintura fine sand. Gently undulating to undulating soils between and on dunes on fan piedmonts. Parent material includes eolian deposits and alluvium modified by wind. Deep and well drained, with moderate surface runoff potential and moderately rapid to rapid permeability. Shrink-swell potential is low. Available water capacity is low. Used mainly as rangeland, forestland, or wildlife habitat.	26,249 (34)
OP	Onite-Pajarito association (0 to 5% slope)	Very low	Very high (WEG 2)	Consists of about 40% Onite loamy sand, 30% Pajarito fine sandy loam, and 15% Pintura fine sand. Level to nearly level soils between and on dunes on fan piedmonts. Parent material includes eolian deposits on dunes and mixed alluvium between dunes. Deep and well to excessively well drained, with moderate surface runoff potential and moderately rapid to rapid permeability. Shrink-swell potential is low. Available water capacity is very low to high. Used mainly as rangeland, forestland, or wildlife habitat.	17,799 (23)
WH	Wink-Harrisburg association (1 to 5% slope)	Very low	Very high (WEG 3)	Consists of about 35% Wink fine sandy loam, 25% Harrisburg loamy fine sand, and 20% Simona sandy loam. Gently undulating to undulating soils between and on dunes and on upland ridges and swales on fan piedmonts. Parent material includes eolian deposits and residuum of sandstone, volcanic ash, and shale. Deep and well drained, with moderate surface runoff potential and moderately rapid permeability. Shrink-swell potential is low. Available water capacity is low. Used mainly as rangeland, forestland, or wildlife habitat.	12,530 (16)

TABLE 12.1.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Acres (% of SEZ)
SH	Simona-Harrisburg association (1 to 5% slope)	Low	Very high (WEG 3)	Consists of about 50% Simona sandy loam and 25% Simona sandy loam. Gently undulating to moderately rolling soils on broad fans, fan piedmonts, and desert mesas. Parent material includes eolian deposits from sandstone, volcanic ash, and shale. Shallow to moderately deep and well drained, with high surface runoff potential (slow infiltration rate) and moderately rapid permeability (above caliche hardpan). Shrink-swell potential is low. Available water capacity is very low. Used mainly as rangeland, forestland, or wildlife habitat.	6,809 (9)
BP	Bluepoint-Caliza-Yturbide complex (5 to 40% slope)	Low	Very high (WEG 2)	Consists of about 25% Bluepoint loamy sand (5 to 15% slopes), 25% Caliza gravelly sandy loam, and 20% Yturbide loamy sand. Hilly to very steep and severely dissected soils with gullies on fans and terraces along the Rio Grande Valley. Parent material consists of sandy alluvium modified by wind. Deep and well drained with low surface runoff potential (high infiltration rate) and moderately rapid to rapid permeability. Shrink-swell potential is low. Available water capacity is low to very low. Used mainly as rangeland, forestland, or wildlife habitat.	4,171 (5)
CA	Cacique-Cruces association (0 to 5% slope)	Very low	Very high (WEG 2)	Consists of about 35% Cacique loamy sand, 25% Cruces loamy sand, and 20% Simona loamy sand. Gently undulating to moderately rolling soils on basin floors, alluvial plains, mesa tops, and low ridges. Parent material consists of alluvium (basin floors) and sandy sediment (plains and low ridges). Shallow to moderately deep and well drained, with high surface runoff potential (low infiltration) and moderately rapid permeability. Shrink-swell potential is low to moderate. Available water capacity is low to very low. Used mainly as rangeland, forestland, or wildlife habitat.	3,629 (5)

TABLE 12.1.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Acres (% of SEZ)
BO	Bluepoint loamy sand (1 to 15% slope)	Very low	Very high (WEG 2)	Nearly level to gently sloping soils on dunes, fans, terraces, and ridges along the upper margins of the Rio Grande Valley. Parent material consists of sandy alluvium modified by wind. Deep and somewhat excessively drained, with a low surface runoff potential (high infiltration rate) and rapid permeability. Shrink-swell potential is low to very low. Available water capacity is low. Used mainly as rangeland, pastureland, forestland, or wildlife habitat.	2,740 (4)
OR	Onite-Pintura complex (0 to 5% slope)	Very low	Very high (WEG 2)	Consists of about 50% Onite loamy fine sand and 25% Pintura loamy fine sand. Level to nearly level soils on and between dunes on alluvial fan piedmonts. Parent material includes both eolian deposits (from sandstone) and alluvium. Deep and well drained, with a moderate surface runoff potential and moderately rapid to rapid permeability. Shrink-swell potential is low. Available water capacity is low to moderate. Used mainly as rangeland, forestland, or wildlife habitat.	1,780 (2)
TE	Tencee-Upton association (3 to 15% slope)	Moderate	Low (WEG 4)	Consists of about 35%Tencee very gravelly sandy loam and 20% Upton gravelly sandy loam. Undulating to moderately rolling soils on low ridge tops and side slopes. Parent material consists of gravelly alluvium. Shallow and well drained, with high surface runoff potential (low infiltration rate) and moderate permeability. Shrink-swell potential is low. Available water capacity is very low. Used mainly as rangeland, forestland, or wildlife habitat.	1,071 (1)
Bm	Bluepoint loamy sand (1 to 5% slope)	Very low	Very high (WEG 2)	Nearly level soils on alluvial fans and valley sides. Parent material consists of sandy alluvium modified by wind. Deep and somewhat excessively drained, with low surface runoff potential (high infiltration rate) and rapid permeability. Shrink-swell potential is low. Available water capacity is low to very low. Used mainly as rangeland, pastureland, forestland, or wildlife habitat.	474 (<1)

Footnotes continued on next page

TABLE 12.1.7.1-1 (Cont.)

[a] Water erosion potential is a qualitative interpretation based on soil properties or combination of properties that contribute to runoff and have low resistance to water erosion processes. The ratings are on a 1.0 scale and take into account soil features such as surface layer particle size, saturated hydraulic conductivity, and high runoff landscapes. A rating of “very high” (>0.9 to ≤1.0) indicates that the soil has the greatest relative vulnerability to water erosion; a rating of “very low” (<0.10) indicates that the soil has little or no relative water erosion vulnerability. A rating of “moderate” (>0.35 and ≤0.65) indicates the soil has medium relative water erosion vulnerability.

[b] Wind erosion potential is a qualitative interpretation based on surface soil properties or combination of properties that contribute to the soil’s potential wind erosivity. The ratings are on a 1.0 scale and assume that the affected area is bare, smooth, and has a long distance exposed to the wind. It is not a measure of actual soil loss from erosion. A rating of “very high” (>0.9 to ≤1.0) denotes a soil with a surface layer of sandy particles, high carbonate content, low organic matter content, or no coarse fragment protection. A rating of “low” (>0.2 to ≤0.4) is given to soils with favorable surface particle size, high organic matter content, or protective coarse fragments.

[c] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEG 2, 134 tons (122 metric tons) per acre (4,000 m^2) per year; and WEGs 3 and 4, 86 tons (78 metric tons) per acre (4,000 m^2) per year.

Sources: NRCS (2010); Bolluch and Neher (1980).

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

12.1.7.2 Impacts

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

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

12.1.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Afton 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.

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

This page intentionally left blank.

12.1.8 Minerals (Fluids, Solids, and Geothermal Resources)

12.1.8.1 Affected Environment

As of August 31, 2010, there were no locatable mining claims within the proposed Afton SEZ, nor have there been any claims in the past (BLM and USFS 2010a). The public land within the SEZ has been closed to locatable mineral entry since June 2009, pending the outcome of this solar energy PEIS.

A two-year lease was recently approved for the sale of scoria (a light weight volcanic rock) from a pit near Santo Tomas Mountain in the far eastern portion of the SEZ.[3] The sale covers about 5 acres (0.02 km^2). Little Black Mountain in the southeastern part of the SEZ has also had extensive development to produce scoria.

While there are no active oil and gas leases in the SEZ, most of the area in and around the area has been leased in the past, but the leases have expired (BLM and USFS 2010b). The area remains open for leasing for oil and gas and other leasable minerals, and for disposal of salable minerals. There is no active geothermal leasing or development in or near the SEZ, nor has the area been leased previously (BLM and USFS 2010b). Land within the Afton SEZ is considered prospectively valuable for oil, gas, and geothermal resources (BLM 2008b).

12.1.8.2 Impacts

If the area is identified as a solar energy zone, it would continue to be closed to all incompatible forms of mineral development. It is assumed that future development of oil and gas resources, should any be discovered, would continue to be possible, since such development could occur utilizing directional drilling from outside the SEZ.

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 scoria, sand and gravel, and mineral materials used for road construction or other purposes, might take place in areas not directly developed for solar energy production. The current mineral lease near Santo Tomas is an existing right that would not be affected by SEZ development during the lease term. Little Black Mountain is too steep for solar development, so if access is maintained to the area it could be used in the future for mineral material sales.

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

---

[3] BLM, LR 2000 Report, accessed October 26, 2010.

12.1.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

12.1.9 Water Resources

12.1.9.1 Affected Environment

The proposed Afton SEZ is located within the Rio Grande–Mimbres Subregion of the Rio Grande Hydrologic Region (USGS 2010d) and the Basin and Range physiographic province characterized by north-south trending basins flanked by small mountain ranges (Robson and Banta 1995). The proposed SEZ has surface elevations that range from 3,870 to 4,420 ft (1,180 to 1,350 m). The proposed Afton SEZ is located on sloping land between the West Potrillo Mountains to the west, Malpais Lava Field to the southwest, Robledo Mountains to the north, and Mesilla Valley of the Rio Grande to the east (Figure 12.1.9.1-1). Annual precipitation is estimated to be between 6.8 and 9.4 in./yr (17 and 24 cm/yr), with average snowfalls of 3 to 4 in./yr (8 to 10 cm/yr) (WRCC 2010a,b). Evaporation in the vicinity of the SEZ is estimated to be 102 in./yr (259 cm/yr) (Cowherd et al. 1988; WRCC 2010c).

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

There are no perennial streams within the proposed Afton SEZ. The Rio Grande River is located between 1.5 and 4.5 mi (2.4 and 7.2 km) to the east of the SEZ in the Mesilla Valley. The West Side Canal branches off from the Rio Grande River in the vicinity of the SEZ and is located less than 1 mi (1.6 km) from the SEZ in some places (Figure 12.1.9.1-1). Several small intermittent pond features are shown on USGS maps of the proposed SEZ (USGS 1978a,b, 1982). On the eastern edge of the SEZ, unnamed ephemeral streams are shown on the USGS maps as occurring in the slopes above the Mesilla Valley (USGS 1978a, 1982). The mean monthly discharge of the Rio Grande River just downstream of Elephant Butte Dam (the gauging station is located more than 60 mi [100 km] north of the proposed Afton SEZ) varies from 234 ft^3/s (6,630 L/s) in November to 1,820 ft^3/s (51,500 L/s) in June (USGS 2010e; gauge 08361000).

Flood hazards within the proposed Afton SEZ have been identified to be within the 100-year floodplain (Zone A) in some areas; the rest of the area is identified as being beyond the 500-year floodplain (Zone X) (FEMA 2009). Many of the areas identified as being within the 100-year floodplain in the SEZ are surface topographic depressions that correspond with the intermittent pond features discussed above. Along the eastern edge of the SEZ, there are linear 100-year floodplain features that correspond with the ephemeral wash features described above. The total Zone A floodplain area within the SEZ has been calculated to be 1,654 acres (6.7 km^2), and this land will be unavailable for solar facility development. During storm events, intermittent flooding may occur with temporary ponding and erosion, especially in low-lying areas (intermittent pond features) and ephemeral streams.

Twenty wetlands mapped by the National Wetland Inventory (NWI) occur in the Afton SEZ, totaling approximately 38.5 acres (0.2 km^2) (USFWS 2009). These wetlands occur primarily in local depressions; however, several near the eastern margin of the SEZ are associated with the Rio Grande floodplain and tributaries. Wetlands have also been identified

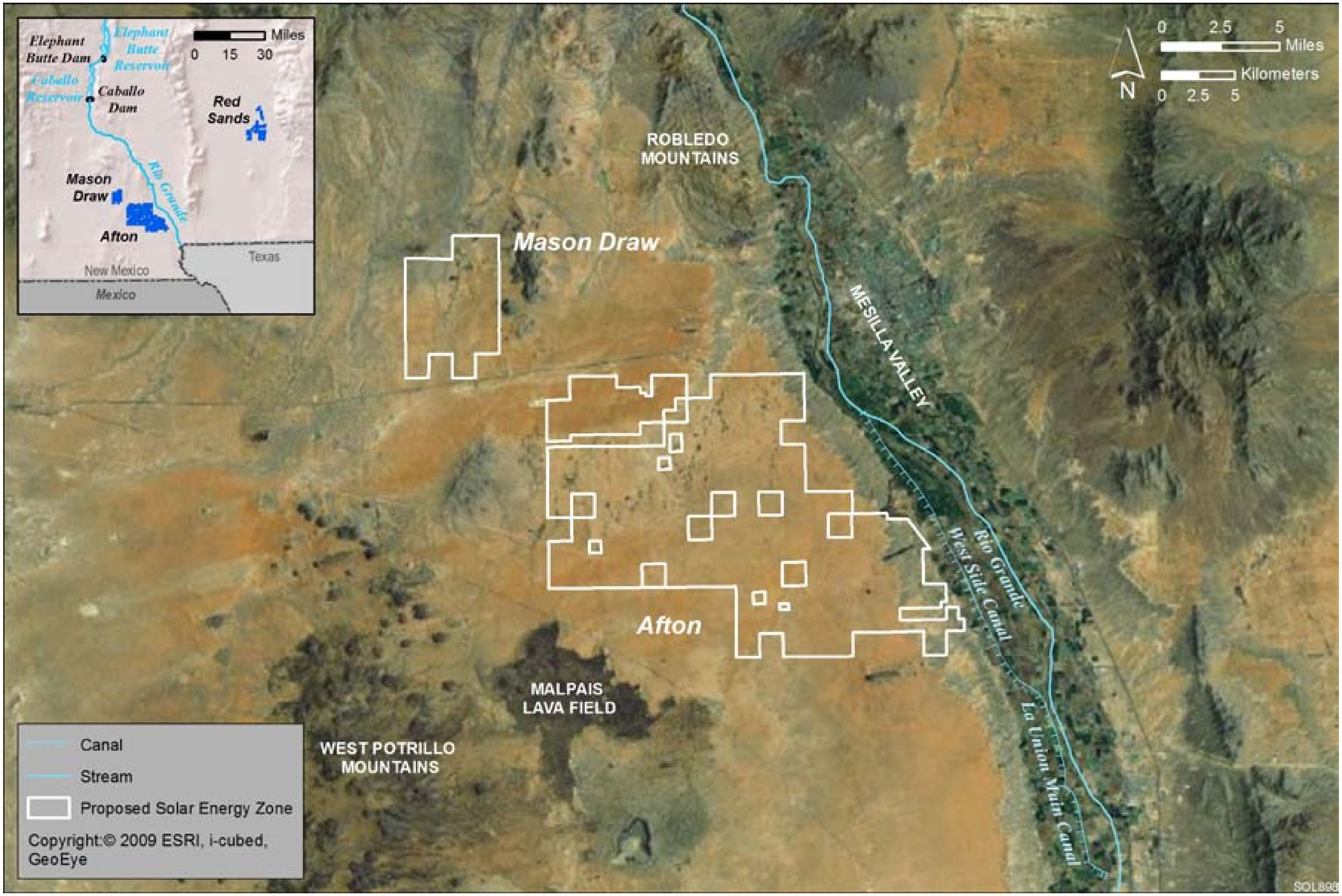

FIGURE 12.1.9.1-1 Surface Water Features near the Proposed Afton SEZ

along the Rio Grande River in the vicinity of the proposed Afton SEZ (NMSPD 2010). Further information regarding the wetlands near the SEZ is provided in Section 12.1.10.1.

12.1.9.1.2 Groundwater

The proposed Afton SEZ is located in the Mesilla Basin, specifically within the northwestern part which is referred to as the West Mesa. The Mesilla Basin occupies about 704,000 acres (2,850 km^2) and is bounded by the East and West Portillo Mountains, Arden Hills, and Sleeping Lady Hills to the west; the Organ Mountains and Franklin Mountains to the east; the Doña Ana Mountains and Robledo Mountains to the north; and the Sierra de Cristo Rey Mountains to the southeast (Figure 12.1.9.1-1). Groundwater is primarily found in basin-fill deposits that consist of Quaternary age alluvium along the floodplain of the Rio Grande and Quaternary and Tertiary age sediments of the Santa Fe Group (Nickerson and Myers 1993). The Mesilla Basin is considered partially drained with respect to groundwater as it contributes subsurface flow to the Hueco Bolson to the south and receives small amounts of water from the Jornada de Muerto groundwater system to the northeast (Hawley et al. 2001).

The Rio Grande alluvial deposits are found within the floodplain areas of the Rio Grande that extends over 60 mi (97 km) through the Mesilla Basin and ranging between several hundred feet to 5 mi (8 km) in width (LRGWUO 2004). The Rio Grande alluvium deposits range from 50 to 125 ft (15 to 38 m) in thickness and consist of gravel, sand, silt, and clay (Nickerson and Myers 1993). Near the Rio Grande River, the groundwater table can be as little as 10 ft (3 m) below ground level (Witcher et al. 2004). The Rio Grande alluvium extends to within about 3 mi (5 km) of the SEZ's eastern boundary. The majority of the basin-fill deposits within the Mesilla Basin are a part of the Santa Fe Group, which consists of deposits of poorly consolidated sedimentary and volcanic sediments (Frenzel et al. 1992). The thickness of the Santa Fe Group is estimated to range from being very thin at the northern and western boundaries of the basin to more than 5,000 ft (1,524 m), with thicknesses in the areas of the West Mesa ranging from 1,000 to 1,500 ft (305 to 457 m) (Nickerson and Myers 1993). A well drilled near the northeast part of the SEZ (Boles No. 1 Federal oil test well, T-24S R-1E S-7) indicates a potentially deeper portion of the Santa Fe Group by the presence of a saturated zone that was measured to be 3,440 ft (1,049 m) thick (Myers and Orr 1985).

The Santa Fe Group is informally divided into upper, middle, and lower hydrostratigraphic units: the upper unit has a thickness of up to 750 ft (229 m) consisting of ancestral Rio Grande channel sands and gravels; the middle unit includes extensive layers of sands interbedded with silty clay and is up to 1,500 ft (457 m) in thickness, and the lower unit has a high clay content and is up to 1,000 ft (305 m) thick (Hawley et al. 2001). The generalized hydrostratigraphic units of the Rio Grande floodplain alluvium and the Santa Fe Group deposits are unconfined and vary with respect to aquifer characteristics (Hawley et al. 2001). Hydraulic conductivity decreases with depth and with typical values that are approximately 70 ft/day (21 m/day) in the Rio Grande alluvium, and from 25 ft/day (8 m/day) in the upper unit of the Santa Fe Group to 12.5 ft/day (4 m/day) in the lower unit of the Santa Fe Group (Frenzel et al. 1992; Nickerson and Myers 1993; CH2M HILL 2002). Aquifer tests indicate that the transmissivity of the Rio Grande alluvium deposits range from 10,000 to 20,000 ft^2/day

(929 to 1,858 m^2/day), and in the Santa Fe Group range from about 10,900 to 40,000 ft^2/day (1,013 to 3,716 m^2/day) (Creel et al. 1998).

Groundwater recharge to the Mesilla Basin is primarily from infiltration of Rio Grande flows to floodplain alluvium, as well as mountain-front recharge processes (Nickerson and Myers 1993; Hawley et al. 2001). Basin-wide recharge estimates vary depending on methods used and range from less than 10,000 to 13,000 ac-ft/yr (12.3 million to 16.0 million m^3/yr) (Frenzel et al. 1992; Hawley et al. 2001; LRGWUO 2004). Discharge of groundwater from the Mesilla Basin occurs primarily as groundwater extractions, evapotranspiration, and discharge to agricultural ditches (Nickerson and Myers 1993). Quantifying groundwater discharge processes within the Mesilla Basin is difficult because of complex interactions between the surface waters (Rio Grande, tributary streams, and agricultural ditches and canals) and shallow groundwater that vary temporally and are also dependent on upstream reservoir releases to the Rio Grande (Frenzel et al. 1992; LRGWUO 2004). Groundwater flow in the Mesilla Groundwater Basin is generally to the southeast and parallel to flow in the Rio Grande River; however, the direction of groundwater flow is influenced by nearby hydraulic structures such as the Rio Grande, drains, canals, well pumpage, and heavily irrigated fields (LRGWUO 2004). The hydraulic gradient (slope of groundwater surface elevations) has been observed to be 0.002 in the northwest part of the West Mesa (near the proposed SEZ) and approximately 0.0004 near the boundary with Mexico (Witcher et al. 2004).

A groundwater monitoring network was established in 1987 by the USGS for the Mesilla Basin (Nickerson 1987). Information from this monitoring network, modeling studies, and previous investigations have shown that between 1978 and 2000, groundwater levels in the Mesilla Basin fluctuated by about 5 to 10 ft (1.5 to 3 m) west of the Rio Grande and decreased by 10 to 40 ft (3 to 12 m) east of the Rio Grande primarily because of groundwater extractions around the City of Las Cruces (LRGWUO 2004). The depth to groundwater varies from approximately 10 ft (3 m) near the Rio Grande to 400 ft (122 m) below the land surface (LRGWUO 2004). In the vicinity of the proposed Afton SEZ, the groundwater table is typically between 300 and 400 ft (91 and 122 m) below the land surface; this has remained fairly steady over time (USGS 2010c,e; e.g., well numbers 321248106560001, 320927106531201, and 320526106470101).

Groundwater in the Santa Fe Group beneath the proposed Afton SEZ is fresh to moderately saline. The concentration of total dissolved solids (TDS) concentrations in groundwater increases with depth (Nickerson and Myers 1993). The TDS content of groundwater samples taken from a well near an Afton test hole well (T-25S R-1E S-6) ranged from 755 mg/L at a depth of 635 to 655 ft (194 to 200 m) to 3,300 mg/L at a depth of 2,200 to 2,220 ft (671 to 677 m) (Nickerson and Meyers 1993). In addition, higher TDS concentrations are estimated to occur in groundwater in the northwestern part of the SEZ (Myers and Orr 1985). Fluoride concentrations were also found to be above the EPA primary MCL, and manganese and iron concentrations were found to exceed the secondary MCL in the Afton test hole well (USGS 2010e; well number 320924106531201).

12.1.9.1.3 Water Use and Water Rights Management

In 2005, 521,000 ac-ft/yr (642 million m^3/yr) of water was withdrawn in Dona Aña County; 61% of this came from surface water, and 39% came from groundwater. The largest water use category was agricultural irrigation, at 470,000 ac-ft/yr (580 million m^3/yr). Public supply water use accounted for 42,000 ac-ft/yr (52 million m^3/yr), with livestock water use accounting for about 6,900 ac-ft/yr (8.5 million m^3/yr) (Kenny et al. 2009). Total water use in the West Mesa portion of the Mesilla Basin is not known. The City of Las Cruces has obtained rights to withdraw 13,000 ac-ft/yr (16 million m^3/yr) from a planned well field in the West Mesa (City of Las Cruces 2008).

Water rights in New Mexico are managed using the doctrine of prior appropriation. All waters (both groundwater and surface water) are public and subject to appropriation by a legal entity with plans of beneficial use for the water (BLM 2001). A water right in New Mexico is a legal entity's right to appropriate water for a specific beneficial use and is defined by seven major elements: owner, point of diversion, place of use, purpose of use, priority date, amount of water, and periods of use. Water rights in New Mexico are administered through the Water Resources Allocation Program (WRAP) under the Office of the State Engineer (NMOSE) (NMOSE 2010d). The WRAP and NMOSE are responsible for both surface water and groundwater appropriations (both novel and transfer of existing water rights). The extent of the NMOSE's authority to regulate groundwater applies only to groundwater basins that are "declared" underground water basins; however, as of 2005, all groundwater basins within the state had been declared. When assessing water right applications, the WRAP considers the following: the existence of unappropriated waters within the basin, the possibility of impairing existing water rights, whether granting the application would be contrary to the conservation of water within the state, and whether the application would be detrimental to public welfare (BLM 2001).

In most regions of the state, groundwater and surface water appropriation application procedures are handled in a similar fashion. The criteria for which the applications are evaluated and administered can vary by region or case (NMOSE 2005a, 2006a). For select basins, in addition to the routine evaluations described above, groundwater and surface water rights applications may be subject to water management plans to ensure that the proposed junior water rights will not be detrimental to more senior water rights or impair water conservation efforts in their specific regions (NMOSE 2004). Under the WRAP is the Active Water Resource Management (AWRM) initiative, which is responsible for administering the water management plans in specific basins/regions (NMOSE 2010a). The AWRM is also responsible for prioritizing basins that are in need of conservation and water management plans. For basins deemed "priority," there are policies set in place that mandate junior water rights be temporarily curtailed in favor of more senior water rights in times of drought or shortage. These priority basins are generally more restrictive in terms of awarding novel water rights and transferring existing water rights (NMOSE 2004). Specific tools to be used in the AWRM initiative are associated with (1) detailed accounting of water use, (2) implementing new or existing regulations, (3) creating water districts for management purposes, and (4) assigning water masters to those districts (NMOSE 2004). The water masters are tasked with prioritizing water rights; this effort is necessary to accurately determine which rights will be curtailed and which will not in a time of water shortage. The process of curtailing junior water rights in favor of more senior ones is called "priority administration" (NMOSE 2010c).

The proposed Afton SEZ is located within the Lower Rio Grande Basin, which is an AWRM priority basin and includes the following groundwater basins: Mesilla Basin, Hueco Bolson, Palomas Basin, and Jornada del Muerto. Both groundwater and surface waters are fully appropriated within the Lower Rio Grande Basin, which has been involved in an ongoing adjudication since 1986 (LRGWUO 2004). New diversions of surface waters and groundwater would need to be carried out through the transfer of existing water rights, which are mostly associated with irrigated agriculture within the Lower Rio Grande Basin (NMOSE 2006a; King 2007; LRGWUO 1999). All water right transfer applications are reviewed by the WRAP on a case-by-case basis because of the diversity among the basins and regions (NMOSE 2010a). The Rio Grande flows north to south through the Lower Rio Grande Basin region before it is intercepted by the borders of both Texas and Mexico, and water management is significantly affected by regulations, compacts, and treaties relating to the Rio Grande that are described in Section 4.9.1.4.2.

The Lower Rio Grande Basin includes the growing city of Las Cruces. A study of the Lower Rio Grande Basin region done in 1999 found that on the basis of water use and population growth data, the demand for water in the city of Las Cruces would exceed the total amount of water rights in 2012 under a high-growth scenario and in 2030 under a low-growth scenario (LRGWUO 1999). The Mesilla Basin extends into both Mexico and Texas, but the majority of water taken by both those entities is taken from the adjacent Hueco Bolson. Mexico uses the Hueco Bolson for irrigation and as the primary (and almost exclusive) source of water for the city of Ciudad Juarez. LRGWUO (1999) indicated that the declining levels and low quality of the water in Hueco Bolson in 1999 might lead users to start using groundwater from the Mesilla Basin as an alternative. In addition, the Mesilla Basin has been identified as a priority transboundary aquifer (i.e., an aquifer that has been identified according to its proximity to areas with a high population density, the extent to which it is used, and its susceptibility to contamination) between the United States and Mexico (TCEQ 2005). It is covered by the United States–Mexico Transboundary Aquifer Assessment Act of 2006. The goals of this Act are to characterize, map, and model priority transboundary aquifers along the United States–Mexico border at a level of detail sufficient for the particular aquifer (Hawley and Granados-Olivas 2008). Characterization of the Mesilla Basin is currently being done by the USGS and the Water Resources Research Institute at New Mexico State University (Hawley and Granados-Olivas 2008). The Secretary of the Interior will use this information to update the status of the transboundary aquifer in an interim report (5 years after the Act was enacted) and as part of a final aquifer report in 2016 (United States–Mexico Transboundary Aquifer Assessment Act of 2006).

12.1.9.2 Impacts

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

12.1.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy developments, which are described in more detail for the four phases of development in Section 5.9.1. These impacts will be minimized through the implementation of the programmatic design features described in Appendix A, Section A.2.2. Land disturbance impacts in the vicinity of the Afton SEZ could potentially affect natural groundwater recharge and discharge properties. Tributary washes within the Afton SEZ contribute flow to the Mesilla Valley during major storm events, as evident from channelization patterns. Land surface depressions that act as intermittent pond/lake features within the SEZ may be an important source of recharge to the West Mesa and may also provide habitat within the SEZ.

12.1.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

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

- On the basis of a total area of 77,623 acres (314 km^2), it is assumed that three solar projects would be constructed during the peak construction year;
- Water needed for making concrete would come from an off-site source;
- The maximum land disturbance for an individual solar facility during the peak construction year is 3,000 acres (12 km^2);
- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land

disturbance, result in the potential to disturb up to 12% of the SEZ total area during the peak construction year; and

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

Site Characterization

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

Construction

During construction, water would be used mainly for fugitive dust suppression and the workforce potable supply. Because there are no significant surface water bodies on the proposed Afton SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources. Water requirements for dust suppression and potable water supply during the peak construction year, shown in Table 12.1.9.2-1, could be as high as 5,372 ac-ft (6.6 million m^3). Groundwater wells would have to yield an estimated 3,330 gal/min (12,600 L/min) to meet the estimated construction water requirements. 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 to groundwater withdrawals, up to 222 ac-ft (273,800 m^3) of sanitary wastewater would be generated during the peak construction year and would need to be either treated on-site or sent to an off-site facility. Groundwater quality in the vicinity of the SEZ would need to be tested to verify that the quality would comply with drinking water standards.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 12.1.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, hybrid, wet). Further refinements to water requirements for cooling would result from the percentage of time that the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 12.1.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions about acreage per megawatt. As a result, the water usage for the more-energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

Water use requirements among the solar energy technologies are a factor of the full build-out capacity for the SEZ as well as assumptions about water use and technology operations

TABLE 12.1.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Afton SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	3,491	5,237	5,237	5,237
Potable supply for workforce (ac-ft)	222	135	56	28
Total water use requirements (ac-ft)	3,713	5,372	5,293	5,265
Wastewater generated				
Sanitary wastewater (ac-ft)	222	135	56	28

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

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 102 in./yr (259 cm/yr) (Cowherd et al. 1988; WRCC 2010b).

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

discussed in Appendix M. Table 12.1.9.2-2 lists the quantities of water needed for mirror/panel washing, potable water supply, and cooling activities for each solar energy technology. At full build-out capacity, the estimated total water use requirements for non-cooling technologies (i.e., technologies that do not use water for cooling) during operations are 353 and 3,527 ac-ft/yr (435,000 and 4.4 million m^3/yr) for the PV and dish engine technologies, respectively. For technologies that use water for cooling (i.e., parabolic trough and power tower), total water needs range from 4,907 ac-ft/yr (6.1 million m^3) (power tower for an operating time of 30% using dry cooling) to 186,469 ac-ft/yr (230 million m^3/yr) (parabolic trough for an operating time of 60% using wet cooling). Operations would generate up to 174 ac-ft/yr (215,000 m^3/yr) of sanitary wastewater. In addition, for wet-cooled technologies, 1,960 to 3,528 ac-ft/yr (2.4 million to 4.4 million m^3/yr) of cooling system blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Water demands for full build-out of technologies that require wet cooling are extremely large compared to the overall water balance in the West Mesa. For either a parabolic trough or power tower, the water demands for wet cooling at full build-out would exceed the estimated annual recharge of the Santa Fe Group of 10,000 ac-ft/yr (12.3 million m^3/yr) by factors of 3.5 and 6.2 for a power tower and parabolic trough, respectively, operating at a level of 30% of the time. If the technologies were operated 60% of the time, the withdrawal rates would exceed recharge by factors of 10.3 and 18.6, respectively. If dry-cooling was used and a facility was operated 30% of the time, a power tower would use about 49% of the annual recharge to the aquifer, and a parabolic trough would use about 89% of the annual recharge. If operations were performed 60% of the time, a power tower system would use a little more than 100% of the annual recharge, and full build-out of a parabolic trough system would exceed the annual recharge by a factor of 1.9.

TABLE 12.1.9.2-2 Estimated Water Requirements during Operations at the Proposed Afton SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a, b]	12,420	6,900	6,900	6,900
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	6,210	3,450	3,450	345
Potable supply for workforce (ac-ft/yr)	174	77	77	7.7
Dry cooling (ac-ft/yr)[e]	2,484–12,420	1,380–6,900	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	55,889–180,085	31,049–100,047	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	3,527	353
Dry-cooled technologies (ac-ft/yr)	8,868–18,804	4,907–10,427	NA	NA
Wet-cooled technologies (ac-ft/yr)	62,272–186,469	34,576–103,575	NA	NA
Wastewater Generated				
Blowdown (ac-ft/yr)[g]	3,528	1,960	NA	NA
Sanitary wastewater (ac-ft/yr)	174	77	77	7.7

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

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

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

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

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

[f] NA = not applicable.

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

The effects of groundwater withdrawal rates on potential groundwater elevations and flow directions would need to be assessed during the site characterization phase of a solar project and during the development of water supply wells. From the perspective of water use requirements, technologies using wet- and dry-cooling would be unfeasible for the full build-out scenario of the proposed Afton SEZ. Groundwater quality in the vicinity of the SEZ would need to be tested to verify that the quality would comply with drinking water standards.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site would be reclaimed to its preconstruction state.

Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and might also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because quantities of water needed during the decommissioning/reclamation phase would be less than those needed for construction, impacts on surface and groundwater resources also would be less.

12.1.9.2.3 Off-Site Impacts: Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns related to potential chemical spills, and land disturbance effects on the natural hydrology. The extent of the impacts on water resources is proportional to the amount and location of land disturbance needed to connect the proposed SEZ to major roads and existing transmission lines. The proposed Afton SEZ is located adjacent to existing roads and transmission lines as described in Section 12.1.1.2, so it is assumed that impacts would be negligible.

12.1.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy at the proposed Afton SEZ are associated with land disturbance effects on the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation issues, as well as alter groundwater recharge and discharge processes. The Afton SEZ contains ephemeral wash features, intermittent pond/lake features, and areas within the 100-year floodplain. These areas are susceptible to increased erosion and sedimentation as a result of solar energy development.

Impacts related to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater is the primary water resource available to solar energy facilities in the proposed Afton SEZ. Estimates of groundwater recharge, discharge, and storage processes are not fully quantified for the Mesilla Basin because of the complex interactions between surface waters and groundwater, as discussed previously. However, estimates of groundwater recharge for the Mesilla Basin are on the order of 10,000 ac-ft/yr (12.3 million m^3/yr), which is much less than the wet-cooling water requirements needed for full build-out of the proposed SEZ. Even dry-cooling technologies could use from 50 to 100% of the estimated recharge of the Mesilla Basin. From the perspective of water use, wet- and dry-cooled technologies would not be feasible for the full build-out scenario of the proposed Afton SEZ.

Obtaining water rights for solar energy development may be challenging within the Lower Rio Grande Basin. Both groundwater and surface water are fully appropriated in the basin, and an adjudication of water rights within the basin has been ongoing since 1986. In addition, the City of Las Cruces has obtained rights to withdraw 13,000 ac-ft/yr (16 million m^3/yr) from a planned well field in the West Mesa (City of Las Cruces 2008).

The combination of this water use with the potential development of the Afton SEZ could put a serious burden on water resources in the West Mesa region of the Mesilla Basin.

Potable water supplies would need to be tested to confirm that they comply with drinking water standards. Concentrations of TDS, fluoride, iron, and manganese have been found to be elevated above MCLs in some samples taken within the Santa Fe Group aquifer.

12.1.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

Design features specific to the proposed Afton SEZ include the following:

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

- Land-disturbance activities should minimize impacts on ephemeral streams located within the proposed SEZ;

- Siting of solar facilities and construction activities should avoid the areas identified as being within a 100-year floodplain that total 1,654 acres (6.7 km^2) within the proposed SEZ;

- Groundwater management/rights should be coordinated with the NMOSE with respect to the Lower Rio Grande AWRM priority basin;

- Groundwater monitoring and production wells should be constructed in accordance with state standards (NMOSE 2005b);

- Stormwater management BMPs should be implemented according to the guidance provided by the New Mexico Environment Department (NMED 2010); and

- Water for potable uses would have to meet or be treated to meet water quality standards as defined by the EPA (2009d).

12.1.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Afton 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 only the SEZ. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the area of direct effect.

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

12.1.10.1 Affected Environment

The proposed Afton SEZ is located primarily within the Chihuahuan Basins and Playas Level IV ecoregion (EPA 2007), which supports communities of desert shrubs and grasses on alluvial fans, flat to rolling internally drained basins, and river valleys, and includes areas of saline and alkaline soils, salt flats, sand dunes, and areas of wind-blown sand (Griffith et al. 2006). The dominant species of the desert shrubland is creosotebush (*Larrea tridentata*), with tarbush (*Flourensia cernua*), yuccas (*Yucca* spp.), sand sage (*Artemisia filifolia*), viscid acacia (*Acacia neovernicosa*), tasajillo (*Cylindropuntia leptocaulis*), lechuguilla (*Agave lechuguilla*), and mesquite (*Prosopis* sp.) also occurring frequently. Gypsum areas support gyp grama (*Bouteloua breviseta*), gyp mentzelia (*Mentzelia humulis*), and Torrey ephedra (*Ephedra torreyana*). Fourwing saltbush (*Atriplex canescens*), seepweed (*Suaeda* sp.), pickleweed (*Allenrolfea occidentalis*), and alkali sacaton (*Sporobolus airoides*) occur on saline flats and along alkaline playa margins. Cacti, including horse crippler (*Echinocactus texensis*), are common in this ecoregion. Small areas in the eastern portion of the SEZ are located within the Rio Grande Floodplain ecoregion. This ecoregion supports riparian woodlands and shrublands along with agricultural areas (Griffith et al. 2006). Riparian habitats include cottonwood (*Populus* sp.)–willow (*Salix* sp.) communities, along with velvet ash (*Fraxinus velutina*), screwbean mesquite (*Prosopis pubescens*), seep willow (*Baccharis salicifolia*), alkali sacaton, skunkbush (*Rhus trilobata*), and creosotebush. Salt cedar (*Tamarix chinensis*), a woody invasive species, dominates some riparian areas. These ecoregions are located within the Chihuahuan Deserts Level III ecoregion, which is described in Appendix I. Annual precipitation in the Chihuahuan Desert occurs mostly in summer (Brown 1994), and is low in the area of the SEZ, averaging about 9.4 in. (24 cm) at Las Cruces, New Mexico (see Section 12.1.13).

Areas surrounding the SEZ include these ecoregions as well as the Low Mountains and Bajadas Level IV ecoregion, which includes desert shrub communities with a sparse cover of grasses, with scattered trees at higher elevations (Griffith et al. 2006). Lands southwest of the SEZ, within the area of indirect effects, include the Lava Malpais Level IV ecoregion, which consists of communities of mixed shrubs and grasses on lava flows (Griffith et al. 2006).

Land cover types described and mapped under the Southwest Regional Gap Analysis Project (SWReGAP) (USGS 2005a) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Afton SEZ are shown in Figure 12.1.10.1-1. Table 12.1.10.1-1 lists the surface area of each cover type within the potentially affected area.

Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub is the predominant cover type within the proposed Afton SEZ. Additional cover types within the SEZ are given in Table 12.1.10.1-1. During a July 2009 visit to the site, the dominant species observed in the desert scrub communities present within the SEZ were creosotebush, honey mesquite (*Prosopis glandulosa*), and snakeweed (*Gutierrezia* sp.) Soaptree yucca (*Yucca elata*) is abundant in some areas of the SEZ. Sensitive habitats on the SEZ include wetlands, desert dry washes, playas, riparian areas, cliffs, and sand dunes. The area has a history of livestock grazing, and the plant communities on the SEZ have likely been affected by grazing.

The area of indirect effects, including the area within 5 mi (8 km) around the SEZ, includes 25 cover types, which are listed in Table 12.1.10.1-1. The predominant cover types are Apacherian-Chihuahuan Mesquite Upland Scrub, Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub, Agriculture, and Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub.

Nineteen palustrine wetlands mapped by the National Wetland Inventory (NWI) occur in the Afton SEZ and total approximately 45 acres (0.2 km^2), and two riverine wetlands total 1.7 mi (2.7 km) (USFWS 2009). NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009). Because digitized wetland data is not available for the area of the SEZ, wetlands are not presented here in a separate figure. The palustrine wetlands occur primarily in local depressions; however, several near the eastern margin of the SEZ are associated with the Rio Grande floodplain and tributaries. Palustrine wetlands are relatively shallow freshwater wetlands that often support plant communities of trees, shrubs, emergents, or floating-leaved plants. Sixteen wetlands within the SEZ are classified as palustrine unconsolidated shore wetlands and range from intermittently flooded to temporarily flooded and seasonally flooded. Unconsolidated shore wetlands support sparse plant communities (less than 30% vegetation cover). They range in size from <0.1 to approximately 4.5 acres (<0.0004 to 0.02 km^2), and total approximately 30.9 acres (0.1 km^2). Three are designated as diked/impounded, while five are designated as excavated. One 6.5-acre (0.03-km^2) wetland, located in the western portion of the SEZ, is classified as a palustrine flats wetland. Flats are unvegetated or support sparse plant communities. Two riverine wetlands, located in intermittent drainages flowing to the Rio Grande floodplain, are temporarily flooded and total about 1.7 mi (2.7 km) in length. Two Palustrine wetlands with scrub-shrub plant communities occur along the Rio Grande floodplain, range from intermittently flooded to temporarily flooded, and total approximately 7.6 acres (0.03 km^2). Cover types occurring on the SEZ, that are typically associated with wetland or riparian areas, include North American Warm

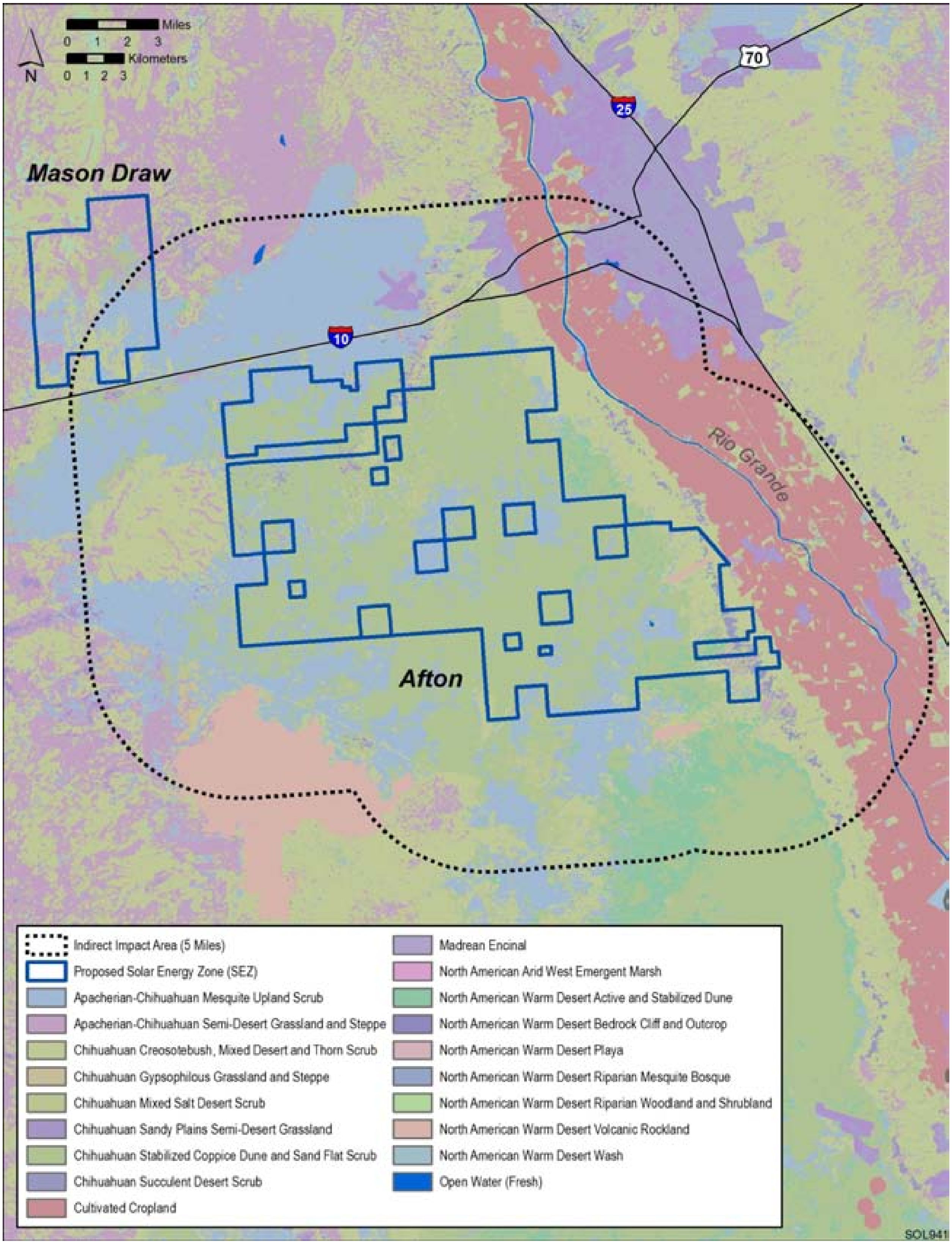

FIGURE 12.1.10.1-1 Land Cover Types within the Proposed Afton SEZ (Source: USGS 2004)

1

TABLE 12.1.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Afton SEZ and Potential Impacts

Land Cover Type[a]	Area of Cover Type Affected (acres)[b]: Within SEZ (Direct Effects)[c]	Area of Cover Type Affected (acres)[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub: Consists of vegetated dunes and sandsheets with open shrublands (generally 10 to 30% plant cover), which include grasses.	51,231 acres[f] (5.9%, 17.4%)	40,947 acres (4.7%)	Moderate
Apacherian-Chihuahuan Mesquite Upland Scrub: Occurs on foothills where deeper soil layers store winter precipitation. Dominant species are western honey mesquite (*Prosopis glandulosa*) or velvet mesquite (*P. velutina*) along with succulents and other deep-rooted shrubs. Cover of grasses is low.	15,659 acres (2.9%, 5.5%)	57,580 acres (10.6%)	Moderate
Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub: Occurs in basins and plains as well as the foothill transition zone. Consists of creosotebush (*Larrea tridentata*) alone or with thornscrub or other desertscrub species, including succulents such as *Agave* and cacti. Although grasses may be common, shrubs generally have greater cover.	6,302 acres (0.6%, 1.1%)	45,551 acres (4.1%)	Small
Chihuahuan Mixed Salt Desert Scrub: Occurs in saline basins, often on alluvial flats and around playas. Consists of one or more species of *Atriplex* along with other halophytic plant species. Grasses are present in varying densities.	1,996 acres (3.0%, 8.3%)	3,345 acres (5.0%)	Moderate
North American Warm Desert Active and Stabilized Dune: Consists of unvegetated to sparsely vegetated (generally <10% plant cover) active dunes and sandsheets. Vegetation includes shrubs, forbs, and grasses. Includes unvegetated “blowouts” and stabilized areas.	917 acres (0.7%, 2.0%)	8,652 acres (6.2%)	Small
Chihuahuan Succulent Desert Scrub: Occurs on hot, dry colluvial slopes, upper bajadas, sideslopes, ridges, canyons, hills, and mesas. Includes an abundance of succulent species, such as cacti, *Agave*, *Yucca*, and others. Shrubs are generally present, and perennial grasses are sparse.	393 acres (2.9%, 9.0%)	874 acres (6.5%)	Moderate

TABLE 12.1.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
Apacherian-Chihuahuan Piedmont Semi-Desert Grassland and Steppe: Occurs on gently sloping bajadas, as well as on mesas and steeper piedmont and foothill slopes. Consists of grassland, steppe, and savanna characterized by a high diversity of perennial grasses as well as succulents, such as *Agave*, sotol (*Dasylirion* spp.) and *Yucca*, and tall shrub/short tree species.	343 acres (<0.1%, 0.1%)	11,924 acres (1.3%)	Small
Chihuahuan Sandy Plains Semi-Desert Grassland: Occurs on sandy plains and sandstone mesas. Consists of grassland and steppe and includes scattered desert shrubs and stem succulents such as *Yucca* spp.	331 acres (0.8%, 2.6%)	963 acres (2.2%)	Small
North American Warm Desert Volcanic Rockland: Consists of barren and sparsely vegetated (<10% plant cover) areas. Vegetation is variable and typically includes scattered desert shrubs.	196 acres (1.2%, 1.3%)	9,460 acres (55.5%)	Small
North American Warm Desert Riparian Woodland and Shrubland: Occurs along medium to large perennial streams in canyons and desert valleys. Consists of a mix of riparian woodlands and shrublands. Vegetation is dependent upon annual or periodic flooding, along with substrate scouring, and/or a seasonally shallow water table.	64 acres (0.9%, 2.5%)	495 acres (7.3%)	Small
Open Water: Plant or soil cover is generally less than 25%.	15 acres (0.4%, 9.7%)	960 acres (26.3%)	Small
North American Warm Desert Playa: Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant.	10 acres (0.1%, 0.7%)	98 acres (0.8%)	Small
Agriculture: Areas where pasture/hay or cultivated crops account for more than 20% of total vegetation cover.	9 acres (<0.1%, 1.0%)	42,452 acres (30.6%)	Small

TABLE 12.1.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b]		Overall Impact Magnitude[e]
	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, and unstable scree and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	9 acres (0.2%, 0.5%)	132 acres (3.4%)	Small
Chihuahuan Gypsophilous Grassland and Steppe: Occurs on gypsum outcrops and on basins and slopes with sandy gypsiferous and/or alkaline soils. Consists of generally sparse grassland, steppe, or dwarf shrubland.	6 acres (<0.1%, 0.9%)	23 acres (0.1%)	Small
North American Arid West Emergent Marsh: Occurs in natural depressions, such as ponds, or bordering lakes, or slow-moving streams and rivers. Alkalinity is highly variable. The plant community is characterized by herbaceous emergent, submergent, and floating leaved species.	2 acres (0.8%, 3.5%)	22 acres (8.4%)	Small
North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense, and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	1 acre (<0.1%, 0.1%)	128 acres (4.3%)	Small
Developed, Medium-High Intensity: Includes housing and commercial/industrial development. Impervious surfaces compose 50–100% of the total land cover.	0 acres	6,323 acres (9.0%)	Small
Developed, Open Space-Low Intensity: Includes housing, parks, golf courses, and other areas planted in developed settings. Impervious surfaces comprise up to 49% of the total land cover.	0 acres	4,506 acres (6.1%)	Small
Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	0 acres	1,603 acres (20.4%)	Small

TABLE 12.1.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ (Direct Effects)[c]	Area of Cover Type Affected (acres)[b] Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e]
Madrean Encinal: Occurs on foothills, bajadas, and plateaus and in canyons. Consists of evergreen oak (*Quercus* spp.) woodlands, which include open woodlands and savannas at lower elevations. Conifers and shrubs may be present. Grasses may be prominent in some areas.	0 acres	111 acres (0.3%)	Small
Madrean Juniper Savanna: Occurs on lower foothills and plains. Consists of widely spaced Madrean juniper (*Juniperus* spp.) trees, with a moderate to high density of grasses (exceeding 25% cover). Succulents such as *Yucca*, *Agave*, or cacti are generally present.	0 acres	458 acres (2.7%)	Small
Madrean Pinyon-Juniper Woodland: Occurs on foothills, mountains, and plateaus. Mexican pinyon (*Pinus cembroides*), border pinyon (*P. discolor*), or other trees and shrubs of the Sierra Madres are present. Dominant species may include redberry juniper (*Juniperus coahuilensis*), alligator juniper (*J. deppeana*), Pinchot's juniper (*J. pinchotii*), oneseed juniper (*J. monosperma*), or twoneedle pinyon (*P. edulis*). Oaks (*Quercus* sp.) may be codominant. Understory shrub or graminoid layers may be present.	0 acres	13 acres (<0.1%)	Small
North American Warm Desert Lower Montane Riparian Woodland and Shrubland: Occurs along perennial and seasonally intermittent streams in mountain canyons and valleys. Consists of a mix of woodlands and shrublands.	0 acres	2 acres (<0.1%)	Small
North American Warm Desert Pavement: Consists of unvegetated to very sparsely vegetated (<2% plant cover) areas, usually in flat basins, with ground surfaces of fine to medium gravel coated with "desert varnish." Desert scrub species are usually present. Herbaceous species may be abundant in response to seasonal precipitation.	0 acres	30 acres (0.3%)	Small

Footnotes continued on next page.

1

TABLE 12.1.10.1-1 (Cont.)

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

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

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

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary, where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project 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 area of indirect effects and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost. Proportion cutoffs were adjusted to account for the fact that 18% of the SEZ region occurs in Mexico.

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

Desert Riparian Woodland and Shrubland, Open Water, North American Warm Desert Playa, North American Arid West Emergent Marsh, and North American Warm Desert Wash. A large number of wetland areas are mapped within and near the Rio Grande floodplain directly east of the SEZ, in the area of indirect effects, including palustrine wetlands with emergent plant communities, scrub-shrub communities, forested communities, and palustrine unconsolidated shore, as well as riverine wetlands.

The State of New Mexico maintains an official list of weed species that are designated noxious species (NMDA 2009). Table 12.1.10.1-2 provides a summary of the noxious weed species regulated in New Mexico that are known to occur in Dona Ana County (USDA 2010; NMSU 2007), which includes the proposed Afton SEZ. No species included in Table 12.1.10.1-2 was observed on the SEZ in July 2009.

The New Mexico Department of Agriculture classifies noxious weeds into one of four categories (NMDA 2009):

- "Class A species are currently not present in New Mexico, or have limited distribution. Preventing new infestations of these species and eradicating existing infestations is the highest priority."

- "Class B species are limited to portions of the state. In areas with severe infestations, management should be designed to contain the infestation and stop any further spread."

- "Class C species are wide-spread in the state. Management decisions for these species should be determined at the local level, based on feasibility of control and level of infestation."

TABLE 12.1.10.1-2 Designated Noxious Weeds of New Mexico Occurring in Dona Ana County

Common Name	Scientific Name	Category
African rue	*Peganum harmala*	Class B
Camelthorn	*Alhagi pseudalhagi*	Class A
Hoary cress	*Cardaria* spp.	Class A
Jointed goatgrass	*Aegilops cylindrica*	Class C
Malta starthistle	*Centaurea melitensis*	Class B
Perennial pepperweed	*Lepidium latifolium*	Class B
Russian knapweed	*Acroptilon repens*	Class B
Russian olive	*Elaeagnus angustifolia*	Class C
Sahara mustard	*Brassica tournefortii*	Watch List
Saltcedar	*Tamarix* spp.	Class C
Siberian elm	*Ulmus pumila*	Class C

Sources: NMDA (2009); NMSU (2007); USDA (2010).

- "Watch List species are species of concern in the state. These species have the potential to become problematic. More data is needed to determine if these species should be listed. When these species are encountered please document their location and contact appropriate authorities."

12.1.10.2 Impacts

The construction of solar energy facilities within the proposed Afton 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 (62,098 acres [251.3 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations, and could include any of the communities occurring on the SEZ. Therefore, for the purposes of this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

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

Because of the proximity of the Mason Draw and Afton SEZs, a large area of overlap of the area of indirect effects exists, with a portion of the Mason Draw SEZ lying within the area of indirect effects of the Afton SEZ, and a portion of the Afton SEZ lying within the area of indirect effects of the Mason Draw SEZ. The potential for impacts could increase in the area of overlap. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation that are encountered within the SEZ are described in more detail in Section 5.10.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2 and through any additional mitigation applied. SEZ-specific design features are given in Section 12.1.10.3.

12.1.10.2.1 Impacts on Native Species

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

Solar facility construction and operation in the proposed Afton SEZ would primarily affect communities of the Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub cover type. Additional cover types that would be affected within the SEZ include Apacherian-Chihuahuan Mesquite Upland Scrub, Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub, Chihuahuan Mixed Salt Desert Scrub, North American Warm Desert Active and Stabilized Dune, Chihuahuan Succulent Desert Scrub, Apacherian-Chihuahuan Piedmont Semi-Desert Grassland and Steppe, Chihuahuan Sandy Plains Semi-Desert Grassland, North American Warm Desert Volcanic Rockland, North American Warm Desert Riparian Woodland and Shrubland, Open Water, North American Warm Desert Playa, North American Warm Desert Bedrock Cliff and Outcrop, Chihuahuan Gypsophilous Grassland and Steppe, North American Arid West Emergent Marsh, and North American Warm Desert Wash. Although the Agriculture cover type occurs within the SEZ, these areas likely support few native plant communities. Table 12.1.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed Afton SEZ. Many of these cover types are relatively common in the SEZ region, however, several are relatively uncommon, representing less than 1% of the land area within the SEZ region: Chihuahuan Gypsophilous Grassland and Steppe (0.7%), North American Warm Desert Volcanic Rockland (0.4%), Chihuahuan Succulent Desert Scrub (0.3%), North American Warm Desert Playa (0.3%), North American Warm Desert Riparian Woodland and Shrubland (0.2%), North American Warm Desert Bedrock Cliff and Outcrop (0.09%), North American Warm Desert Wash (0.07%), and North American Arid West Emergent Marsh (0.006%). Wetlands, desert dry washes, playas, riparian areas, cliffs, and sand dunes are sensitive habitats on the SEZ.

The construction, operation, and decommissioning of solar projects within the proposed Afton SEZ would result in moderate impacts on Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub, Apacherian-Chihuahuan Mesquite Upland Scrub, Chihuahuan Mixed Salt Desert Scrub, and Chihuahuan Succulent Desert Scrub cover types. Solar energy development would result in small impacts on all other cover types in the affected area.

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

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the area of indirect effects identified in Table 12.1.10.1-1.

Approximately 45 acres (0.2 km^2) of palustrine wetlands and about 1.7 mi (2.7 km) of riverine wetlands occur within the Afton SEZ. Grading could result in direct impacts on these wetlands if fill material is placed within wetland areas. Grading near the wetlands in the SEZ could disrupt surface water or groundwater flow characteristics, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter wetland plant communities and affect wetland function. Increases in surface runoff from a solar energy project site could also affect wetland hydrologic characteristics. The introduction of contaminants into wetlands in or near the SEZ could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in wetland areas, which could degrade or eliminate wetland plant communities. Sedimentation effects or hydrologic changes could also extend to wetlands outside of the SEZ, such as those in or near the Rio Grande.

Grading could also affect dry washes within the SEZ. Some desert dry washes in the SEZ support riparian woodland communities. 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. Communities associated with intermittently flooded areas, such as playas, downgradient from solar projects in the SEZ, could be affected by ground-disturbing activities. Site clearing and grading could result in hydrologic changes, and could potentially alter 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. See Section 12.1.9 for further discussion of impacts on washes.

Although the use of groundwater within the Afton SEZ for technologies with high water requirements, such as wet-cooling systems, may be unlikely, groundwater withdrawals for such systems could reduce groundwater elevations. Communities that depend on accessible groundwater, such as wetlands and riparian habitats along the Rio Grande floodplain, could become degraded or lost as a result of lowered groundwater levels.

12.1.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

E.O. 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Species designated as noxious weeds in New Mexico and known to occur in Dona Ana County are given in Table 12.1.10.1-2. 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 Afton SEZ, such that weeds could be transported into areas that were previously relatively weed-free, which could result in reduced restoration success and possible widespread habitat degradation.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Existing roads, grazing, and recreational OHV use within the SEZ area of potential impact would also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species. Disturbed areas, including 6,323 acres (25.6 km^2) of Developed, Medium-High Intensity and 4,506 acres (18.2 km^2) of Developed, Open Space-Low Intensity, occur within the area of indirect effects and may contribute to the establishment of noxious weeds and invasive species.

12.1.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While the 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 desert scrub, dune, steppe, grassland communities, and other affected habitats, and minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- All wetland, dry wash, playa, riparian, succulent, and dune communities within the SEZ should be avoided to the extent practicable, and any impacts minimized and mitigated. Any yucca, agave, ocotillo, cacti (including *Opuntia* spp., *Cylindropuntia* spp., and *Echinocactus* spp.) and other succulent plant species that cannot be avoided should be salvaged. A buffer area should be maintained around wetland, dry wash, playa, and riparian habitats to reduce the potential for impacts.

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

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on groundwater-dependent communities, such as wetland or riparian communities associated with the Rio Grande floodplain.

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

12.1.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Afton SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from the SWReGAP (USGS 2007) and the Biota Information System of New Mexico (BISON-M 2010; NMDGF 2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007) and the South Central Gap Analysis Program (USGS 2010a). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) within the SEZ. The maximum developed area within the SEZ would be 62,098 acres (251.3 km^2). No areas of direct effects would occur for either a new transmission line or a new access road, because existing transmission line and road corridors are adjacent to or through the SEZ.

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur, but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills in the SEZ). Potentially suitable habitat within the SEZ greater than the maximum of 62,098 acres (251.3 km^2) of direct effects was also included as part of the area of indirect effects. The potential degree of indirect effects would decrease with increasing distance from the SEZ. The area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. These areas of direct and indirect effects are defined and the impact assessment approach is described in Appendix M.

The primary land cover habitat types within the affected area are Chihuahuan stabilized coppice dune and sand flat scrub, as well as Chihuahuan mesquite desert scrub (Section 12.1.10). Potentially unique habitats in the affected area include cliff and rock outcrops, desert dunes, playas, washes, and aquatic and riparian habitats. There is also approximately 42,500 acres (172 km^2) of agricultural land cover types in the affected area. A number of wetlands occur within the SEZ and within the area of indirect effects surrounding the SEZ (Section 12.1.10). No aquatic habitats are known to occur on the SEZ; however, the Rio Grande, West Side Canal, and La Union Main Canal are east of the SEZ within the area of indirect effects (see Figure 12.1.9.1-1).

12.1.11.1 Amphibians and Reptiles

12.1.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Afton SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from BISON-M (NMDGF 2010) and range maps and habitat information available from CDFG (2008), NatureServe (2010), and USGS (2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007) and the South Central Gap Analysis Program (USGS 2010a). See Appendix M for additional information on the approach used.

More than 10 amphibian species occur in Dona Ana County. Based on species distributions within the area of the SEZ and habitat preferences of the amphibian species, Couch's spadefoot (*Scaphiopus couchii*), Great Plains toad (*Bufo cognatus*), plains spadefoot (*Spea bombifrons*), and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (NMDGF 2010; USGS 2007; Stebbins 2003).

More than 50 reptile species occur within Dona Ana County (NMDFG 2010; USGS 2007; Stebbins 2003). Lizard species expected to occur within the proposed Afton SEZ include the collared lizard (*Crotaphytus collaris*), eastern fence lizard (*Sceloporus undulatus*), Great Plains skink (*Eumeces obsoletus*), long-nosed leopard lizard (*Gambelia wislizenii*), round-tailed horned lizard (*Phrynosoma modestum*), side-blotched lizard (*Uta stansburiana*), and western whiptail (*Cnemidophorus tigris*). Snake species expected to occur within the SEZ are the coachwhip (*Masticophis flagellum*), common kingsnake (*Lampropeltis getula*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), long-nosed snake (*Rhinocheilus lecontei*), and nightsnake (*Hypsiglena torquata*). The most common poisonous snakes that could occur on the SEZ are the western diamond-backed rattlesnake (*Crotalus atrox*) and western rattlesnake (*Crotalus viridis*).

Table 12.1.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Afton SEZ. Special status amphibian and reptile species are addressed in Section 12.1.12.

12.1.11.1.2 Impacts

The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 12.1.11.1.3 identifies SEZ-specific design features of particular relevance to the proposed Afton SEZ.

TABLE 12.1.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Afton SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Amphibians				
Couch's spadefoot (*Scaphiopus couchii*)	Desert washes, desert riparian, palm oasis, desert succulent shrub, and desert scrub habitats. Requires pools or potholes with water that lasts longer than 10 to 12 days for breeding sites. About 2,553,700 acres[g] of potentially suitable habitat occurs within the SEZ region.	22,637 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	116,040 acres of potentially suitable habitat (4.5% of available suitable habitat)	Small overall impact. Avoidance of wetland, playa, and wash habitats could reduce impacts.
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 983,200 acres of potentially suitable habitat occurs within the SEZ region.	364 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) during construction and operations	14,510 acres of potentially suitable habitat (1.5% of available suitable habitat)	Small overall impact. Avoidance of wetland, playa and wash habitats could reduce impacts.
Plains spadefoot (*Spea bombifrons*)	Common in areas of soft sandy/gravelly soils along stream floodplains Also occurs in semidesert shrublands. Breeds in deep open-water playa habitats. Usually remains in underground burrows until it rains. About 1,272,700 acres of potentially suitable habitat occurs within the SEZ region.	8,378 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat) during construction and operations	49,525 acres of potentially suitable habitat (3.9% of available suitable habitat)	Small overall impact. Avoidance of wetland, playa, and wash habitats could reduce impacts.
Red-spotted toad (*Bufo punctatus*)	Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos; desert streams and oases; open grassland; scrubland oaks; and dry woodlands. About 3,577,700 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	175,383 acres of potentially suitable habitat (4.9% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 12.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Lizards				
Collared lizard (*Crotaphytus collaris*)	Level or hilly rocky terrain in a variety of vegetative communities. Typical habitats include lava fields, rocky canyons, slopes, and gullies. About 2,693,400 acres of potentially suitable habitat occurs within the SEZ region.	24,904 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	129,390 acres of potentially suitable habitat (4.8% of available suitable habitat)	Small overall impact. Avoidance of rocky cliffs and outcrops could reduce impacts.
Eastern fence lizard (*Sceloporus undulatus*)	Sunny, rocky habitats of cliffs, talus, old lava flows and cones, canyons, and outcrops. Various vegetation adjacent or among rocks include montane forests, woodlands, semidesert shrubland, and various forbs and grasses. About 2,959,100 acres of potentially suitable habitat occurs within the SEZ region.	27,817 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	143,101 acres of potentially suitable habitat (4.8% of available suitable habitat)	Small overall impact. Avoidance of volcanic rocklands, rocky cliffs, and outcrops could reduce impacts.
Great Plains skink (*Eumeces obsoletus*)	Creosotebush desert, desert-grasslands, riparian corridors, pinyon-juniper woodlands, and pine-oak woodlands. About 2,843,200 acres of potentially suitable habitat occurs within the SEZ region.	25,825 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	139,801 acres of potentially suitable habitat (4.9% of available suitable habitat)	Small overall impact.
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 2,495,700 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (2.5% of available potentially suitable habitat) during construction and operations	161,780 acres of potentially suitable habitat (6.5% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 12.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Lizards (Cont.)				
Round-tailed horned lizard (*Phrynosoma modestum*)	Desert-grassland and desert shrubland habitats with scrubby vegetation and sandy or gravelly soil. About 2,666,800 acres of potentially suitable habitat occurs within the SEZ region.	24,702 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	119,988 acres of potentially suitable habitat (4.5% of available suitable habitat)	Small overall impact.
Side-blotched lizard (*Uta stansburiana*)	Arid and semiarid locations with scattered bushes or scrubby trees. Often occurs in sandy washes with scattered rocks and bushes. About 2,669,800 acres of potentially suitable habitat occurs within the SEZ region.	24,703 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	120,116 acres of potentially suitable habitat (4.5% of available suitable habitat)	Small overall impact.
Western whiptail (*Cnemidophorus tigris*)	Arid and semiarid habitats with sparse plant cover. About 2,627,800 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat) during construction and operations	160,526 acres of potentially suitable habitat (6.1% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Snakes				
Coachwhip (*Masticophis flagellum*)	Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 2,845,300 acres of potentially suitable habitat occurs within the SEZ region.	25,625 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	130,266 acres of potentially suitable habitat (4.6% of available potentially suitable habitat)	Small overall impact.

TABLE 12.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Snakes (Cont.)				
Common kingsnake (*Lampropeltis getula*)	Coniferous forests, woodlands, swampland, coastal marshes, river bottoms, farmlands, prairies, chaparral, and deserts. Uses rock outcrops and rodent burrows for cover. About 4,088,800 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	238,967 acres of potentially suitable habitat (5.8% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Glossy snake (*Arizona elegans*)	Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 3,586,300 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	185,348 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 4,203,900 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	239,609 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 12.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Snakes (Cont.)				
Groundsnake (*Sonora semiannulata*)	Arid and semiarid regions with rocky to sandy soils. River bottoms, desert flats, sand hummocks, and rocky hillsides. About 3,581,800 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	172,775 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Long-nosed snake (*Rhinocheilus lecontei*)	Typically inhabits deserts, dry prairies, and river valleys. Occurs by day and lays eggs underground or rocks. Burrows rapidly in loose soil. Common in desert regions. About 2,769,100 acres of potentially suitable habitat occurs within the SEZ region.	25,675 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	129,120 acres of potentially suitable habitat (4.7% of available suitable habitat)	Small overall impact.
Nightsnake (*Hypsiglena torquata*)	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, it seeks refuge underground, in crevices, or under rocks. About 2,929,300 acres of potentially suitable habitat occurs within the SEZ region.	25,956 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	131,229 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	Moderate overall impact.
Western diamond-backed rattlesnake (*Crotalus atrox*)	Dry and semidry lowland areas. Usually found in brush-covered plains, dry washes, rock outcrops, and desert foothills. About 4,135,800 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	244,603 acres of potentially suitable habitat (5.9% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 12.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Snakes (Cont.)				
Western rattlesnake (*Crotalus viridis*)	Most terrestrial habitats. Typically inhabits plains grasslands, sandhills, semidesert and mountain shrublands, riparian areas, and montane woodlands. About 4,098,900 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	240,208 acres of potentially suitable habitat (5.9% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

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

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 62,098 acres of direct effects within the SEZ was assumed.

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

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 62,098 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

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

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

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

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

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 12.1.11.1.1, following the analysis approach described in Appendix M. Additional National Environmental Policy Act of 1969 (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 12.1.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on amphibians and reptiles summarized in Table 12.1.11.1-1, direct impacts on amphibian and reptile species would be moderate for the red-spotted toad, long-nosed leopard lizard, western whiptail, common kingsnake, glossy snake, gophersnake, groundsnake, western diamond-backed snake, and western rattlesnake, because 1.4 to 2.5% of the potentially suitable habitats identified for these species in the SEZ would be lost. Direct impacts on all other representative amphibian and reptile species would be small, because 0.04 to 0.9% of potentially suitable habitats identified for those species in the SEZ region would be lost. Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 6.5% of available habitat for the long-nosed leopard lizard). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

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

12.1.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- Wash, riparian, playa, rock outcrop, and wetland habitats, which could provide more unique habitats for some amphibian and reptile species, 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, as potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

12.1.11.2 Birds

12.1.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Afton SEZ. The list of bird species potentially present in the SEZ area was determined from species lists available from the BISON-M (NMDGF 2010) and range maps and habitat information available from CDFG (2008), NatureServe (2010), and USGS (2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007) and the South Central Gap Analysis Program (USGS 2010a). See Appendix M for additional information on the approach used.

Almost 300 species of birds are reported from Dona Ana County (NMDGF 2010); however, suitable habitats for a number of these species are limited or nonexistent within the proposed Afton SEZ (USGS 2007). Similar to the overview of birds provided for the six-state solar energy study area (Section 4.10.2.2), the following discussion for the SEZ emphasizes the following bird groups: (1) waterfowl, wading birds, and shorebirds; (2) neotropical migrants; (3) birds of prey; and (4) upland game birds.

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state study area. However, within the proposed Afton SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Wetland, playa, and wash habitats within the SEZ may attract shorebird species, but the Rio Grande River, La Union Main Canal, West Side Canal, various intermittent streams, and the intermittent Lake Lucero, located within 50 mi (80 km) of the SEZ, would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) and least sandpiper (*Calidris minutilla*) are the shorebird species most likely to occur within the SEZ.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state study area. Species expected to occur within the proposed Afton SEZ include the ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Poloptila melanura*), black-throated sparrow (*Amphispiza bilineata*), Brewer's blackbird (*Euphagus cyanocephalus*), cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), Crissal thrasher (*Toxostoma crissale*), Gila woodpecker (*Melanerpes uropygialis*), greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker (*Picoides scalaris*), lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), Lucy's warbler (*Vermivora luciae*), phainopepla (*Phainopepla nitens*), sage sparrow (*Amphispiza belli*), Say's phoebe (*Sayornis saya*), Scott's oriole (*Icterus parisorum*), verdin (*Auriparus flaviceps*), western meadowlark (*Sturnella neglecta*), and white-throated swift (*Aeronautes saxatalis*) (NMDGF 2010; USGS 2007).

Birds of Prey

Section 4.10.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state study area. Raptor species that could occur within the proposed Afton SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*) (NMDGF 2010; USGS 2007). Several other special status birds of prey are discussed in Section 12.1.12. These include the American peregrine falcon (*Falco peregrinus anatum*), bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk (*Buteo regalis*), northern aplomado falcon (*Falco femoralis septentrionalis*), osprey (*Pandion haliaetus*), and western burrowing owl (*Athene cunicularia*).

Upland Game Birds

Section 4.10.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed Afton SEZ include the Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), scaled quail (*Callipepla squamata*), white-winged dove (*Zenaida asiatica*), and wild turkey (*Meleagris gallopavo*) (NMDGF 2010; USGS 2007).

Table 12.1.11.2-1 provides habitat information for representative bird species that could occur within the proposed Afton SEZ. Special status bird species are discussed in Section 12.1.12.

TABLE 12.1.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Afton SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Shorebirds				
Killdeer (*Charadrius vociferus*)	Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 412,000 acres[g] of potentially suitable habitat occurs within the SEZ region.	36 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat) during construction and operations	54,361 acres of potentially suitable habitat (13.2% of potentially suitable habitat)	Small overall impact. Avoidance of wetland, wash, playa, marsh, and shoreline areas could reduce impacts. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Least sandpiper (*Calidris minutilla*)	Wet meadows, mudflats, flooded fields, lake shores, edge of salt marshes, and river sandbars. About 11,600 acres of potentially suitable habitat occurs within the SEZ region.	66 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	519 acres of potentially suitable habitat (4.5% of available suitable habitat)	Small overall impact. Avoidance of wetland, wash, playa, marsh, and shoreline areas could reduce impacts. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants				
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 3,547,600 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat) during construction and operations	174,861 acres of potentially suitable habitat (4.9% of potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-tailed gnatcatcher (*Polioptila melanura*)	Nests in bushes mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 2,628,700 acres of potentially suitable habitat occurs within the SEZ region.	23,222 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	123,835 acres of potentially suitable habitat (4.7% of available suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 2,814,100 acres of potentially suitable habitat occurs within the SEZ region.	23,748 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	134,284 acres of potentially suitable habitat (4.8% of available suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Brewer's blackbird (*Euphagus cyanocephalus*)	Meadows, grasslands, riparian areas, agricultural and urban areas, and occasionally sagebrush in association with prairie dog colonies and other shrublands. Requires dense shrubs for nesting. Roosts in marshes or dense vegetation. In winter, most often near open water and farmyards with livestock. About 1,441,800 acres of potentially suitable habitat occurs within the SEZ region.	755 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	66,710 acres of potentially suitable habitat (4.6% of available suitable habitat)	Small overall impact. Avoidance of grasslands and riparian areas could reduce impacts. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. About 2,102,700 acres of potentially suitable habitat occurs within the SEZ region.	7,112 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	59,106 acres of potentially suitable habitat (2.8% of available suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 1,193,700 acres of potentially suitable habitat occurs within the SEZ region.	6,376 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	46,319 acres of potentially suitable habitat (3.9% of potentially suitable habitat)	Small overall impact. Some measure of mitigation also provided by the requirements of the Migratory Bird Treaty Act.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or man-made structures. Forages in sparse, open terrain. About 4,062,900 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	231,430 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 2,659,700 acres of potentially suitable habitat occurs within the SEZ region.	24,758 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	120,023 acres of potentially suitable habitat (4.5% of available suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Crissal thrasher (*Toxostoma crissale*)	Desert scrub, mesquite, tall riparian brush and chaparral; usually beneath dense cover. Nests in low tree or shrubs. About 1,225,200 acres of potentially suitable habitat occurs within the SEZ region.	6,367 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	46,300 acres of potentially suitable habitat (3.8% of available suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Gila woodpecker (*Melanerpes uropygialis*)	Lower-elevation woodlands, especially those dominated by cottonwoods, along stream courses. About 160,000 acres of potentially suitable habitat occurs within the SEZ region.	64 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) during construction and operations	11,326 acres of potentially suitable habitat (7.1% of available suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Fairly common in many desert habitats. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,028,600 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	231,461 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. 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 326,300 acres of potentially suitable habitat occurs in the SEZ region.	2,005 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat) during construction and operations	47,400 acres of potentially suitable habitat (14.5% of available potentially suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Ladder-backed woodpecker (*Picoides scalaris*)	Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 2,694,900 acres of potentially suitable habitat occurs within the SEZ region.	24,758 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	120,481 acres of potentially suitable habitat (4.5% of potentially suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 3,628,100 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	193,572 acres of potentially suitable habitat (5.3% of potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 3,993,000 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	225,212 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Lucy's warbler (*Vermivora luciae*)	Breeds most often in dense lowland riparian mesquite woodlands. Inhabits dry washes, riparian forests, and thorn forests during winter and migration. About 2,579,800 acres of potentially suitable habitat occurs within the SEZ region.	22,369 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	115,804 acres of potentially suitable habitat (4.5% of available suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Phainopepla (*Phainopepla nitens*)	Desert scrub, mesquite, juniper and oak woodlands, tall brush, washes, riparian woodlands, and orchards. Nests in dense foliage of large shrubs or trees, sometimes in a clump of mistletoe. About 3,883,500 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.6% of available potentially suitable habitat) during construction and operations	222,008 acres of potentially suitable habitat (5.7% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Sage sparrow (*Amphispiza belli*)	Prefers shrubland, grassland, and desert habitats. The nest, constructed of twigs and grasses, is located either low in a shrub or on the ground. About 1,959,000 acres of potentially suitable habitat occurs within the SEZ region.	25,221 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	118,316 acres of potentially suitable habitat (6.1% of available potentially suitable habitat)	Moderate overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 326,400 acres of potentially suitable habitat occurs within the SEZ region.	18 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat) during construction and operations	47,072 acres of potentially suitable habitat (14.4% of potentially suitable habitat)	Small overall impact. Avoidance of cliffs could reduce impacts. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Scott's oriole (*Icterus parisorum*)	Yucca, pinyon-juniper, arid oak scrub and palm oases. Foothills, desert slopes of mountains, and more elevated semiarid plains. Nests in trees or yuccas. About 2,433,800 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (2.6% of available potentially suitable habitat) during construction and operations	118,729 acres of potentially suitable habitat (4.9% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Verdin (*Auriparus flaviceps*)	Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 2,844,200 acres of potentially suitable habitat occurs within the SEZ region.	22,771 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	159,130 acres of potentially suitable habitat (5.6% of available suitable habitat)	Small overall impact. Avoidance of wash and riparian areas could reduce impacts. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b] Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Neotropical Migrants (Cont.)				
Western meadowlark (*Sturnella neglecta*)	Agricultural areas, especially in winter. Also inhabits native grasslands, croplands, weedy fields, and less commonly in semidesert and sagebrush shrublands. About 1,305,400 acres of potentially suitable habitat occurs within the SEZ region.	755 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	57,484 acres of potentially suitable habitat (4.4% of available suitable habitat)	Small overall impact. Avoidance of desert grassland habitats could reduce impacts. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
White-throated swift (*Aeronautes saxatalis*)	Mountainous country near cliffs and canyons where breeding occurs. Forages over forest and open situations. Nests in rock crevices and canyons, sometimes in buildings. Ranges widely over most terrain and habitats, usually high in the air. About 203,800 acres of potentially suitable habitat occurs within the SEZ region.	73 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) during construction and operations	11,471 acres of potentially suitable habitat (5.6% of available suitable habitat)	Small overall impact. Avoidance of rocky cliffs and outcrops could reduce impacts. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Birds of Prey				
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 3,163,100 acres of potentially suitable habitat occurs in the SEZ region.	25,308 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	185,704 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	Small overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Birds of Prey (Cont.)				
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 3,033,800 acres of potentially suitable habitat occurs in the SEZ region.	25,319 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	175,101 acres of potentially suitable habitat (5.8% of available potentially suitable habitat)	Small overall impact. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Great horned owl (*Bubo virginianus*)	Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 4,256,800 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	252,038 acres of potentially suitable habitat (5.9% of potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Long-eared owl (*Asio otus*)	Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush-bursage flats, desert scrub, grasslands, and agricultural fields). About 1,323,000 acres of potentially suitable habitat occurs within the SEZ region.	416 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	57,058 acres of potentially suitable habitat (4.3% of potentially suitable habitat)	Small overall impact. Avoidance of riparian woodlands could reduce impacts on roosting habitats.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Birds of Prey (Cont.)				
Prairie falcon (*Falco mexicanus*)	Associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. Nests in pothole or well-sheltered ledge on rocky cliff or steep earth embankment. May also nest in man-made excavations on otherwise unsuitable cliffs and old nests of ravens, hawks, and eagles. Forages in large patch areas with low vegetation. May forage over irrigated croplands in winter. About 4,256,800 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	252,038 acres of potentially suitable habitat (5.9% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
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 2,965,300 acres of potentially suitable habitat occurs in the SEZ region.	25,033 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	168,798 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Small overall impact.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 1,891,000 acres of potentially suitable habitat occurs in the SEZ region.	24,432 acres of potentially suitable habitat lost (1.3% of available potentially suitable habitat) during construction and operations	150,431 acres of potentially suitable habitat (8.0% of available potentially suitable habitat)	Moderate overall impact.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Upland Game Birds				
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 2,803,700 acres of potentially suitable habitat occurs within the SEZ region.	25,104 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	123,202 acres of potentially suitable habitat (4.4% of potentially suitable habitat)	Small overall impact.
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,045,000 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	231,614 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Scaled quail (*Callipepla squamata*)	Desert scrub dominated by mesquite, yucca, and cactus and grasslands. Bare habitat is an important habitat component. About 2,681,700 acres of potentially suitable habitat occurs within the SEZ region.	24,763 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	121,868 acres of potentially suitable habitat (4.5% of available suitable habitat)	Small overall impact.
White-winged dove (*Zenaida asiatica*)	Desert riparian, wash, succulent shrub, scrub, and Joshua tree habitats; orchards and vineyards, croplands, and pastures. About 2,708,500 acres of potentially suitable habitat occurs within the SEZ region.	25,611 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	128,054 acres of potentially suitable habitat (4.7% of available suitable habitat)	Small overall impact.

TABLE 12.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Upland Game Birds (Cont.)				
Wild turkey (*Meleagris gallopavo*)	Lowland riparian forests, foothill shrubs, pinyon-juniper woodlands, foothill riparian forests, and agricultural areas. About 588,500 acres of potentially suitable habitat occurs within the SEZ region.	15,920 acres of potentially suitable habitat lost (2.7% of available potentially suitable habitat) during construction and operations	69,850 acres of potentially suitable habitat (11.9% of available potentially suitable habitat)	Moderate overall impact.

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

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 62,098 acres of direct effects within the SEZ was assumed.

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

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 62,098 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

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

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

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

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

12.1.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 12.1.11.2.3, below, identifies design features of particular relevance to the proposed Afton 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 12.1.11.2.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 12.1.11.2.3).

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 12.1.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed Afton SEZ. Direct impacts on representative bird species would be moderate for the ash-throated flycatcher, common raven, greater roadrunner, lesser nighthawk, loggerhead shrike, phainopepla, sage sparrow, Scott's oriole, great horned owl, prairie falcon, turkey vulture, mourning dove, and wild turkey, as 1.3 to 2.7% of the potentially suitable habitats identified for these species in the SEZ would be lost. Direct impacts on all other representative bird species would be small, as less than 0.01 to 0.9% of potentially suitable habitats identified for those species in the SEZ region would be lost. Larger areas of potentially suitable habitats for the bird species occur within the area of potential indirect effects (e.g., up to 14.5% of available habitat for the horned lark) (Table 12.1.11.2-1). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

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

12.1.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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

- Wash, riparian, playa, rock outcrops, and wetland areas, which could provide unique habitats for some bird species, should be avoided.

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

12.1.11.3 Mammals

12.1.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Afton SEZ. The list of mammal species potentially present in the SEZ area was determined from species lists available from the BISON-M (NMDGF 2010) and range maps and habitat information available from CDFG (2008), NatureServe (2010), and USGS (2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007) and the South Central Gap Analysis Program (USGS 2010a). See Appendix M for additional information on the approach used.

More than 75 species of mammals are reported from Dona Ana County (NMDGF 2010); however, suitable habitats for a number of these species are limited or nonexistent within the proposed Afton SEZ (USGS 2007). Similar to the overview of mammals provided for the six-state study area (Section 4.10.2.3), the following discussion for the SEZ emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share important habitats.

Big Game

The big game species that could occur within the vicinity of the proposed Afton SEZ are the cougar (*Puma concolor*), desert bighorn sheep (*Ovis canadensis mexicana*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), and pronghorn (*Antilocapra americana*) (NMDGF 2010; USGS 2007). Because of its special species status, the desert bighorn sheep is addressed in Section 12.1.12. No potentially suitable habitat for elk occurs within the area of direct or indirect effects for the SEZ. Potentially suitable habitat for the cougar occurs throughout the SEZ. Figure 12.1.11.3-1 shows the location of the SEZ relative to where mule deer are rare or absent and where they occur at a density of less than 10 deer/mi^2 (<4 deer/km^2). Figure 12.1.11.3-2 shows the location of the SEZ relative to the mapped range of pronghorn.

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Afton SEZ. Species that could occur within the area of the SEZ include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), javelina (*Pecari tajacu*), kit fox (*Vulpes macrotis*), ringtail (*Bassariscus astutus*), and striped skunk (*Mephitis mephitis*) (NMDGF 2010; USGS 2007).

The nongame (small) mammals include rodents, bats, and shrews. Representative species for which potentially suitable habitat occurs within the proposed Afton SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), canyon mouse (*Peromyscus crinitus*), deer mouse (*P. maniculatus*), desert pocket mouse (*Chaetodipus penicillatus*), desert shrew (*Notiosorex crawfordi*), Merriam's kangaroo rat (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), Ord's kangaroo rat (*Dipodomys ordii*), round-tailed ground squirrel (*Spermophilus tereticaudus*), southern plains woodrat (*Neotoma micropus*), spotted ground squirrel (*Spermophilus spilosoma*), western harvest mouse (*Reithrodontomys megalotis*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (NMDGF 2010; USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), silver-haired bat (*Lasionycteris noctivagans*), spotted bat (*Euderma maculatum*), and western pipistrelle (*Parastrellus hesperus*) (NMDGF 2010; USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ. Special status bat species that could occur within the SEZ area are addressed in Section 12.1.12.

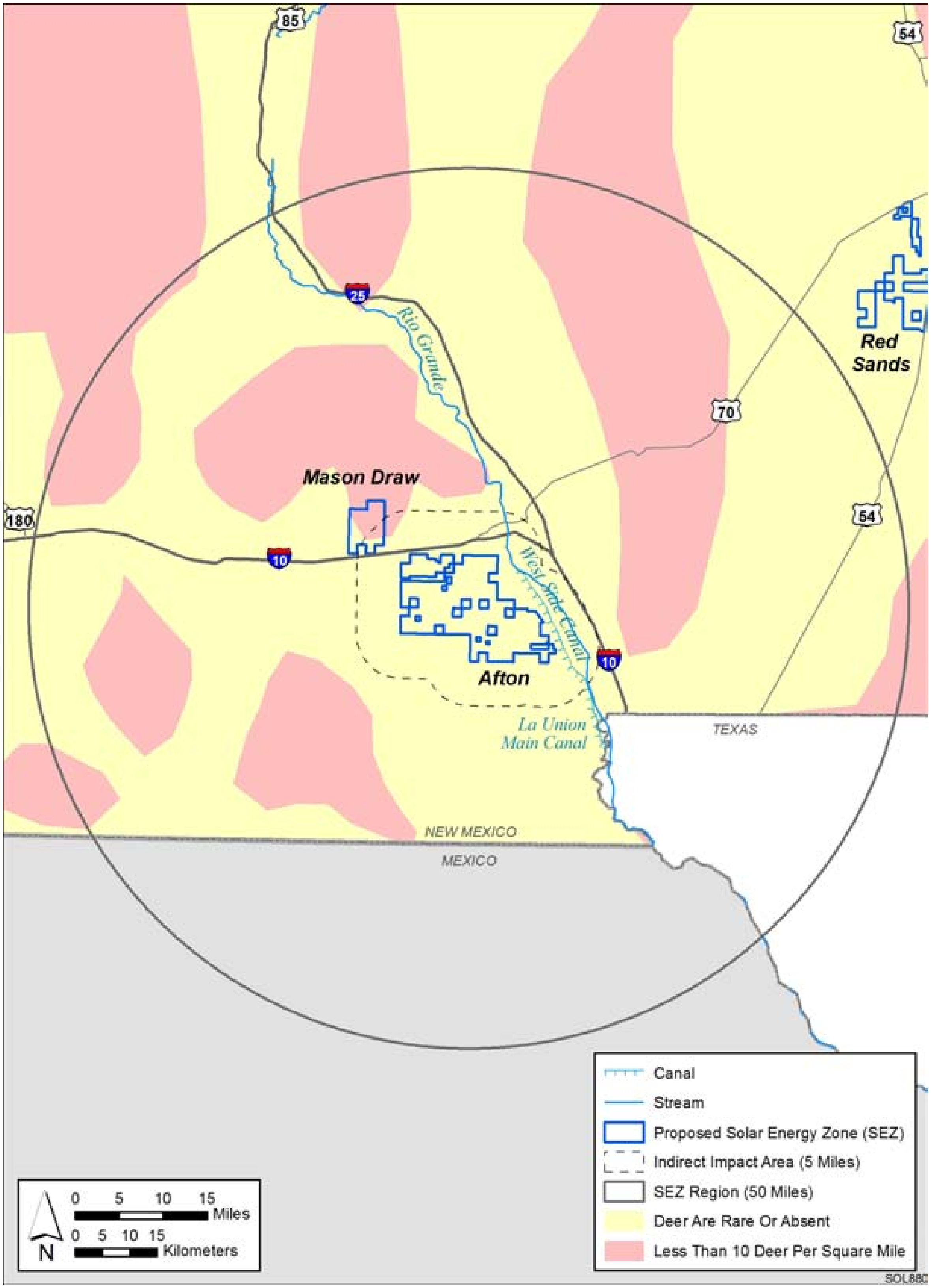

FIGURE 12.1.11.3-1 Density of Mule Deer within the Proposed Afton SEZ Region (Source: BLM 2009a)

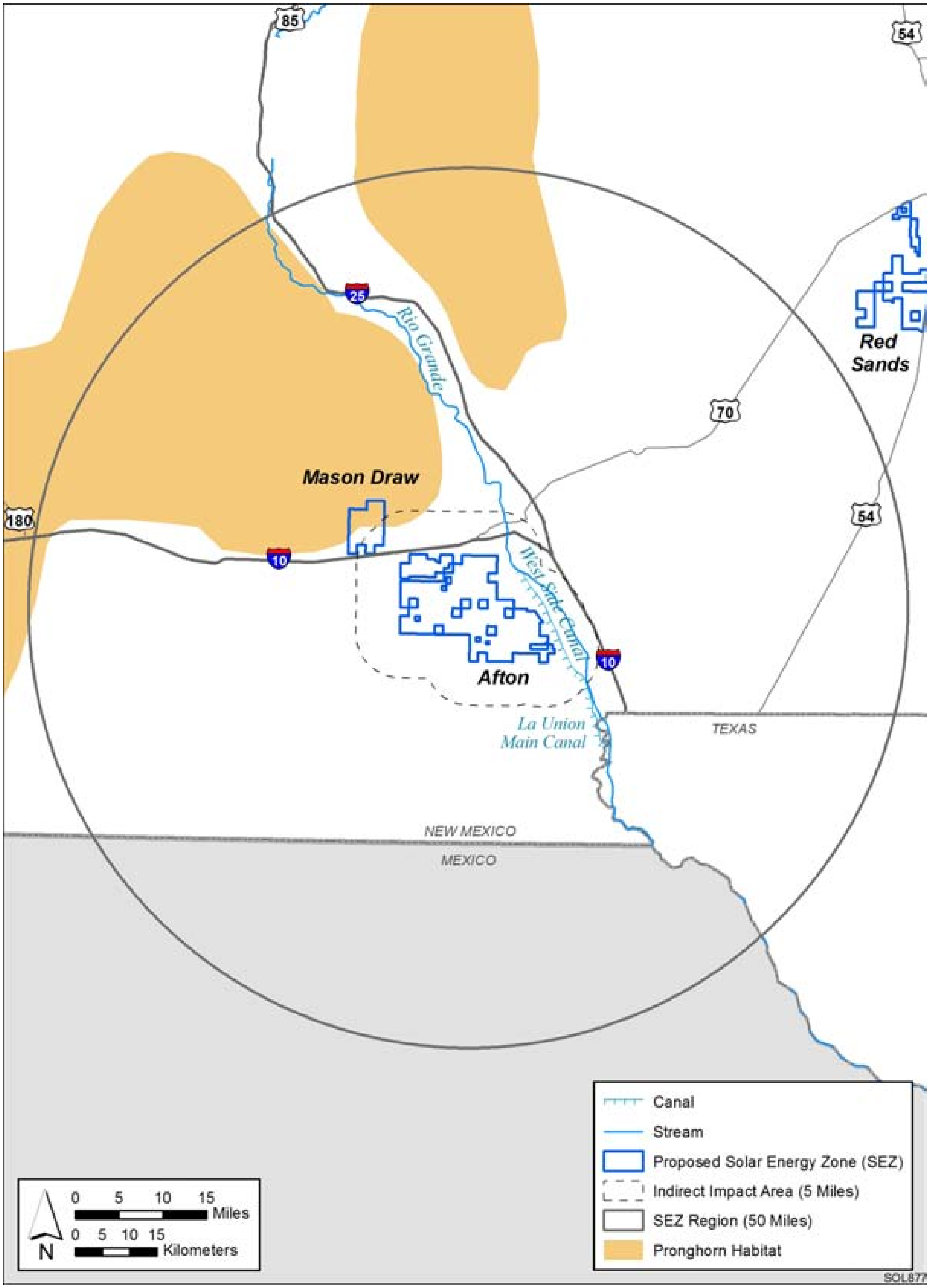

FIGURE 12.1.11.3-2 Location of the Proposed Afton SEZ Relative to the Mapped Range of Pronghorn (Source: BLM 2009b)

Table 12.1.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Afton SEZ. Special status mammal species are discussed in Section 12.1.12.

12.1.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 12.1.11.3.3, below, identifies design features of particular relevance to mammals for the proposed Afton 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 12.1.11.3.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 12.1.11.3.3).

Table 12.1.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed Afton SEZ.

Cougar

Up to 62,098 acres (251.3 km^2) of potentially suitable cougar habitat could be lost by solar energy development within the proposed Afton SEZ. This represents about 1.7% of potentially suitable cougar habitat within the SEZ region. About 178,260 acres (721.4 km^2) of potentially suitable cougar habitat occurs within the area of indirect effects. Overall, impacts on cougar from solar energy development in the SEZ would be moderate.

Elk

Potentially suitable elk habitat does not occur within the proposed Afton SEZ. Thus, solar energy development would not directly affect elk habitat. About 111 acres (0.45 km^2) of potentially suitable elk habitat occurs within the area of indirect effects. This is only about 0.2% of potentially suitable elk habitat within the SEZ region. Overall, impacts on elk from solar energy development in the SEZ would be small to none.

TABLE 12.1.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Afton SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Big Game				
Cougar (*Puma concolor*)	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 3,674,700 acres[g] of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	178,257 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
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 58,200 acres of potentially suitable habitat occurs within the SEZ region.	0.0 acres of potentially suitable habitat lost (0.0% of available potentially suitable habitat) during construction and operations	111 acres of potentially suitable habitat (0.2% of available suitable habitat)	Small to no overall impact. No species-specific mitigation is warranted.
Mule deer (*Odocoileus hemionus*)	Most habitats including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provides abundant browse and cover. About 4,146,200 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	234,913 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Pronghorn (*Antilocapra americana*)	Grasslands and semidesert shrublands on rolling topography that affords good visibility. Most abundant in shortgrass or midgrass prairies and least common in xeric habitats. About 1,289,800 acres of potentially suitable habitat occurs in the SEZ region.	751 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	57,445 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	Small overall impact.

TABLE 12.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Small Game and Furbearers				
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 2,715,600 acres of potentially suitable habitat occurs in the SEZ region.	24,765 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	122,001 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	Small overall impact.
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 3,129,800 acres of potentially suitable habitat occurs in the SEZ region.	23,703 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	174,502 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Small overall impact.
Bobcat (*Lynx rufus*)	Most habitats except subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 1,665,800 acres of potentially suitable habitat occurs in the SEZ region.	16,793 acres of potentially suitable habitat lost (1.0% of available potentially suitable habitat) during construction and operations	78,679 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Small overall impact.
Coyote (*Canis latrans*)	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 4,246,200 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	250,504 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 12.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]		Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	
Small Game and Furbearers (Cont.)				
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 3,916,000 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.6% of available potentially suitable habitat) during construction and operations	223,357 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Gray fox (*Urocyon cinereoargenteus*)	Deserts, open forests, and brush. Prefers wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 4,063,700 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	229,987 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Javelina (spotted peccary) (*Pecari tajacu*)	Often in thickets along creeks and washes. Beds in caves, mines, boulder fields, and dense stands of brush. May visit a water hole on a daily basis. About 2,687,900 acres of potentially suitable habitat occurs within the SEZ region.	22,700 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	118,828 acres of potentially suitable habitat (4.4% of available suitable habitat)	Small overall impact.

TABLE 12.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Small Game and Furbearers (Cont.)				
Kit fox (*Vulpes macrotis*)	Desert and semidesert areas with relatively open vegetative cover and soft soils. Seek shelter in underground burrows. About 3,729,800 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	187,237 acres of potentially suitable habitat (5.0% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Ringtail (*Bassariscus astutus*)	Usually in rocky areas with cliffs or crevices for daytime shelter, desert scrub, chaparral, pine-oak and conifer woodlands. About 3,146,000 acres of potentially suitable habitat occurs within the SEZ region.	24,977 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	184,852 acres of potentially suitable habitat (5.9% of available suitable habitat)	Small overall impact.
Striped skunk (*Mephitis mephitis*)	Occurs in most habitats other than alpine tundra. Common at lower elevations, especially in and near cultivated fields and pastures. Generally inhabits open country in woodlands, brush areas, and grasslands, usually near water. Dens under rocks, logs, or buildings. About 4,076,800 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.5% of available potentially suitable habitat) during construction and operations	230,548 acres of potentially suitable habitat (5.7% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 12.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals				
Big brown bat (*Eptesicus fuscus*)	Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 3,121,600 acres of potentially suitable habitat occurs in the SEZ region.	24,732 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	175,855 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Small overall impact. Avoidance of rocky cliffs and outcrops could reduce impacts on roosting habitats.
Botta's pocket gopher (*Thomomys bottae*)	Variety of habitats including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 2,724,500 acres of potentially suitable habitat occurs in the SEZ region.	24,700 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	121,610 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	Small overall impact.
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 3,270,500 acres of potentially suitable habitat occurs in the SEZ region.	25,699 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	184,172 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Small overall impact. Avoidance of rocky cliffs and outcrops could reduce impacts on roosting habitats.
Cactus mouse (*Peromyscus eremicus*)	Variety of areas including desert scrub, semidesert chaparral, desert wash, semidesert grassland, and cliff and canyon habitats. About 2,719,600 acres of potentially suitable habitat occurs in the SEZ region.	23,101 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	119,747 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact.

TABLE 12.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
California myotis (*Myotis californicus*)	Desert scrub, semidesert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 2,739,600 acres of potentially suitable habitat occurs in the SEZ region.	24,775 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	12,261 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	Small overall impact. Avoidance of rocky cliffs and outcrops could reduce impacts on roosting habitats.
Canyon mouse (*Peromyscus crinitus*)	Associated with rocky substrates in a variety of habitats, including desert scrub, sagebrush shrublands, woodlands, cliffs and canyons, and volcanic rock and cinder lands. Source of free water not required. About 1,006,600 acres of potentially suitable habitat occurs within the SEZ region.	603 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	22,339 acres of potentially suitable habitat (2.2% of available suitable habitat)	Small overall impact. Avoidance of rocky cliffs and outcrops could reduce impacts.
Deer mouse (*Peromyscus maniculatus*)	Tundra; alpine and subalpine grasslands;, plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran desert scrub habitats. About 3,926,800 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.6% of available potentially suitable habitat) during construction and operations	220,742 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Desert pocket mouse (*Chaetodipus penicillatus*)	Sparsely vegetated sandy deserts. Prefers rock-free bottomland soils along rivers and streams. Sleeps and rears young in underground burrows. About 2,606,700 acres of potentially suitable habitat occurs within the SEZ region.	22,708 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat) during construction and operations	118,291 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	Small overall impact.

TABLE 12.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Desert shrew (*Notiosorex crawfordi*)	Generally found in arid areas with adequate cover for nesting and resting. Deserts, semiarid grasslands with scattered cactus and yucca, chaparral slopes, alluvial fans, sagebrush, gullies, juniper woodlands, riparian areas, and dumps. About 3,144,100 acres of potentially suitable habitat occurs within the SEZ region.	26,032 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat) during construction and operations	174,217 acres of potentially suitable habitat (5.5% of available suitable habitat)	Small overall impact.
Merriam's kangaroo rat (*Dipodomys merriami*)	Plains grasslands, scrub-grasslands, desert scrub, shortgrass plains, oak and juniper savannahs, mesquite dunes, and creosote flats. About 3,748,100 acres of potentially suitable habitat occurs in the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	186,812 acres of potentially suitable habitat (5.0% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
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 3,740,200 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	182,344 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 12.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Ord's kangaroo rat (*Dipodomys ordii*)	Various habitats ranging from semidesert shrublands and pinyon-juniper woodlands to shortgrass or mixed prairie and silvery wormwood. Also occurs in dry, grazed, riparian areas if vegetation is sparse. Most common on sandy soils that allow for easy digging and construction of burrow systems. About 3,794,900 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.6% of available potentially suitable habitat) during construction and operations	187,253 acres of potentially suitable habitat (4.9% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Round-tailed ground squirrel (*Spermophilus tereticaudus*)	Optimum habitat includes desert succulent shrub, desert wash, desert scrub, alkali desert scrub, and levees in cropland habitat. Also occurs in urban habitats. Burrows usually at base of shrubs. About 1,557,400 acres of potentially suitable habitat occurs within the SEZ region.	22,025 acres of potentially suitable habitat lost (1.4% of available potentially suitable habitat) during construction and operations	103,628 acres of potentially suitable habitat (6.6% of available suitable habitat)	Moderate overall impact.
Silver-haired bat (*Lasionycteris noctivagans*)	Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savanna, and desert scrub habitats. Roosts under bark, in hollow trees, caves and mines. Forages over clearings and open water. About 2,421,600 acres of potentially suitable habitat occurs within the SEZ region.	9,124 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	76,319 acres of potentially suitable habitat (3.2% of available suitable habitat)	Small overall impact.
Southern plains woodrat (*Neotoma micropus*)	Semiarid and desert grassland environments. Burrows along the sides of arroyos and favors outwash plains and overgrazed lands. Occurs on rocky, gravelly, and sandy soils. About 3,761,700 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	187,245 acres of potentially suitable habitat (5.0% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.

TABLE 12.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
Spotted bat (*Euderma maculatum*)	Various habitats from desert to montane coniferous forests, mostly in open or scrub areas. Roosts in caves and cracks and crevices in cliffs and canyons. About 1,194,600 acres of potentially suitable habitat occurs within the SEZ region.	6,378 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	46,801 acres of potentially suitable habitat (3.9% of available suitable habitat)	Small overall impact. Avoidance of rocky cliffs and outcrops could reduce impacts on roosting habitats.
Spotted ground squirrel (*Spermophilus spilosoma*)	Arid grasslands and deserts. About 3,679,900 acres of potentially suitable habitat occurs within the SEZ region.	62,098 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat) during construction and operations	181,672 acres of potentially suitable habitat (4.9% of available suitable habitat)	Moderate overall impact. No species-specific mitigation of direct effects is feasible, because suitable habitat is widespread in the area of direct effects.
Western harvest mouse (*Reithrodontomys megalotis*)	Various habitats including scrub-grasslands, temperate swamps and riparian forests, salt marshes, shortgrass plains, oak savanna, dry fields, agricultural areas, deserts, and desert scrub. Grasses are the preferred cover. About 2,680,200 acres of potentially suitable habitat occurs in the SEZ region.	9,051 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	117,205 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact.
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 2,437,700 acres of potentially suitable habitat occurs in the SEZ region.	9,049 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	74,863 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. Avoidance of rocky cliffs and outcrops could reduce impacts on roosting habitats.

TABLE 12.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Overall Impact Magnitude[e] and Species-Specific Mitigation[f]
Nongame (small) Mammals (Cont.)				
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends its nights and other periods of inactivity in underground burrows. About 2,168,100 acres of potentially suitable habitat occurs within the SEZ region.	7,379 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	61,175 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Small overall impact.

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

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 62,098 acres of direct effects within the SEZ was assumed.

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

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 62,098 acres of direct effects was also added to the area of indirect effects. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

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

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

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

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

Mule Deer

Based on land cover analyses, up to 62,098 acres (251.3 km^2) of potentially suitable mule deer habitat could be lost by solar energy development within the proposed Afton SEZ. This represents about 1.5% of potentially suitable mule deer habitat within the SEZ region. More than 234,900 acres (950.6 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effects. Based on mapped ranges, up to 62,098 acres (251.3 km^2) of mule deer range where deer are rare or absent could be directly impacted by solar energy development in the SEZ. This is 2.4% of such range within the SEZ region. About 325,840 acres (1,319 km^2) of this low-density deer range and 4,375 acres (17.7 km^2) of higher density mule deer range (i.e., <10 deer/mi^2 [<4 deer/km^2]) occur within the area of indirect effects (Figure 12.1.11.3-1). Overall, impacts on mule deer from solar energy development in the SEZ would be moderate.

Pronghorn

Based on land cover analyses, up to 751 acres (3.0 km^2) of potentially suitable pronghorn habitat could be lost by solar energy development within the proposed Afton SEZ. This represents about 0.06% of potentially suitable pronghorn habitat within the SEZ region. About 57,445 acres (232.5 km^2) of potentially suitable pronghorn habitat occurs within the area of indirect effects. However, the SEZ would not be located within the mapped range of pronghorn, while 3,840 acres (15.5 km^2) of its range would be located within the area of indirect effects (Figure 12.1.11.3-2). Overall, impacts on pronghorn from solar energy development in the SEZ would be small.

Other Mammals

Direct impacts on coyote, desert cottontail, gray fox, kit fox, striped skunk, deer mouse, Merriam's kangaroo rat, northern grasshopper mouse, Ord's kangaroo rat, round-tailed ground squirrel, southern plains woodrat, and spotted ground squirrel would be moderate, because 1.4 to 1.7% of the potentially suitable habitats identified for these species in the proposed Mason Draw SEZ would be lost. Direct impacts on all other representative mammal species would be small, because 0.06 to 1.0% of potentially suitable habitats identified for those species in the SEZ region would be lost. Larger areas of potentially suitable habitats for the representative mammal species occur within the area of potential indirect effects (e.g., up to 6.6% of available habitat for the round-tailed ground squirrel) (Table 12.1.11.3-1).

Summary

Overall, direct impacts on mammal species from habitat loss would be small to moderate (Table 12.1.11.3-1). Other impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) would be negligible with implementation of programmatic design features.

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

12.1.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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

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

If these SEZ-specific design features are implemented in addition to other programmatic design features, impacts on mammals could be reduced. 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.

12.1.11.4 Aquatic Biota

12.1.11.4.1 Affected Environment

The proposed Afton SEZ is located in a desert valley where surface waters are typically limited to intermittent washes that contain water for only short periods during or following precipitation. No intermittent or perennial streams or water bodies or springs are present on the proposed Afton SEZ. The National Wetlands Inventory (NWI) mapping (USFWS 2009) indicates 20 intermittent or ephemeral wetlands are present in the Afton SEZ (see Section 12.1.10). Ephemeral streams may also be present on the southeastern corner of the SEZ. Such ephemeral features contain water only following rainfall and typically do not provide aquatic habitat. Although not considered aquatic habitat, nonpermanent ponds may contain invertebrates that are either aquatic opportunists (i.e., species that occupy both temporary and permanent waters) or specialists adapted to living in temporary aquatic environments (Graham 2001). Although most ephemeral pools are populated with widespread species, some can contain species that are endemic to particular geographic regions or even specific pools (Graham 2001). On the basis of information for other ephemeral pools in the American Southwest, ostracods (seed shrimp) and small planktonic crustaceans (e.g., copepods or cladocerans) are expected to be present, and larger branchiopod crustaceans such as fairy shrimp could occur (Graham 2001). Various types of insects that have aquatic larval stages, such as dragonflies and a variety of midges and other fly larvae, may also occur depending on pool longevity, distance to permanent water features, and the abundance of other invertebrates for prey (Graham 2001).

No perennial or intermittent water bodies are present within the area of indirect effects associated with the proposed Afton SEZ, but 15 mi (24 km) of canals (La Union Main Canal and West Side Canal) and 23 mi (37 km) of the Rio Grande River are located within the area of indirect effects associated with the SEZ. The canals are both supplied by the Rio Grande River. Wetlands occur along the Rio Grande River in the vicinity of the proposed Afton SEZ. The Rio Grande River is a large river system originating in the Rocky Mountains and emptying into the Gulf of Mexico. It is the fifth-longest river in North America. Within the area of indirect effects, land use surrounding the Rio Grande is primarily agricultural and urban. In unimpaired reaches of the Rio Grande north of the Afton SEZ is a diverse community of aquatic insects dominated by mayflies, caddisflies, and dipterans (Crawford et al. 1993). While non-native species like carp (*Cyprinus carpio*), catfish, mosquito fish (*Gambusia affinis*), and white sucker (*Catostomus commersonii*) make up a significant proportion of the fish assemblage, native species such as the red shiner (*Cyprinella lutrensis*), longnose dace (*Rhynichthys cataractae*), and flathead chub (*Platygobio gracilis*) are abundant as well (Crawford et al. 1993).

Outside of the indirect effects area but within 50 mi (80 km) of the proposed Afton South SEZ are approximately 77 mi (124 km) of perennial streams, 74 mi (119 km) of intermittent streams, and 8 mi (13 km) of canals. Also present within 50 mi (80 km) of the SEZ is 4,041 acres (16 km^2) of intermittent lake habitat (Lake Lucero). Perennial streams and canals are the only surface water features in the area of direct and indirect effects, and their area represents approximately 31% of the total amount of perennial stream present in the 50-mi (80-km) SEZ region.

12.1.11.4.2 Impacts

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

No permanent or intermittent water bodies or streams are present within the boundaries of the proposed Afton SEZ, and consequently there would be no direct impacts on aquatic habitats from solar energy development. Intermittent or ephemeral ponds or pools may be present that, while not aquatic habitat, may contain aquatic organisms for brief periods. More detailed information is required to determine the ecological significance of these ponds and to assess the impacts of solar energy development on these features. The Rio Grande River is present in the area of indirect effects, and given the proximity of the Rio Grande River to the SEZ (less than 2 mi [3.2 km]), disturbance of land areas within the SEZ for solar energy facilities could increase the transport of soil into the Rio Grande River and associated wetlands via water- and airborne pathways. Turbidity and sedimentation from sediment deposition may adversely affect aquatic biota if sediment loads are unusually high or last for extended periods of time compared with natural conditions for a given water body. Increased sediment loads can suffocate aquatic vegetation, invertebrates, and fish; decrease the rate of photosynthesis in plants and phytoplankton; decrease fish feeding efficiency; decrease the levels of invertebrate prey; reduce fish spawning success; and adversely affect the survival of incubating fish eggs, larvae, and fry. No perennial or intermittent streams exist in the SEZ that could convey sediments to the Rio Grande River. Any waterborne sediment delivery would be via small ephemeral washes, which are not likely to carry appreciable flows to the Rio Grande. The introduction of airborne sediments into the Rio Grande River could be minimized by site watering, while implementation of measures to control erosion and runoff into aquatic habitats (e.g., silt fences, retention ponds, runoff-control structures, and earthen berms) would reduce the potential for impacts from increased sedimentation.

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 Afton 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. Both wet and dry cooling would use a significant portion of available groundwater, potentially affecting water levels in surface water features outside of the proposed SEZ and area of indirect effects, and, as a consequence, aquatic organisms in those habitats (Section 12.1.9). Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

As described in Section 5.10.3, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning/reclamation for a solar energy facility. However, because of the lack of perennial or intermittent stream connections between the SEZ and the Rio Grande River and associated canals, the potential for introducing contaminants into such water bodies would be small. Intermittent or ephemeral streams, ponds, or pools may be present in the SEZ, and there is the potential for runoff containing contaminants to enter features that, while not aquatic habitat, may contain aquatic organisms. More detailed site surveys for biota in ephemeral and intermittent surface waters would be necessary to determine whether solar energy development activities would result in direct or indirect impacts on aquatic biota. The introduction of contaminants into these ephemeral features can be minimized if the appropriate mitigation measures are used.

12.1.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- Appropriate engineering controls should be implemented to minimize the amount of surface water runoff and fugitive dust that reaches the Rio Grande River and associated wetlands and canals.

- Wetlands and streams located within the SEZ should be avoided to the extent practicable.

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

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

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

- Species listed as threatened or endangered under the Endangered Species Act (ESA);
- Species that are proposed for listing, under review, or are candidates for listing under the ESA;
- Species that are listed by the BLM as sensitive;
- Species that are listed by the State of New Mexico[5]; and
- Species that have been ranked by the State of New Mexico as S1 or S2, or species of concern by the State of New Mexico or the USFWS, hereafter referred to as “rare” species.

Special status species known to occur within 50 mi (80 km) of the Afton SEZ center (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the BLM Las Cruces District Office (Hewitt 2009b), New Mexico Rare Plant Technical Council (1999), BISON-M (NMDGF 2010), Natural Heritage New Mexico (NHNM) (McCollough 2009), Southwest Regional Gap Analysis Project (SWReGAP) (USGS 2004, 2005a, 2007), South Central GAP Analysis Program (SCReGAP) (USGS 2010a), Texas GAP Analysis Program (USGS 2010b), and the USFWS Environmental Conservation Online System (ECOS) (USFWS 2010). Information reviewed consisted of county-level occurrences as determined from Nature Serve and BISON-M, quad-level occurrences provided by the NHNM, and modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from SWReGAP and SCReGAP. The 50-mi (80-km) SEZ region intersects Dona Ana, Luna, Otero, and Sierra Counties in New Mexico, as well as El Paso County, Texas, and Chihuahua, Mexico. However, the SEZ and affected area occur only in Dona Ana County. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

---

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

[5] State listed species for the state of New Mexico are those plants listed as endangered under the Endangered Plant Species Act (NMSA 1978 § 75-6-1) or wildlife listed as threatened or endangered by the Wildlife Conservation Act (NMSA 1978 § 17-2-37).

12.1.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the proposed Afton SEZ, the area of direct effect included only the SEZ itself. Because of the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ because of the proximity of I-10 (see Section 12.1.1.2 for a discussion of development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary. Indirect effects considered in the assessment included effects from groundwater withdrawals, surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but do not include ground-disturbing activities. For the most part, the potential magnitude of indirect effects would decrease with increasing distance away 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 includes both the direct and indirect effects areas.

The primary land cover habitat types within the affected area are Chihuahuan stabilized coppice dune and sand flat scrub, as well as Chihuahuan mesquite desert scrub (see Section 12.1.10). Potentially unique habitats in the affected area in which special status species may reside include cliff and rock outcrops, desert dunes, playas, washes, and riparian and aquatic habitats. There are also approximately 42,500 acres (172 km^2) of agricultural land cover types in the affected area. There are no aquatic habitats known to occur on the SEZ; however, the Rio Grande flows through the area of indirect effects (Figure 12.1.12.1-1).

All special status species that are known to occur within the Afton SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats in Appendix J. Of these species, there are 35 that could be affected by solar energy development on the SEZ, on the basis of recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 12.1.12.1-1. For many of the species listed in the table (especially plants), their predicted potential occurrence in the affected area is based only on a general correspondence between mapped land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is over 20 mi (32 m) away from the SEZ.

Based on NHNM records and information provided by the BLM Las Cruces District Office, occurrences for the following 6 special status species intersect the affected area of the Afton SEZ: sand prickly-pear cactus, smallmouth buffalo, Texas horned lizard, eastern bluebird, fringed myotis, and Townsend's big-eared bat. These species are indicated in bold text in

Table 12.1.12.1-1. There are no groundwater-dependent species in the vicinity of the SEZ based upon NHNM records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Afton SEZ region (Section 12.1.9).

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

In scoping comments on the proposed Afton SEZ (Stout 2009), the USFWS expressed concern for impacts of project development within the SEZ on habitat for the northern aplomado falcon—a species listed as endangered under the ESA. In addition to this species, the Sneed's pincushion cactus—listed as endangered under the ESA—may also occur in the affected area of the Afton SEZ. These two species are discussed below and information on their habitat is presented in Table 12.1.12.1-1; additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

Sneed's Pincushion Cactus

The Sneed's pincushion cactus is a perennial cactus that is listed as endangered under the ESA. This species is endemic to a range of less than 100 mi (160 km) between Las Cruces, New Mexico, and El Paso, Texas. This species is primarily known to occur in limestone cracks of broken terrain on steep slopes at elevations between 4,000 and 6,000 ft (1,220 and 1,800 m). The nearest recorded occurrences of this species are approximately 10 mi (16 km) southeast of the SEZ. The USFWS did not identify the Sneed's pincushion cactus in scoping comments on the proposed Afton SEZ (Stout 2009); however, approximately 141 acres (0.6 km^2) of potentially suitable habitat (rocky slopes and cliffs) may occur in the affected area of the SEZ (Figure 12.1.12.1-1; Table 12.1.12.1-1). Critical habitat for this species has not been designated.

Northern Aplomado Falcon

The northern aplomado falcon is a raptor that is listed as endangered under the ESA. This species is known to occur in Chihuahuan grassland habitats in southern New Mexico, western Texas, and northern Mexico. Suitable habitats include rangeland, savannas, and semiarid grasslands with scattered trees, mesquite (*Prosopis glandulosa*), and *Yucca* spp. Within these areas, the northern aplomado falcon feeds primarily on small birds and infrequently on small mammals and reptiles. Nests are located in old nests of other bird species (usually raptors or ravens).

In scoping comments on the Afton SEZ, the USFWS discussed the potential for northern aplomado falcons to occur in the affected area, because natural and reintroduced populations may occur within the SEZ region (Stout 2009). Reintroductions of northern aplomado falcons in southern New Mexico under section 10(j) of the ESA began in 2006. According to the USFWS, northern aplomado falcon populations may occur on the SEZ and throughout the affected area of the proposed Afton SEZ in areas of Chihuahuan desert grassland, especially where scattered

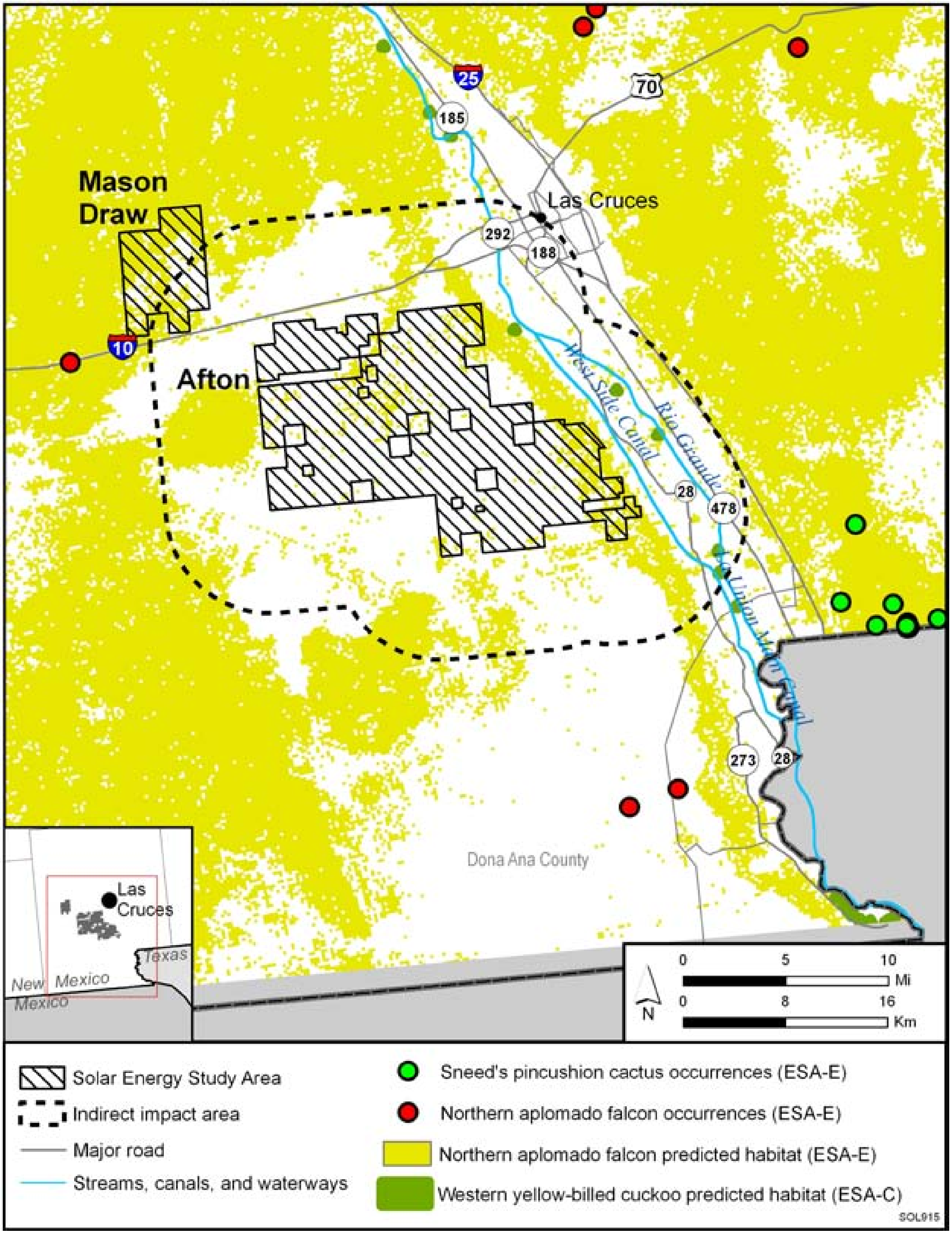

FIGURE 12.1.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA, Candidates for Listing under the ESA, or Species under Review for ESA Listing in the Affected Area of the Proposed Afton SEZ (Sources: Hewitt 2009b; USGS 2007)

TABLE 12.1.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Afton SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants						
Alamo beardtongue	*Penstemon alamosensis*	FWS-SC; NM-SC	Sacramento and San Andres Mountains in Dona Ana and Otero Counties, New Mexico, as well as the Hueco Mountains in El Paso County, Texas, in sheltered rocky areas, canyon sides, and canyon bottoms on limestone substrate. Elevations range between 4,300 and 5,300 ft.[h] Nearest recorded occurrence is 29 mi[i] northeast of the SEZ. About 4,500 acres[j] of potentially suitable habitat occurs in the SEZ region.	9 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	132 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effect, translocation of individuals from the area of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Arizona coralroot	*Hexalectris spicata* var. *arizonica*	BLM-S; NM-E; FWS-SC; NM-S2	Oak and pinyon-juniper woodland communities in areas of heavy leaf litter. Known to occur in Dona Ana County, New Mexico. About 47,500 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	13 acres of potentially suitable habitat (<0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Desert night-blooming cereus	*Peniocereus greggii* var. *greggii*	BLM-S; NM-E; FWS-SC; NM-S1	Sandy to silty gravelly soils in desert grassland communities, gravelly flats, and washes. Nearest recorded occurrence is 6 mi north of the SEZ. About 1,052,000 acres of potentially suitable habitat occurs in the SEZ region.	680 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	13,070 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert grassland habitats on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effect, translocation of individuals from the area of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Grama grass cactus	*Sclerocactus papyracanthus*	BLM-S	Pinyon-juniper woodlands and desert grasslands on sandy soils at elevations between 4,900 and 7,200 ft. Nearest recorded occurrence is 29 mi northeast of the SEZ. About 1,037,800 acres of potentially suitable habitat occurs in the SEZ region.	680 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	12,900 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert grassland habitats on the SEZ could reduce impacts. See desert night-blooming cereus for a list of other applicable mitigations.
Marble Canyon rockcress	*Sibara grisea*	BLM-S; FWS-SC; NM-SC	Rock crevices and the bases of limestone cliffs in chaparral and pinyon-juniper woodland communities at elevations between 4,500 and 6,000 ft. Known to occur in Dona Ana County, New Mexico. About 82,700 acres of potentially suitable habitat occurs in the SEZ region.	9 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	600 acres of potentially suitable habitat (0.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops on the SEZ could reduce impacts. See Alamo beardtongue for a list of other applicable mitigations.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Mosquito plant	*Agastache cana*	FWS-SC; NM-SC	Rock crevices of granite cliffs or in canyon habitats at the lower edge of the pinyon-juniper zone. Elevations range between 4,600 and 5,900 ft. Known to occur in Dona Ana County, New Mexico. About 4,500 acres of potentially suitable habitat occurs in the SEZ region.	9 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	132 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops on the SEZ could reduce impacts. See Alamo beardtongue for a list of other applicable mitigations.
New Mexico rock daisy	*Perityle staurophylla* var. *staurophylla*	BLM-S; FWS-SC; NM-SC	Endemic to south-central New Mexico in crevices of limestone cliffs and boulders at elevations between 4,900 and 7,000 ft. Known to occur in Dona Ana County, New Mexico. About 4,400 acres of potentially suitable habitat occurs in the SEZ region.	9 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	132 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops on the SEZ could reduce impacts. See Alamo beardtongue for a list of other applicable mitigations.
Sand prickly-pear cactus[k]	***Opuntia arenaria***[k]	NM-E; FWS-SC; NM-S2	Sandy areas, particularly semi-stabilized sand dunes among open Chihuahuan desert scrub, often associated with sparse cover of grasses at elevations between 3,800 and 4,300 ft. Known to occur on the SEZ and in other portions of the affected area. About 913,000 acres of potentially suitable habitat occurs in the SEZ region.	51,500 acres of potentially suitable habitat lost (5.6% of available potentially suitable habitat)	41,900 acres of potentially suitable habitat (4.6% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to sand dunes and sand transport systems on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effect, translocation of individuals from the area of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Sandberg pincushion cactus	*Escobaria sandbergii*	FWS-SC; NM-SC; NM-S2	San Andres and Fra Cristobal Mountains in Dona Ana and Sierra Counties, New Mexico, on rocky limestone soils in Chihuahuan desert scrub and open oak and pinyon-juniper woodlands at elevations between 4,200 and 7,400 ft. Known to occur in Dona Ana County, New Mexico. About 2,676,500 acres of potentially suitable habitat occurs in the SEZ region.	62,000 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	162,250 acres of potentially suitable habitat (6.1% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effect, translocation of individuals from the area of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Sandhill goosefoot	*Chenopodium cycloides*	BLM-S; NM-S2	Open sandy areas, frequently along the edges of sand dunes. Known to occur in Dona Ana County, New Mexico. About 1,009,000 acres of potentially suitable habitat occurs in the SEZ region.	52,000 acres of potentially suitable habitat lost (5.2% of available potentially suitable habitat)	49,600 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to sand dunes on the SEZ could reduce impacts. See sand prickly-pear cactus for a list of other applicable mitigations.
Sneed's pincushion cactus	*Escobaria sneedii* var. *sneedii*	ESA-E; NM-E; NM-S2	Limestone cracks of broken terrain on steep slopes and on limestone edges and rocky slopes in mountainous regions at elevations between 4,000 and 6,000 ft. Nearest recorded occurrences are approximately 10 mi southeast of the SEZ. About 4,500 acres of potentially suitable habitat occurs in the SEZ region.	9 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	132 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops on the SEZ could reduce impacts. See Alamo beardtongue for a list of other applicable mitigations. The potential for impact and need for mitigation should be determined in consultation with the USFWS and the NMDGF.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Villard pincushion cactus	*Escobaria villardii*	BLM-S; NM-E; FWS-SC; NM-S2	Franklin and Sacramento Mountains in Otero and Dona Ana Counties, New Mexico on loamy soils of desert grassland on broad limestone benches at elevations between 4,500 and 6,500 ft. Known to occur in Dona Ana County, New Mexico. About 1,038,000 acres of potentially suitable habitat occurs in the SEZ region.	680 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	12,900 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to desert grassland habitats on the SEZ could reduce impacts. See desert night-blooming cereus for a list of other applicable mitigations.
Invertebrates						
Samalayuca Dune grasshopper	*Cibolacris samalayucae*	NM-SC	Open sand dune habitats. Known to occur in Dona Ana County, New Mexico. About 1,009,000 acres of potentially suitable habitat occurs in the SEZ region.	2,100 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	99,600 acres of potentially suitable habitat (9.9% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to sand dunes and sand transport systems on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Anthony blister beetle	*Lytta mirifica*	BLM-S; FWS-SC; NM-SC	On flowering plants, often in agricultural areas where the species may be a pest of certain crops. Known to occur in Dona Ana County, New Mexico. About 138,500 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	42,500 acres of potentially suitable habitat (30.6% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Invertebrates (Cont.)						
Shotwell's range grasshopper	*Shotwellia isleta*	NM-SC	Non-saline playas that are composed of clay soils. Known to occur in Dona Ana County, New Mexico. About 12,000 acres of potentially suitable habitat occurs in the SEZ region.	10 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	100 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to playa habitats on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Fish						
Smallmouth buffalo	***Ictiobus bubalus***	NM-S2	Native to the Rio Grande and Pecos River in larger pools of higher order rivers with low-velocity current and abundant aquatic vegetation. Prefers clean to moderately turbid, deep, warm waters. Nearest quad-level occurrence is from the Rio Grande, approximately 4 mi east of the SEZ. About 79 mi of potentially suitable habitat in the Rio Grande occurs in the SEZ region.	0 miles	23 mi of potentially suitable habitat in the Rio Grande (29.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles						
Texas horned lizard	***Phrynosoma cornutum***	BLM-S	Flat, open, generally dry habitats with little plant cover, except for bunchgrass, cactus, and desert scrub in areas of sandy or gravelly soil. Nearest quad-level occurrence intersects the affected area within 5 mi north of the SEZ. About 3,844,800 acres of potentially suitable habitat occurs in the SEZ region.	77,500 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	182,300 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effect, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Birds						
American peregrine falcon	*Falco peregrinus anatum*	BLM-S; NM-T	Year-round resident in the SEZ region. Open habitats, including deserts, shrublands, and woodlands that are associated with high, near-vertical cliffs and bluffs above 200 ft. When not breeding, activity is concentrated in areas with ample prey, such as farmlands, marshes, lakes, rivers, and urban areas. Known to occur in Dona Ana County, New Mexico. About 1,997,000 acres of potentially suitable habitat occurs in the SEZ region.	23,000 acres of potentially suitable foraging or nesting habitat lost (1.2% of available potentially suitable habitat)	159,500 acres of potentially suitable habitat (8.0% of available potentially suitable habitat)	Moderate overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied nests in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Bald eagle	*Haliaeetus leucocephalus*	BLM-S; NM-T; FWS-SC	Winter resident in the SEZ region. Large bodies of water or free-flowing rivers with abundant fish and waterfowl prey. Wintering areas are associated with open water. May occasionally forage in arid shrubland habitats. Known to occur in Dona Ana County, New Mexico. About 1,277,000 acres of potentially suitable habitat occurs in the SEZ region.	840 acres of potentially suitable foraging habitat lost (0.1% of available potentially suitable habitat)	67,250 acres of potentially suitable habitat (5.3% 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.
Bell's vireo	*Vireo bellii*	NM-T; FWS-SC; NM-S2	Summer breeding resident in the SEZ region. Dense shrublands or woodlands along lower elevation riparian areas among willows, scrub oak, and mesquite. May potentially nest in any successional stage with dense understory vegetation. Known to occur in Dona Ana County, New Mexico. About 386,000 acres of potentially suitable habitat occurs in the SEZ region.	11,300 acres of potentially suitable habitat lost (2.9% of available potentially suitable habitat)	19,600 acres of potentially suitable habitat (5.1% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied nests in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Dickcissel	*Spiza americana*	NM-S1	Summer breeding resident in SEZ region. Grassland, meadows, savanna, cultivated lands, brushy fields. Nests on the ground in grass, tall weeds, or in low shrubs or trees. Prefers habitat with dense, moderate to tall vegetation and moderately deep litter. Suitable habitats are found in old fields, hayfields, fencerows, hedgerows, road rights-of-way, planted cover, and moderately grazed prairie. Known to occur in Dona Ana County, New Mexico. About 233,000 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	42,600 acres of potentially suitable habitat (18.3% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Eastern bluebird	***Sialia sialis***	NM-S1	Year-round resident in the SEZ region. Forest edges, open woodlands, and partly open situations with scattered trees, in coniferous or deciduous forest and riparian woodland. Nests in natural cavities, old woodpecker holes, and bird boxes. Nearest quad-level occurrence intersects the affected area within 5 mi east of the SEZ. About 850,000 acres of potentially suitable habitat occurs in the SEZ region.	16,000 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat)	60,300 acres of potentially suitable habitat (7.1% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied nests in the area of direct effects or compensatory mitigation of direct effects or occupied habitat could reduce impacts.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Ferruginous hawk	*Buteo regalis*	BLM-S; NM-S2	Winter resident in grasslands, sagebrush and saltbrush habitats, and the periphery of pinyon-juniper woodlands. Known to occur in Dona Ana County, New Mexico. About 131,300 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	42,800 acres of potentially suitable habitat (32.6% of available potentially suitable habitat)	Small overall impact on foraging habitat only; no direct impact. No species-specific mitigation is warranted.
Gray vireo	*Vireo vicinior*	NM-T; NM-S2	Summer breeding resident in the SEZ region. Semiarid, shrubby habitats, especially mesquite and brushy pinyon-juniper woodlands; also chaparral, desert scrub, thorn scrub, oak-juniper woodland, pinyon-juniper, mesquite, and dry chaparral. Nests in shrubs or trees. Known to occur in Dona Ana County, New Mexico. About 549,500 acres of potentially suitable habitat occurs in the SEZ region.	16,000 acres of potentially suitable habitat lost (2.9% of available potentially suitable habitat)	58,500 acres of potentially suitable habitat (10.6% of available potentially suitable habitat)	Moderate overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied nests in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Northern aplomado falcon	*Falco femoralis septentrionalis*	ESA-E; NM-E; NM-S1	Year-round resident in the SEZ region. Open rangeland and savanna, semiarid grasslands with scattered trees, mesquite, and yucca. Nests in old stick nests of other raptors or ravens that are located in trees or shrubs in desert grassland. Nearest occurrences are 9 mi west of the SEZ. About 2,138,000 acres of potentially suitable habitat occurs in the SEZ region.	9,400 acres of potentially suitable foraging or nesting habitat lost (0.4% of available potentially suitable habitat)	62,700 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Avoiding or minimizing disturbance to desert grasslands on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance to occupied nests in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and NMDGF.
Osprey	*Pandion haliaetus*	NM-SC; NM-S2	Winter resident in the SEZ region. Along rivers, lakes, reservoirs, and seacoasts. Typically build large stick nests on living or dead trees and also use numerous manmade structures such as utility poles, wharf pilings, windmills, and channel markers. Nests are usually near or above water. Known to occur in Dona Ana County, New Mexico. About 9,300 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	1,500 acres of potentially suitable habitat (15.9% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Western burrowing owl	*Athene cunicularia*	BLM-S; FWS-SC; NM-SC	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.). Known to occur in Dona Ana County, New Mexico. About 3,800,000 acres of potentially suitable habitat occurs in the SEZ region.	77,300 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	218,800 acres of potentially suitable habitat (5.8% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied burrows in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	ESA-C; NM-SC	Summer breeding resident in the SEZ region. Riparian obligate, usually found in large tracts of cottonwood/willow habitats with dense sub-canopies. Known to occur in Dona Ana County, New Mexico. About 9,300 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	71 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Mammals						
Desert bighorn sheep	*Ovis canadensis mexicana*	NM-T; NM-SC; NM-S1	Open, steep rocky terrain in mountainous habitats in desert regions. Rarely uses desert lowlands, but may use them as corridors for travel between mountain ranges. Known to occur in Dona Ana County, New Mexico. About 208,500 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	1,650 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Fringed myotis	***Myotis thysanodes***	BLM-S	Year-round resident in the SEZ region. Wide range of habitats including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roosts in buildings and caves. Nearest quad-level occurrence intersects the affected area about 5 mi north of the SEZ. About 3,040,800 acres of potentially suitable habitat occurs in the SEZ region.	25,600 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat)	178,200 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied roosts in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Long-legged myotis	*Myotis volans*	BLM-S	Year-round resident in the SEZ region. Primarily in montane coniferous forests; also riparian and desert habitats. Hibernates in caves and mines. Roosts in abandoned buildings, rock crevices, and under bark of trees. Known to occur in Dona Ana County, New Mexico. About 2,705,000 acres of potentially suitable habitat occurs in the SEZ region.	25,250 acres of potentially suitable habitat lost (0.9% of available potentially suitable habitat)	127,800 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied roosts in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 12.1.12.1-1 (Cont.)

				Maximum Area of Potential Habitat Affected[c]		
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Townsend's big-eared bat	***Corynorhinus townsendii***	BLM-S; FWS-SC; NM-SC	Year-round resident in the SEZ region. Near forests and shrubland habitats below 9,000 ft elevation. Roosts and hibernates in caves, mines, and buildings. Nearest quad-level occurrence intersects the affected area about 5 mi north of the SEZ. About 2,627,600 acres of potentially suitable habitat occurs in the SEZ region.	10,400 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	127,500 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied roosts in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Western red bat	*Lasiurus blossevillii*	FWS-SC; NM-S2	Year-round resident in the SEZ region. Forages in riparian and other wooded areas. Roosts primarily in cottonwood trees along riparian areas, but also in fruit orchards. Known to occur in Dona Ana County, New Mexico. About 43,700 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	640 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Western small-footed myotis	*Myotis ciliolabrum*	BLM-S	Year-round resident in the SEZ region. Variety of woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Known to occur in Dona Ana County, New Mexico. About 3,805,400 acres of potentially suitable habitat occurs in the SEZ region.	76,400 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	218,675 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate overall impact habitat. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied roosts in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 12.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Yellow-faced pocket gopher	*Cratogeomys castanops*	NM-S2	Deep sandy or silty soils that are relatively free of rocks. Prefers deep firm soils, rich soils of river valleys and streams, agricultural land (orchards, gardens, potato fields and other croplands), and meadows. Also in mesquite-creosote habitat. Constructs shallow foraging burrows and deeper ones between nest and food cache. Known to occur in Dona Ana County, New Mexico. About 1,625,000 acres of potentially suitable habitat occurs in the SEZ region.	25,400 acres of potentially suitable habitat lost (1.6% of available potentially suitable habitat)	150,800 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

[a] BLM-S = listed as a sensitive species by the BLM; ESA-C = candidate for listing under the ESA; ESA-E listed as endangered under the ESA; FWS-SC = USFWS species of concern; NM-E = listed as endangered by the State of New Mexico; NM-T = listed as threatened by the State of New Mexico; NM-S1 = ranked as S1 in the State of New Mexico; NM-S2 = ranked as S2 in the State of New Mexico; NM-SC = species of concern in the State of New Mexico.

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

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

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

Footnotes continued on next page.

1

TABLE 12.1.12.1-1 (Cont.)

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

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

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

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

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

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

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

yucca, mesquite, and cactus are present. According to information provided by the BLM Las Cruces District Office (Hewitt 2009b), suitable grassland habitat for this species does not occur on the SEZ, but very suitable habitat may occur in the area of indirect effects west of the SEZ (as determined by a field-validated habitat suitability model for this species). The species is known to occur as near as 9 mi (14 km) west of the SEZ (Figure 12.1.12.1-1; Table 12.1.12.1-1). According to the SWReGAP habitat suitability model, approximately 9,400 acres (38 km^2) and 62,700 acres (38 km^2) of potentially suitable habitat may occur on the SEZ and within the area of indirect effects, respectively. On the basis of SWReGAP land cover data, approximately 680 acres (2.4 km^2) of Chihuahuan grassland habitat occurs on the SEZ. This habitat could represent foraging and nesting habitat. Based upon this information, it is concluded that portions of the Afton SEZ may provide marginally suitable habitat for the northern aplomado falcon. Critical habitat for this species has not been designated. The Texas Gap Analysis Program does not include a habitat suitability model for the northern aplomado falcon.

12.1.12.1.2 Species That Are Candidates for Listing under the ESA

In scoping comments on the proposed Afton SEZ (Stout 2009), the USFWS did not mention any species that are candidates for listing under the ESA that may be affected by solar energy development on the Afton SEZ. However, the western yellow-billed cuckoo is a candidate for listing under the ESA and has the potential to occur in the affected area. The western yellow-billed cuckoo is a neotropical migrant bird that inhabits large riparian woodlands in the western United States and is known to occur in Dona Ana County, New Mexico. Although the SWReGAP habitat suitability model for the western yellow-billed cuckoo does not identify any suitable habitat for this species within the SEZ, approximately 71 acres (0.3 km^2) of riparian habitat occurs within the area of indirect effects along the Rio Grande (Figure 12.1.12.1-1; Table 12.1.12.1-1). Additional basic information on life history, habitat needs, and threats to populations of this species is provided in Appendix J.

12.1.12.1.3 Species That Are under Review for Listing under the ESA

In scoping comments on the proposed Afton SEZ (Stout 2009), the USFWS did not mention any species that are under review for listing under the ESA that may be affected by solar energy development on the Afton SEZ. On the basis of known occurrences and the presence of potentially suitable habitat, there are no species under review for ESA listing that may occur in the affected area of the Afton SEZ.

12.1.12.1.4 BLM-Designated Sensitive Species

There are 17 BLM-designated sensitive species that may occur in the affected area of the Afton SEZ (Table 12.1.12.1-1), including the following (1) plants: Arizona coralroot, desert night-blooming cereus, grama grass cactus, Marble Canyon rockcress, New Mexico rock daisy, sandhill goosefoot, and Villard pincushion cactus; (2) invertebrate: Anthony blister beetle; (3) reptile: Texas horned lizard; (4) birds: American peregrine falcon, bald eagle, ferruginous hawk, and western burrowing owl; and (5) mammals: fringed myotis, long-legged myotis, Townsend's big-eared bat, and western small-footed myotis. Of these BLM-designated sensitive species with potentially suitable habitat in the affected area, only quad-level occurrences of the Texas horned lizard and fringed myotis intersect the affected area of the Afton SEZ. Habitats in which BLM-designated sensitive species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are presented in Table 12.1.12.1-1. These species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Arizona Coralroot

The Arizona coralroot is a perennial herb that is known from Arizona, New Mexico, and Texas. It occurs in oak and pinyon-juniper woodland communities in areas with heavy leaf litter. This species is known to occur in Dona Ana County, New Mexico. According to the SWReGAP land cover model, potentially suitable woodland habitat does not occur on the SEZ. However, potentially suitable woodland habitat may occur in the area of indirect effects within 5 mi (8 km) of the SEZ (Table 12.1.12.1-1).

Desert Night-Blooming Cereus

The desert night-blooming cereus is a perennial shrub-like cactus that is known from southern Arizona, New Mexico, and Texas. It occurs in sandy to silty soils in desert grassland communities, flats, and washes. The nearest recorded occurrence of this species is approximately 6 mi (10 km) north of the SEZ. Although it is not known to occur in the affected area, potentially suitable desert grassland and wash habitat may occur on the SEZ and in other portions of the affected area (Table 12.1.12.1-1).

Grama Grass Cactus

The grama grass cactus is a perennial shrub-like cactus that is known from southern Arizona, New Mexico, and Texas. It occurs in pinyon-juniper woodlands and desert grasslands on sandy soils. The nearest recorded occurrence of this species is approximately 29 mi (46 km) northeast of the SEZ. Although it is not known to occur in the affected area, potentially suitable desert grassland habitat may occur on the SEZ and in other portions of the affected area (Table 12.1.12.1-1).

Marble Canyon Rockcress

The Marble Canyon rockcress is an annual herb that is known from southern New Mexico and Texas. It occurs in rock crevices and at the bases of limestone cliffs in chaparral and pinyon-juniper communities at elevations between 4,500 and 6,000 ft (1,350 and 1,800 m). This species is known to occur in Dona Ana County, New Mexico. According to the SWReGAP land cover model, potentially suitable rocky cliff and outcrop habitat may occur on the SEZ and other portions of the affected area (Table 12.1.12.1-1).

New Mexico Rock Daisy

The New Mexico rock daisy is a perennial herb that is endemic to south-central New Mexico. It occurs in crevices of limestone cliffs and boulders at elevations between 4,900 and 7,000 ft (1,500 and 2,100 m). This species is known to occur in Dona Ana County, New Mexico. According to the SWReGAP land cover model, potentially suitable rocky cliff and outcrop habitat may occur on the SEZ and other portions of the affected area (Table 12.1.12.1-1).

Sandhill Goosefoot

The sandhill goosefoot is an annual herb that ranges from Nebraska south to New Mexico and Texas. It occurs in open sandy habitats, frequently along desert sand dunes. This species is known to occur in Dona Ana County, New Mexico. According to the SWReGAP land cover model, potentially suitable sand dune habitat may occur on the SEZ and other portions of the affected area (Table 12.1.12.1-1).

Villard Pincushion Cactus

The Villard pincushion cactus is a perennial shrub in the cactus family that is known from the Franklin and Sacramento Mountains in southern New Mexico. It occurs on loamy soils on limestone benches in desert grassland at elevations between 4,500 and 6,500 ft (1,370 and 2,000 m). This species is known to occur in Dona Ana County, New Mexico. According to the SWReGAP land cover model, potentially suitable desert grassland habitat may occur on the SEZ and other portions of the affected area (Table 12.1.12.1-1).

Anthony Blister Beetle

The Anthony blister beetle is an insect known only from New Mexico. This species occurs on flowering plants, particularly in agricultural areas, where adults are sometimes considered to be crop pests. This species is known to occur in Dona Ana County, New Mexico. Suitable habitat for this species does not occur on the SEZ. However, according to the SWReGAP land cover model, potentially suitable agricultural habitat may occur in the area of indirect effects (Table 12.1.12.1-1).

Texas Horned Lizard

The Texas horned lizard is widespread in the south-central United States and northern Mexico. This lizard inhabits open arid and semiarid regions on sandy substrates and sparse vegetation. Vegetation in suitable habitats includes grasses, cacti, or scattered brush or scrubby trees. The nearest quad-level occurrences of this species intersect the affected area about 5 mi (8 km) north of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species occurs on the SEZ and throughout portions of the affected area (Table 12.1.12.1-1).

American Peregrine Falcon

The American peregrine falcon occurs throughout the western United States from areas with high vertical cliffs and bluffs that overlook large open areas such as deserts, shrublands, and woodlands. Nests are usually constructed on rock outcrops and cliff faces. Foraging habitat varies from shrublands and wetlands to farmland and urban areas. This species is known to occur in Dona Ana County, New Mexico. According to the SWReGAP habitat suitability model, potentially suitable year-round foraging and nesting habitat for the American peregrine falcon may occur within the affected area of the Afton SEZ. On the basis of an evaluation of SWReGAP land cover types, potentially suitable nesting habitat (cliffs or outcrops) may occur on the SEZ (9 acres [<0.1 km^2]) and other portions of the affected area (132 acres [0.5 km^2]).

Bald Eagle

The bald eagle primarily occurs in riparian habitats associated with larger permanent water bodies such as lakes, rivers, and reservoirs. However, it may occasionally forage in arid shrubland habitats. This species is known to occur in Dona Ana County, New Mexico. According to the SWReGAP habitat suitability model, potentially suitable winter foraging habitat for this species may occur in the affected area of the Afton SEZ (Table 12.1.12.1-1). On the basis of an investigation of SWReGAP land cover types, there is relatively little aquatic and riparian habitat (<100 acres [<0.4 km^2]) on the SEZ, and most of the potentially suitable foraging habitat on the SEZ is represented by shrubland. Approximately 1,550 acres (6 km^2) of aquatic and riparian foraging habitat, primarily associated with the Rio Grande, occurs in the area of indirect effects.

Ferruginous Hawk

The ferruginous hawk occurs throughout the western United States. According to the SWReGAP habitat suitability model, only potentially suitable winter foraging habitat for this species occurs within the affected area of the Afton SEZ. This species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. It is known to occur in Dona Ana County, New Mexico. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur within the area of direct effects; however, potentially suitable foraging habitat occurs in portions of the area of indirect effects outside of the SEZ (Table 12.1.12.1-1).

Western Burrowing Owl

The western burrowing owl forages in grasslands, shrublands, and open disturbed areas, and nests in burrows usually constructed by mammals. According to the SWReGAP habitat suitability model for the western burrowing owl, potentially suitable year-round foraging and nesting habitat may occur in the affected area of the Afton SEZ. This species is known to occur in Dona Ana County, New Mexico. Potentially suitable foraging and breeding habitat is expected to occur on the SEZ and in other portions of the affected area (Table 12.1.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Fringed Myotis

The fringed myotis is a year-round resident in the Afton SEZ region, where it occurs in a variety of habitats, including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. The species roosts in buildings and caves. The nearest quad-level occurrence of this species intersects the affected area about 5 mi (8 km) north of the SEZ. The SWReGAP habitat suitability model for the species indicates that potentially suitable foraging or roosting habitat may occur on the SEZ and in other portions of the affected area (Table 12.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (cliffs or outcrops) may occur on the SEZ (9 acres [<0.1 km^2]) and other portions of the affected area (132 acres [0.5 km^2]).

Long-Legged Myotis

The long-legged myotis is a year-round resident in the Afton SEZ region, where it is primarily known from montane coniferous forests. The species is also known to forage in desert shrublands. The species roosts in buildings, caves, mines, and rock crevices. It is known to occur in Dona Ana County, New Mexico. The SWReGAP habitat suitability model for the species indicates that potentially suitable foraging or roosting habitat may occur on the SEZ and in other portions of the affected area (Table 12.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (cliffs or outcrops) may occur on the SEZ (9 acres [<0.1 km^2]) and other portions of the affected area (132 acres [0.5 km^2]).

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident in the Afton SEZ region, where it forages in a wide variety of desert and non-desert habitats. The species roosts in caves, mines, tunnels, buildings, and other manmade structures. The nearest quad-level occurrence of this species intersects the affected area about 5 mi (8 km) north of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable year-round foraging or roosting habitat for this species may occur on the SEZ and other portions of the affected area (Table 12.1.12.1-1).

On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (cliffs or outcrops) may occur on the SEZ (9 acres [<0.1 km^2]) and other portions of the affected area (132 acres [0.5 km^2]).

Western Small-Footed Myotis

The western small-footed myotis is a year-round resident in the Afton SEZ region, where it occupies a wide variety of desert and non-desert habitats including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, and tunnels, beneath boulders or loose bark, buildings, and in other manmade structures. This species is known to occur in Dona Ana County, New Mexico. According to the SWReGAP habitat suitability model, potentially suitable year-round foraging or roosting habitat for this species may occur on the SEZ and other portions of the affected area (Table 12.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (cliffs or outcrops) may occur on the SEZ (9 acres [<0.1 km^2]) and other portions of the affected area (132 acres [0.5 km^2]).

12.1.12.1.5 State-Listed Species

There are 10 species listed by the State of New Mexico that may occur in the Afton SEZ affected area (Table 12.1.12.1-1). These state-listed species include the following (1) plants: Arizona coralroot, desert night-blooming cereus, sand prickly-pear cactus, and Sneed's pincushion cactus; (2) birds: American peregrine falcon, bald eagle, Bell's vireo, gray vireo, and northern aplomado falcon; and (3) mammal: desert bighorn sheep. All of these species are protected in New Mexico under the Endangered Plant Species Act (NMSA 1978 Section 75-6-1) or the Wildlife Conservation Act (NMSA 1978 Section 17-2-37). Of these species, the following four species have not been previously described due to their status under the ESA or BLM (Sections 12.1.12.1.1 or 12.1.12.1.4): sand prickly-pear cactus, Bell's vireo, gray vireo, and desert bighorn sheep. These species as related to the SEZ are described in this section and Table 12.1.12.1-1. Additional life history information for these species is provided in Appendix J.

Sand Prickly-Pear Cactus

The sand prickly-pear cactus occurs from southern New Mexico and western Texas. This species is listed as endangered in the State of New Mexico. It occurs in semi-stabilized sand dunes in the Chihuahua Desert region in areas of sparse grass cover. This species is known to occur on the Afton SEZ and in other locations throughout the area of indirect effects. According to the SWReGAP land cover model, potentially suitable desert dune habitat occurs on the SEZ and other portions of the affected area (Table 12.1.12.1-1).

Bell's Vireo

The Bell's vireo is a small neotropical migrant songbird that is widespread in the central and southwestern United States and northern Mexico. This species is listed as threatened in the State of New Mexico. According to the SWReGAP habitat suitability model, this species may occur throughout the SEZ region as a summer breeding resident. Breeding and foraging habitat for this species consists of dense shrub-scrub vegetation such as riparian woodlands where there is an abundance of willows, scrub-oak communities, and mesquite woodlands. This species is known to occur in Dona Ana County, New Mexico, and potentially suitable foraging or nesting habitat may occur on the SEZ or in other portions of the affected area (Table 12.1.12.1-1).

Gray Vireo

The gray vireo is a small neotropical migrant songbird that occurs in the southwestern United States and northern Mexico. This species is listed as threatened in the State of New Mexico. According to the SWReGAP habitat suitability model, this species may occur throughout the SEZ region as a summer breeding resident. Breeding and foraging habitat for this species consists of semiarid shrublands, pinyon-juniper woodlands, oak-scrub woodlands, and chaparral habitats. This species is known to occur in Dona Ana County, New Mexico, and potentially suitable foraging or nesting habitat may occur on the SEZ or in other portions of the affected area (Table 12.1.12.1-1).

Desert Bighorn Sheep

The desert bighorn sheep (*Ovis canadensis mexicana*) is currently listed as threatened in the State of New Mexico. It is one of several subspecies of bighorn sheep that occurs in the southwestern United States. This subspecies is known to occur in eastern Arizona, New Mexico, and Texas. Within the State of New Mexico, desert bighorn sheep inhabit visually open, rocky, desert mountain ranges in the southern portion of the state. The species rarely uses desert lowlands and valleys, but these areas may be occasionally used as movement corridors between mountain ranges. This species is known to occur in Dona Ana County, New Mexico. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ; however, potentially suitable habitat may occur in the area of indirect effects within 5 mi (8 km) of the SEZ (Table 12.1.12.1-1).

12.1.12.1.6 Rare Species

There are 30 rare species (i.e., state rank of S1 or S2 in New Mexico or a species of concern by the USFWS or state of New Mexico) that may be affected by solar energy development on the Afton SEZ (Table 12.1.12.1-1). Of these species, there are 11 rare species that have not been discussed previously. These include the following (1) plants: Alamo beardtongue, mosquito plant, and Sandberg pincushion; (2) invertebrates: Samalayuca Dune grasshopper and Shotwell's range grasshopper; (3) fish: smallmouth buffalo; (4) birds:

dickcissel, eastern bluebird, and osprey; and (5) mammals: western red bat and yellow-faced pocket gopher. These species as related to the SEZ are described in Table 12.1.12.1-1.

12.1.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Afton SEZ is presented in this section. The types of impacts 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 12.1.12.1 following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 12.1.12.3).

Solar energy development within the Afton SEZ could affect a variety of habitats (see Sections 12.1.9 and 12.1.10). These impacts on habitats could in turn affect special status species that are dependent on those habitats. Based on NHNM records and information provided by the BLM Las Cruces District Office, occurrences for the following five special status species intersect the Afton affected area: sand prickly-pear cactus, smallmouth buffalo, Texas horned lizard, eastern bluebird, and fringed myotis. Suitable habitat for each of these species may occur in the affected area. Other special status species may occur on the SEZ or within the affected area based on the presence of potentially suitable habitat. As discussed in Section 12.1.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

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 12.1.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming design features are in place) is presented along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 12.1.1.2, impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

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

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

12.1.12.2.1 Impacts on Species Listed under the ESA

In scoping comments on the proposed Afton SEZ (Stout 2009), the USFWS expressed concern for impacts of project development within the SEZ on the northern aplomado falcon—a bird species listed as endangered under the ESA. In addition to this species, the Sneed's pincushion cactus—also listed as endangered under the ESA—may be affected by project developments on the SEZ. Impacts on these species are discussed below and summarized in Table 12.1.12.1-1.

Sneed's Pincushion Cactus

The Sneed's pincushion cactus is endemic to a small region between Las Cruces, New Mexico, and El Paso, Texas. It inhabits limestone cracks of broken terrain on steep rocky slopes and is known to occur within 10 mi (16 km) southeast of the Afton SEZ (Figure 12.1.12.1-1). According to the SWReGAP land cover model, approximately 9 acres (<0.1 km^2) of potentially suitable habitat within the SEZ could be directly affected by construction and operations of solar energy development on the Afton SEZ. This direct effects area represents about 0.2% of available suitable habitat in the region. About 132 acres (0.5 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.0% of the available suitable habitat in the region (Table 12.1.12.1-1).

The overall impact on the Sneed's pincushion cactus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered small because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to all rocky cliffs, slopes, and outcrops on the SEZ could reduce direct impacts on the Sneed's pincushion cactus. It is considered unlikely that these areas of relatively high relief would be suitable for development. For this species and other special status plants, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not a feasible option, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions) on the Sneed's pincushion cactus, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, compensatory mitigation, would require formal consultation with the USFWS per Section 7 of the ESA. Consultation may also be used to authorize incidental take statements per Section 10 of the ESA (if necessary). Consultation with New Mexico Department of Game and Fish (NMDGF) should also occur to determine any state mitigation requirements.

Northern Aplomado Falcon

The northern aplomado falcon inhabits Chihuahuan grasslands in southern New Mexico, western Texas, and northern Mexico and is known to occur approximately 9 mi (14 km) west of the SEZ (Figure 12.1.12.1-1). According to the SWReGAP habitat suitability model, approximately 9,400 acres (38 km^2) of potentially suitable habitat within the SEZ could be directly affected by construction and operations of solar energy development on the Afton SEZ. This direct effects area represents about 0.4% of available suitable habitat in the region. About 62,700 acres (254 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 2.9% of the available suitable habitat in the region (Table 12.1.12.1-1). On the basis of SWReGAP land cover data, approximately 680 acres (2.4 km^2) of Chihuahuan grassland habitat occurs on the SEZ. However, the field-verified habitat suitability model provided by the BLM Las Cruces District Office indicates that, in areas where field validation was conducted, suitable grassland habitat for this species does not occur on the SEZ. Based on this information, it is concluded that the grasslands on the Afton SEZ provide only marginally suitable habitat for the northern aplomado falcon. The Texas Gap Analysis Program does not include a habitat suitability model for the northern aplomado falcon.

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

Avoiding or minimizing disturbance to desert grassland habitat on the SEZ could reduce direct impacts on the northern aplomado falcon to negligible levels. Impacts could also be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied nests in the area of direct effects. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than design features, should be determined by conducting pre-disturbance surveys for the species and its habitat in the area of direct effects.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions) on the northern aplomado falcon, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, compensatory mitigation, would require consultation with the USFWS per Section 7 of the ESA. This consultation may also be used to develop incidental take statements per Section 10 of the ESA (if necessary). Consultation with NMDGF should also occur to determine any state mitigation requirements.

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

In scoping comments on the proposed Afton SEZ (Stout 2009), the USFWS did not mention any species that are candidates for listing under the ESA that may occur in the affected area of the Afton SEZ. However, the western yellow-billed cuckoo is a candidate species under the ESA and may potentially occur in the affected area of the SEZ. Impacts on this species are discussed below and summarized in Table 12.1.12.1-1.

The western yellow-billed cuckoo is known to occur in Dona Ana County, New Mexico and potentially suitable habitat occurs in the affected area of the Afton SEZ in riparian areas along the Rio Grande (Figure 12.1.12.1-1). According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, the SWReGAP habitat suitability model indicates approximately 71 acres (0.3 km^2) of potentially suitable habitat in the area of indirect effects. This indirect effects area represents about 0.8% of the available suitable habitat in the region (Table 12.1.12.1-1).

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

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

In scoping comments on the proposed Afton SEZ (Stout 2009), the USFWS did not mention any species that are under review for listing under the ESA that may be impacted by solar energy development on the Afton SEZ. On the basis of known occurrences and the presence of potentially suitable habitat, there are no species under review for ESA listing that may occur in the affected area of the Afton SEZ.

12.1.12.2.4 Impacts on BLM-Designated Sensitive Species

There are 17 BLM-designated sensitive species that were not previously discussed as listed under the ESA, candidates, or under review for ESA listing. Impacts on these BLM-designated sensitive species that may be affected by solar energy development on the Afton SEZ are discussed below.

Arizona Coralroot

The Arizona coralroot is not known to occur in the affected area of the Afton SEZ and suitable habitat does not occur on the SEZ; however, approximately 13 acres (<0.1 km^2) of potentially suitable pinyon-juniper woodland habitat occurs in the area of indirect effects within 5 mi (8 km) of the SEZ; this area represents less than 0.1% of the available suitable habitat in the SEZ region (Table 12.1.12.1-1).

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

Desert Night-Blooming Cereus

The desert night-blooming cereus is known to occur about 6 mi (10 km) north of the Afton SEZ and potentially suitable habitat occurs in the affected area. Approximately 680 acres (3 km^2) of potentially suitable desert grassland habitat on the SEZ may be directly affected by construction and operations of solar energy development on the SEZ (Table 12.1.12.1-1). This direct effects area represents 0.1% of available suitable habitat in the region. About 13,070 acres (53 km^2) of potentially suitable grassland habitat occurs in the area of potential indirect effects; this area represents about 1.2% of the available suitable habitat in the SEZ region (Table 12.1.12.1-1).

The overall impact on the desert night-blooming cactus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered small because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

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

Grama Grass Cactus

The grama grass cactus is known to occur about 29 mi (46 km) northeast of the Afton SEZ and potentially suitable habitat occurs in the affected area. Approximately 680 acres (3 km^2) of potentially suitable desert grassland habitat on the SEZ may be directly affected by construction and operations of solar energy development on the SEZ (Table 12.1.12.1-1). This direct effects area represents 0.1% of available suitable habitat in the region. About 12,900 acres (52 km^2) of potentially suitable grassland habitat occurs in the area of potential indirect effects; this area represents about 1.2% of the available suitable habitat in the SEZ region (Table 12.1.12.1-1).

The overall impact on the grama grass cactus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered small because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

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

Marble Canyon Rockcress

The Marble Canyon rockcress is not known to occur in the affected area of the Afton SEZ. However, the species is known to occur in Dona Ana County, New Mexico, and approximately 9 acres (<0.1 km^2) of potentially suitable rocky cliff and outcrop habitat on the SEZ may be directly affected by construction and operations of solar energy development on the

SEZ. This direct effects area represents less than 0.1% of available suitable habitat in the region. Approximately 600 acres (2 km^2) of potentially suitable habitat occurs in the area of indirect effects within 5 mi (8 km) outside of the SEZ; this area represents 0.7% of the available suitable habitat in the SEZ region (Table 12.1.12.1-1).

The overall impact on the Marble Canyon rockcress from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered small because less than 1% of potentially suitable habitat (rocky cliffs and outcrops) for this species occurs in the area of direct effects. In addition, it is considered unlikely that these areas of relatively high relief would be suitable for development. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

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

New Mexico Rock Daisy

The New Mexico rock daisy is not known to occur in the affected area of the Afton SEZ. However, the species is known to occur in Dona Ana County, New Mexico, and approximately 9 acres (<0.1 km^2) of potentially suitable rocky cliff and outcrop habitat on the SEZ may be directly affected by construction and operations of solar energy development on the SEZ. This direct effects area represents 0.2% of available suitable habitat in the region. Approximately 132 acres (0.5 km^2) of potentially suitable habitat occurs in the area of indirect effects within 5 mi (8 km) outside of the SEZ; this area represents 3.0% of the available suitable habitat in the SEZ region (Table 12.1.12.1-1).

The overall impact on the New Mexico rock daisy from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered small because less than 1% of potentially suitable habitat (rock cliffs and outcrops) for this species occurs in the area of direct effects. In addition, it is considered unlikely that these areas of relatively high relief would be suitable for development. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to rocky cliff and outcrop habitat in the area of direct effects and the implementation of mitigation measures described previously for the Marble Canyon rockcress could reduce direct impacts on this species to negligible levels. The need for mitigation, other than design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Sandhill Goosefoot

The sandhill goosefoot is not known to occur in the affected area of the Afton SEZ. However, the species is known to occur in Dona Ana County, New Mexico, and approximately 52,000 acres (210 km^2) of potentially suitable desert sand dune habitat on the SEZ may be directly affected by construction and operations of solar energy development on the SEZ. This direct effects area represents 5.2% of available suitable habitat in the region. Approximately 49,600 acres (201 km^2) of potentially suitable habitat occurs in the area of indirect effects within 5 mi (8 km) outside of the SEZ; this area represents 4.9% of the available suitable habitat in the SEZ region (Table 12.1.12.1-1).

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

Avoiding or minimizing disturbance of sand dunes, other sandy areas, and sand transport systems on the SEZ could reduce direct impacts on this species. In addition, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not a feasible option, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development.

Villard Pincushion Cactus

The Villard pincushion cactus is not known to occur in the affected area of the Afton SEZ. However, the species is known to occur in Dona Ana County, New Mexico, and approximately 680 acres (3 km^2) of potentially suitable desert grassland habitat on the SEZ may be directly affected by construction and operations of solar energy development on the SEZ (Table 12.1.12.1-1). This direct effects area represents 0.1% of available suitable habitat in the region. About 12,900 acres (52 km^2) of potentially suitable grassland habitat occurs in the area of potential indirect effects; this area represents about 1.2% of the available suitable habitat in the SEZ region (Table 12.1.12.1-1).

The overall impact on the Villard pincushion cactus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered small because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

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

Anthony Blister Beetle

The Anthony blister beetle is known to occur in Dona Ana County, New Mexico. According to the SWReGAP land cover model, suitable habitat for this species does not occur on the SEZ. However, about 42,500 acres (172 km^2) of potentially suitable agricultural habitat occurs in the area of potential indirect effects; this area represents about 30.6% of the available suitable habitat in the SEZ region (Table 12.1.12.1-1).

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

Texas Horned Lizard

The Texas horned lizard is known to occur in the affected area of the Afton SEZ. Approximately 77,500 acres (314 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents about 2.0% of potentially suitable habitat in the SEZ region. About 182,300 acres (738 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 4.7% of the potentially suitable habitat in the SEZ region (Table 12.1.12.1-1).

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

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

American Peregrine Falcon

The American peregrine falcon is a year-round resident in the Afton SEZ region and potentially suitable foraging and nesting habitat is expected to occur in the affected area. Approximately 23,000 acres (93 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 1.2% of potentially suitable habitat in the SEZ region. About 159,500 acres (645 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 8.0% of the potentially suitable habitat in the SEZ region (Table 12.1.12.1-1). Most of this area could serve as foraging habitat (open shrublands). The availability of nest sites (e.g., rock outcrops) within the affected area has not been determined, but rocky cliffs and outcrops that may be suitable nesting sites occur within the affected area. On the basis of SWReGAP land cover data, approximately 9 acres (14 km^2) of rocky cliffs and outcrops on the SEZ may be potentially suitable nesting habitat for this species.

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

Impacts on the American peregrine falcon could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to potential nesting habitat in the area of direct effects. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on suitable nesting habitats. Compensation could involve the protection and enhancement of existing 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 design features, should be determined by conducting pre-disturbance surveys for the species and its habitat in the area of direct effects.

Bald Eagle

The bald eagle is a winter resident in the Afton SEZ region and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 840 acres (3 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 0.1% of potentially suitable habitat in the SEZ region. About 67,250 acres (272 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5.3% of the potentially suitable habitat in the SEZ region (Table 12.1.12.1-1). Most of the suitable foraging habitat on the SEZ and in the area of indirect effects is composed of desert shrubland and grassland.

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

Ferruginous Hawk

The ferruginous hawk is a winter resident in the Afton SEZ region and potentially suitable foraging habitat is expected to occur in the affected area. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur within the area of direct effects. However, about 42,800 acres (173 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 32.6% of the potentially suitable habitat in the SEZ region (Table 12.1.12.1-1).

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

Western Burrowing Owl

The western burrowing owl is a year-round resident in the Afton SEZ region and potentially suitable foraging and nesting habitat is expected to occur in the affected area. Approximately 77,300 acres (313 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 2.0% of potentially suitable habitat in the SEZ region. About 218,800 acres (885 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5.8% of the potentially suitable habitat in the SEZ region (Table 12.1.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting in the affected area has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region.

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

Fringed Myotis

The fringed myotis is a year-round resident within the Afton SEZ region and quad-level occurrences of this species are known to intersect the affected area of the SEZ. According to the SWReGAP habitat suitability model, approximately 25,600 acres (104 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 0.8% of potentially suitable habitat in the SEZ region. About 178,200 acres (721 km^2) of potentially suitable foraging habitat occurs in the area of indirect effect; this area represents about 5.9% of the available suitable habitat in the region (Table 12.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (cliffs or rock outcrops) may occur on the SEZ (9 acres [<0.1 km^2]) and in the area of indirect effects (132 acres [0.5 km^2]). However, the availability of roost sites within the affected area has not been determined.

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

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

Long-Legged Myotis

The long-legged myotis is a year-round resident within the Afton SEZ region. According to the SWReGAP habitat suitability model, approximately 25,250 acres (102 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 0.9% of potentially suitable habitat in the SEZ region. About 127,800 acres (517 km^2) of potentially suitable foraging habitat occurs in the area of indirect effect; this area represents about 4.7% of the available suitable habitat in the region (Table 12.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (cliffs or rock outcrops) may occur on the SEZ (9 acres [<0.1 km^2]) and in the area of indirect effects (132 acres [0.5 km^2]). However, the availability of roost sites within the affected area has not been determined.

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

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

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident within the Afton SEZ region and quad-level occurrences of this species are known to intersect the affected area of the SEZ. According to the SWReGAP habitat suitability model, approximately 10,400 acres (42 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 0.4% of potentially suitable habitat in the SEZ region. About 127,500 acres (516 km^2) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 4.9% of the available suitable foraging habitat in the region (Table 12.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (cliffs or rock outcrops) may occur on the SEZ (9 acres [<0.1 km^2]) and in the area of indirect effects (132 acres [0.5 km^2]). However, the availability of roost sites within the affected area has not been determined.

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

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

Western Small-Footed Myotis

The western small-footed myotis is a year-round resident within the Afton SEZ region. According to the SWReGAP habitat suitability model, approximately 76,400 acres (309 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 2.0% of potentially suitable habitat in the SEZ region. About 218,675 acres (885 km^2) of potentially suitable habitat occurs in the area of indirect effect; this area represents about 4.9% of the available suitable foraging habitat in the region (Table 12.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, potentially suitable roosting habitat (cliffs or rock outcrops) may occur on the SEZ (9 acres [<0.1 km^2]) and in the area of indirect effects (132 acres [0.5 km^2]). However, the availability of roost sites within the affected area has not been determined.

The overall impact on the western small-footed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered moderate because the amount of potentially suitable foraging or roosting habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of design features may be sufficient to reduce indirect impacts on this species to negligible levels.

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

12.1.12.2.5 Impacts on State-Listed Species

There are 10 species listed by the state of New Mexico that may occur in the Afton SEZ affected area (Table 12.1.12.1-1). Of these species, impacts on the following state-listed species have not been previously described: sand prickly-pear cactus, Bell's vireo, gray vireo, and desert bighorn sheep. Impacts on each of these four species are discussed below and summarized in Table 12.1.12.1-1.

Sand Prickly-Pear Cactus

The sand prickly-pear cactus is known to occur on the Afton SEZ and in portions of the area of indirect effects within 5 mi (8 km) outside of the SEZ. According to the SWReGAP land cover model, approximately 51,500 acres (208 km^2) of potentially suitable sand dune habitat for this species on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 5.6% of potentially suitable habitat in the SEZ region. Approximately 41,900 acres (170 km^2) of potentially suitable sand dune habitat occurs in the area of potential indirect effects; this area represents about 4.6% of the available suitable habitat in the SEZ region (Table 12.1.12.1-1).

The overall impact on the sand prickly-pear cactus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered moderate because greater than 1% but less than 10% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance to sand dunes and sand transport systems on the SEZ and the implementation of mitigation measures described previously for the sandhill goosefoot (Section 12.1.12.2.4) could reduce direct impacts on this species. The need for mitigation, other than design features, should be determined by conducting pre-disturbance surveys for the species and its habitat in the area of direct effects.

Bell's Vireo

The Bell's vireo is widespread in the central and southwestern United States and is a summer breeding resident in the Afton SEZ region. According to the SWReGAP habitat suitability model, approximately 11,300 acres (46 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 2.9% of potentially suitable habitat in the SEZ region. About 19,600 acres (79 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5.1% of the potentially suitable habitat in the SEZ region (Table 12.1.12.1-1). Most of the potentially suitable habitat on the SEZ and throughout the area of indirect effects could serve as foraging or nesting habitat where suitable dense shrub-scrub vegetation occurs.

The overall impact on the Bell's vireo from construction, operation, and decommissioning of utility-scale solar energy facilities within the Afton SEZ is considered moderate because greater than 1% but less than 10% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

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

Gray Vireo

The gray vireo is known from the southwestern United States and is known to occur as a summer breeding resident in the Afton SEZ region. According to the SWReGAP habitat suitability model, approximately 16,000 acres (65 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 12.1.12.1-1). This direct impact area represents 2.9% of potentially suitable habitat in the SEZ region. About 58,500 acres (237 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 10.6% of the potentially suitable habitat in the SEZ region (Table 12.1.12.1-1). Most of the potentially suitable habitat on the SEZ and throughout the area of indirect effects could serve as foraging or nesting habitat where suitable shrubs and trees occur.

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

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

Desert Bighorn Sheep

The desert bighorn sheep (*Ovis canadensis mexicana*), a subspecies of bighorn sheep, is known in southeastern Arizona, southern New Mexico, and western Texas. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur in the area of direct effects. However, approximately 1,650 acres (7 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.8% of the potentially suitable habitat in the SEZ region (Table 12.1.12.1-1).

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

12.1.12.2.6 Impacts on Rare Species

There are 30 rare species (i.e., state rank of S1 or S2 in New Mexico or a species of concern by the USFWS or State of New Mexico) that may be affected by solar energy development on the Afton SEZ (Table 12.1.12.1-1). Impacts on 11 rare species have not been discussed previously. These include the following (1) plants: Alamo beardtongue, mosquito plant, and Sandberg pincushion; (2) invertebrates: Samalayuca Dune grasshopper and Shotwell's range grasshopper; (3) fish: smallmouth buffalo; (4) birds: dickcissel, eastern bluebird, and osprey; and (5) mammals: western red bat and yellow-faced pocket gopher. Impacts on these species are described in Table 12.1.12.1-1.

12.1.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 12.1.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts 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.

- Consultation with the USFWS and NMDGF should be conducted to address the potential for impacts on the following species currently listed as threatened or endangered under the ESA: Sneed's pincushion cactus and northern aplomado falcon. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Coordination with the USFWS and NMDGF should be conducted to address the potential for impacts on the western yellow-billed cuckoo, a candidate species for listing under the ESA. Coordination would identify an appropriate survey protocol, and mitigation, which may include avoidance, minimization, translocation, or compensation.

- Avoiding or minimizing disturbance to rocky slopes, cliffs, and outcrops on the SEZ could reduce or eliminate impacts on the following ten special status species: Alamo beardtongue, Marble Canyon rockcress, mosquito plant, New Mexico rock daisy, Sneed's pincushion cactus, American peregrine falcon, fringed myotis, long-legged myotis, Townsend's big-eared bat, and western small-footed myotis.

- Avoiding or minimizing disturbance to desert grassland habitat on the SEZ could reduce or eliminate impacts on the following four special status species: desert night-blooming cereus, grama grass cactus, Villard pincushion cactus, and northern aplomado falcon.

- Avoiding or minimizing disturbance to sand dune habitat and sand transport systems on the SEZ could reduce or eliminate impacts on the following three special status species: sand prickly-pear cactus, sandhill goosefoot, and Samalayuca Dune grasshopper.

- Avoiding or minimizing disturbance to playa habitat on the SEZ could reduce or eliminate impacts on the Shotwell's range grasshopper.

- 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 NMDGF.

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

12.1.13 Air Quality and Climate

12.1.13.1 Affected Environment

12.1.13.1.1 Climate

The proposed Afton SEZ is located in the southwestern portion of Dona Ana County in south-central New Mexico. The SEZ has an average elevation of about 4,230 ft (1,290 m) and is located west of the Mesilla Valley, which is the floodplain of the Rio Grande River running north-south. The SEZ is located in the northern portion of the Chihuahuan Desert, the northern reaches of which protrude into New Mexico from north-central Mexico. The area experiences a high desert arid climate, characterized by warm summers, mild winters, light precipitation, a high evaporation rate, low relative humidity, abundant sunshine, and relatively wide annual and diurnal temperature ranges (NCDC 2010a). Meteorological data collected at the Las Cruces International Airport, about 2 mi (3 km) north of the Afton SEZ boundary, and at New Mexico State University (NMSU), about 5 mi (8 km) northeast, are summarized below.

A wind rose from the Las Cruces International Airport, based on data collected 33 ft (10 m) above the ground over the 5-year period 2005 to 2009, is presented in Figure 12.1.13.1-1 (NCDC 2010b). During this period, the annual average wind speed at the airport was about 7.1 mph (3.2 m/s); the prevailing wind direction was from the west (about 13.1% of the time) and secondarily from the west–southwest (about 9.3% of the time). Westerly winds occurred more frequently throughout the year, except from July through September when southeast winds prevailed. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 16.6% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were the highest in spring at 9.1 mph (4.1 m/s); lower in winter and summer at 6.9 mph (3.1 m/s) and 6.8 mph (3.0 m/s), respectively; and lowest in fall at 5.8 mph (2.6 m/s).

Elevation plays a larger role than latitude in determining the temperature of any specific location in New Mexico (NCDC 2010a). For the period 1959 to 2010, the annual average temperature at NMSU was 61.8°F (16.6°C) (WRCC 2010d). January was the coldest month, with an average minimum of 28.1°F (−2.2°C), and July was the warmest, with an average maximum of 94.8°F (34.9°C). In summer, daytime maximum temperatures higher than 90°F (32.2°C) are common, and minimums are in the 60s. The minimum temperatures recorded were below freezing (≤32°F [0°C]) during the colder months (from October to April with a peak of about 24 days in January and 23 days in December), but subzero temperatures were very rare. During the same period, the highest temperature, 110°F (43.3°C), was reached in June 1994, and the lowest, −10°F (−23.3°C), in January 1962. In a typical year, about 98 days had a maximum temperature of at least 90°F (32.2°C), while about 84 days had minimum temperatures at or below freezing.

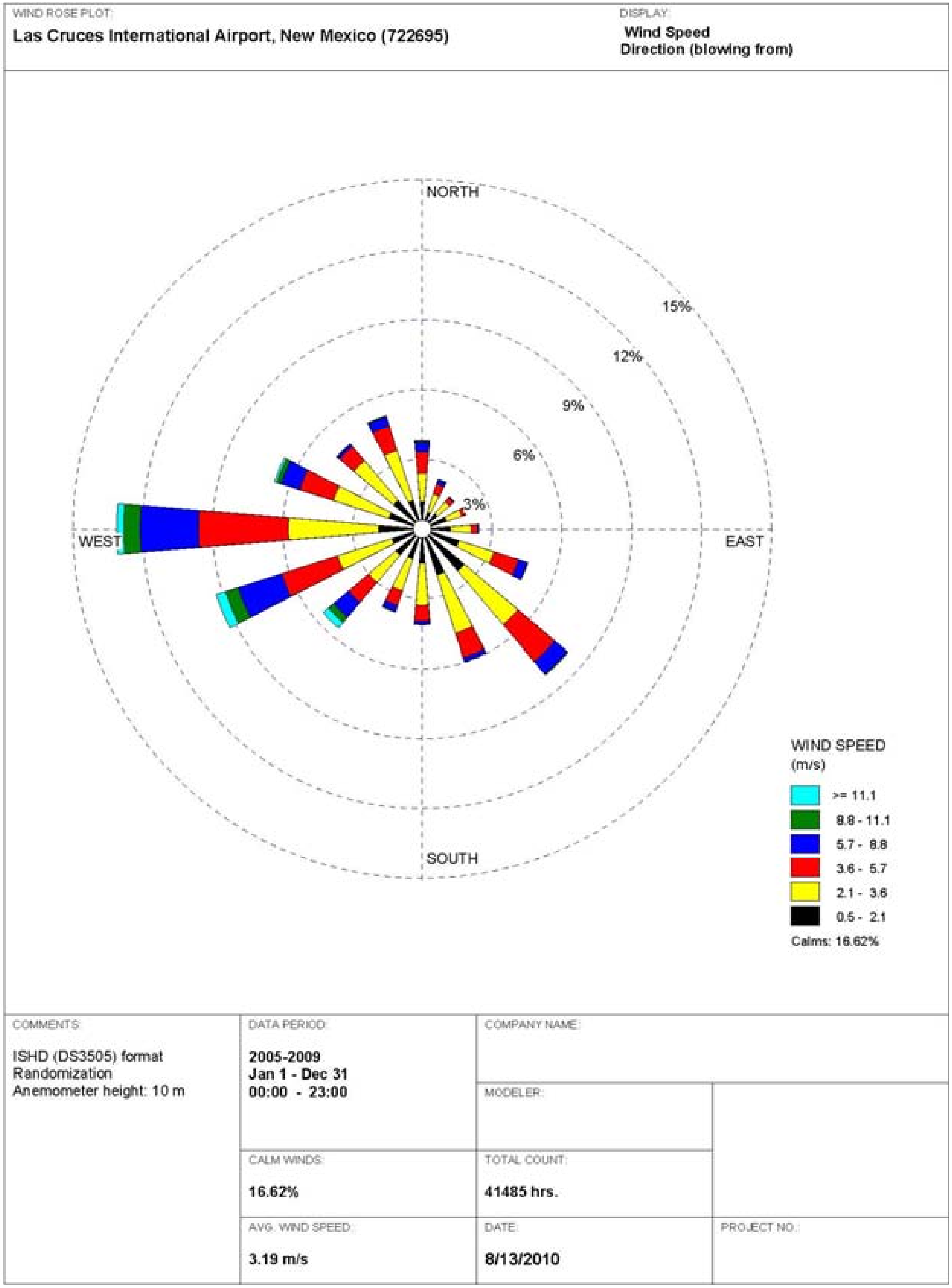

FIGURE 12.1.13.1-1 Wind Rose at 33 ft (10 m) at the Las Cruces International Airport, New Mexico, 2005 to 2009 (Source: NCDC 2010b)

In New Mexico, summer rains fall mostly during brief but frequently intense thunderstorms associated with general southeasterly circulation from the Gulf of Mexico (NCDC 2010a). In contrast, winter precipitation is caused mainly by frontal activity associated with general movement of Pacific Ocean storms. For the 1959 to 2010 period, annual precipitation at NMSU averaged about 9.38 in. (23.8 cm) (WRCC 2010). On average, 50 days a year have measurable precipitation (0.01 in. [0.025 cm] or higher). Seasonally, precipitation is the highest in summer, nearly half of the annual total and lower in fall and winter and tapers off markedly in spring. Snow occurs mostly from November to February, and the annual average snowfall at NMSU was about 3.5 in. (8.9 cm), with the highest monthly snowfall of 12.7 in. (32.3 cm) in November 1976.

The proposed Afton SEZ is far from major water bodies (more than 360 mi [579 km] to the Gulf of California and 650 mi [1,046 km] to the Gulf of Mexico). Severe weather events, with the exception of dust storms, are a rarity in Dona Ana County, which encompasses the Afton SEZ (NCDC 2010c).

General floods are seldom widespread in New Mexico. Rather, floods associated with heavy thunderstorms may occur in small areas for a short time (NCDC 2010a). Since 1994, 44 floods (mostly flash flood) have been reported in Dona Ana County, most of which occurred during July through September (NCDC 2010c). These floods caused no deaths or injuries but considerable property and minor crop damage.

In Dona Ana County, 57 hail events in total have been reported since 1956, some of which caused considerable property damage. Hail measuring 2.5 in. (6.4 cm) in diameter was reported in 1991. In Dona Ana County, 46 thunderstorm winds have been reported since 1959, and those up to a maximum wind speed of 102 mph (46 m/s) occurred primarily during the summer months and caused some property damage (NCDC 2010c).

No dust storm events were reported in Dona Ana County (NCDC 2010c). However, the ground surface of the SEZ is covered primarily with loamy fine sand and fine sand, which have relatively high dust storm potential. High winds can trigger large amounts of dust from areas of dry and loose soils with sparse vegetation in Dona Ana County. Dust storms can deteriorate air quality and visibility and may have adverse effects on health, particularly for people with asthma or other respiratory problems. Dona Ana County experiences between 6 and 18 days per year when dust levels exceed federal health standards (NMED 2000a). In this area, high winds are common during the months of January to April, and most dust storms last about 4 hours.

Because of the considerable distances to major water bodies, hurricanes never hit New Mexico. On rare occasions, remnants of a tropical storm system originating from the Pacific Ocean or the Gulf of Mexico may dump rains in the area, but there is no record of serious wind damage from these storms (NCDC 2010a). Historically, three tropical depressions have passed within 100 mi (160 km) of the proposed Afton SEZ (CSC 2010). In the period from 1950 to April 2010, a total of 12 tornadoes (0.2 per year each) were reported in Dona Ana County (NCDC 2010c). Most tornadoes occurring in Dona Ana County were relatively weak (i.e., nine were F0 and three were F1 on the Fujita tornado scale), and these tornadoes caused no death or injuries but some property damage. Several of these tornadoes occurred not far from the SEZ, the nearest one of which hit the area about 0.7 mi (1.1 km) north of the SEZ.

12.1.13.1.2 Existing Air Emissions

Dona Ana County has a few industrial emission sources, but their emissions are relatively small, except for two major NO_x emission sources: Rio Grande Generating Station in Sunland Park and physical plant boilers at NMSU. Several emission sources are located around the proposed Afton SEZ, but their emissions are relatively small. Several major roads exist in Dona Ana County, such as I-10, I-25, U.S. 70, and many state routes. Thus, onroad mobile source emissions are substantial compared with those from other sources in Dona Ana County. Data on annual emissions of criteria pollutants and volatile organic compounds (VOCs) in Dona Ana County are presented in Table 12.1.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, area sources were major contributors to total emissions of sulfur dioxide (SO_2) (about 41%), PM_{10} (about 91%), and $PM_{2.5}$ (about 79%). Onroad sources were major contributors to nitrogen oxides (NO_x) and carbon monoxide (CO) emissions (about 48% and 65%, respectively). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions contributed secondarily to CO emissions (about 16%) and accounted for most of the VOC emissions (about 89%). Nonroad sources were secondary contributors to SO_2 and NO_x emissions. In Dona Ana County, point and fire emissions sources were minor contributors to criteria pollutants and VOCs.

TABLE 12.1.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Dona Ana County, New Mexico, Encompassing the Proposed Afton SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)[c]
SO_2	788
NO_x	12,263
CO	73,129
VOCs	81,171
PM_{10}	7,299
$PM_{2.5}$	2,316

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

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

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

Source: WRAP (2009).

In 2010, New Mexico is projected to produce about 89.4 MMt of *gross*[6] carbon dioxide equivalent (CO_2e)[7] emissions (Bailie et al. 2006), which is about 1.3% of total U.S. greenhouse gas (GHG) emissions in 2008. Gross GHG emissions in New Mexico increased by about 31% from 1990 to 2010, compared to 14% growth in U.S. GHG emissions during the 1990 to 2008 period. In 2010, about 89.1% of GHG emissions in New Mexico is from the energy sector:

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

[7] This is a measure used to compare the emissions from various GHG emission sources 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.

electric power production (about 37.2%), transportation (about 19.7%), fossil fuel industry (about 22.7%), and fuel use in the residential, commercial, and industrial sectors combined (about 9.5%). New Mexico's *net* emissions in 2010 are about 68.5 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The U.S. Environmental Protection Agency (EPA) (2009a) also estimated 2005 emissions in New Mexico. Its estimate of CO_2 emissions from fossil fuel combustion was 59.0 MMt, which was slightly lower than the state's estimate. Electric power generation and transportation accounted for about 53.8% and 26.0% of the CO_2 emissions total, respectively, while the residential, commercial, and industrial sectors accounted for the remainder (about 20.2%).

12.1.13.1.3 Air Quality

New Mexico has established more stringent standards than National Ambient Air Quality Standards (NAAQS) for SO_2, NO_2, and CO, but no standards for ozone (O_3), PM (PM_{10} and $PM_{2.5}$), or lead (Pb) (EPA 2010a; Title 20, Chapter 2, Part 3 of the *New Mexico Administrative Code* [20.2.3 NMAC]). In addition, the state has adopted standards for hydrogen sulfide and total reduced sulfur and still retains a standard for total suspended particulate (TSP), which was formerly a criteria pollutant but were replaced by PM_{10} in 1987.

Dona Ana County is located administratively within the El Paso–Las Cruces–Alamogordo Interstate Air Quality Control Region (AQCR 153) (Title 40, Part 81, Section 82 of the *Code of Federal Regulations* [40 CFR 81.82]), along with three other counties in New Mexico (Lincoln, Otero, and Sierra) and six counties in Texas. Southeastern Dona Ana County, which borders El Paso in Texas and Ciudad Juarez in Mexico, has historically experienced air quality problems, notably, PM and O_3 pollution. Dona Ana County is designated as being in attainment for all criteria pollutants except PM_{10} (40 CFR 81.332).[8] The entire state is designated as an unclassifiable/attainment area, except for a small portion of southeastern Donna Ana County around Anthony, which is adjacent to El Paso, Texas, and has been designated nonattainment for PM_{10} since 1991. Accordingly, the area surrounding the proposed Afton SEZ is in unclassifiable/attainment for all six criteria pollutants.

As briefly discussed in Section 12.1.13.1.1, Dona Ana County frequently experiences natural dust storms, which cause PM_{10} exceedances of the NAAQS. Western states frequently plagued by natural dust storms requested that the EPA develop a commonsense policy, called a Natural Events Policy (NEP), to address high PM_{10} pollution caused by natural events. Under the NEP, state and local governments are required to develop a Natural Events Action Plan (NEAP), which provides alternatives for controlling significant sources of human-caused windblown dust, with the understanding that dust storms sometimes override the best dust control efforts (NMED 2000b). The New Mexico Air Quality Bureau submitted an original NEAP for Dona Ana County in December 2000 and reevaluated it in 2005. In accordance with the NEAP for Dona Ana County, the county and the City of Las Cruces maintain erosion control

8 A small, "marginal" 1-hour O_3 nonattainment area, the Sunland Park area, had existed in the southeastern part of the county since 1995. The area is no longer subject to the 1-hour standard, however, because the standard was revoked in 2004, and Sunland Park was redesignated a maintenance area for the 8-hour O_3 standard.

ordinances to protect and maintain the natural environment and to reduce the negative health effects caused by the creation of fugitive dust.

Ambient concentration data representative of the proposed Afton SEZ for all criteria pollutants except Pb are available for Dona Ana County. For CO, O_3, PM_{10}, and $PM_{2.5}$, concentration data from monitoring stations in and around Las Cruces are presented, from 1.5 mi (2.4 km) north to 6 mi (10 km) northeast of the SEZ. For SO_2 and NO_2, concentration data from Sunland Park, about 22 mi (35 km) south–southeast of the SEZ, are presented. Concentration levels for O_3, PM_{10}, and $PM_{2.5}$ in southeastern Dona Ana County (e.g., Anthony and Sunland Park) have frequently exceeded these standards. Ambient air quality in Anthony and Sunland Park, which are small cities, is affected by the adjacent metropolitan areas of El Paso, Texas, and Ciudad Juarez, Mexico, and by the Chihuahuan Desert. In contrast, ambient air quality around the proposed Afton SEZ represented by measurements in Las Cruces is fairly good. The Background concentration levels for SO_2, NO_2, CO, 1-hour O_3, annual PM_{10}, and $PM_{2.5}$ around the Afton SEZ from 2004 through 2008 were less than or equal to 68% of their respective standards, as shown in Table 12.1.13.1-2 (EPA 2010b). However, the monitored 8-hour O_3 concentrations were approaching the applicable standard (about 93%). Concentrations for 24-hour PM_{10} were below the standard (about 94%) during the 2004 through 2007 period. However, the 24-hour PM_{10} standard was exceeded in 2008 because of the higher-than-usual number of dust storm episodes. No measurement data for Pb are available for Dona Ana County, but Pb levels are expected to be low, because the most recent Pb concentration in Albuquerque in 2004 was only 2% of the standard.[9]

The Prevention of Significant Deterioration (PSD) regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, the EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. Several Class I areas are located in Arizona, New Mexico and Texas, but none is within 62 mi (100 km) of the proposed SEZ. The nearest is Gila WA (40 CFR 81.421), about 81 mi (131 km) northwest of the Afton SEZ. This Class I area is not located downwind of prevailing winds at the Afton SEZ (Figure 12.1.13.1-1). The next nearest Class I areas include White Mountains WA, Bosque del Apache WA, and Guadalupe Mountains NP in Texas, which are about 96 mi (154 km) northeast, 98 mi (158 km) north, and 100 mi (161 km) east of the SEZ, respectively.

12.1.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low levels of emissions would

9 Pb measurements have been discontinued since 2004 in the state of New Mexico because of continuously low readings after the phaseout of leaded gasoline.

TABLE 12.1.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed Afton SEZ in Dona Ana County, New Mexico, 2004 to 2008

Pollutant[a]	Averaging Time	NAAQS	SAAQS	Background Concentration Level: Concentration[b,c]	Background Concentration Level: Measurement Location, Year
SO_2	1-hour	75 ppb[d]	NA[e]	NA	NA
	3-hour	0.5 ppm	NA	0.006 ppm (1.2%; NA)	Sunland Park, 2005
	24-hour	0.14 ppm	0.10 ppm	0.004 ppm (2.9%; 4.0%)	Sunland Park, 2004
	Annual	0.030 ppm	0.02 ppm	0.001 ppm (3.3%; 5.0%)	Sunland Park, 2006
NO_2	1-hour	100 ppb[f]	NA	NA	NA
	24-hour	NA	0.10 ppm	NA	NA
	Annual	0.053 ppm	0.05 ppm	0.011 ppm (21%; 22%)	Sunland Park, 2004
CO	1-hour	35 ppm	13.1 ppm	3.8 ppm (11%; 29%)	Las Cruces, 2004
	8-hour	9 ppm	8.7 ppm	2.7 ppm (30%; 31%)	Las Cruces, 2006
O_3	1-hour	0.12 ppm[g]	NA	0.082 ppm (68%; NA)	Las Cruces, 2006
	8-hour	0.075 ppm	NA	0.070 ppm (93%; NA)	Las Cruces, 2006
PM_{10}	24-hour	150 $\mu g/m^3$	NA	175 $\mu g/m^3$ (117%; NA)	Las Cruces, 2008
	Annual	50 $\mu g/m^3$ [h]	NA	25 $\mu g/m^3$ (50%; NA)	Las Cruces, 2008
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	NA	15.0 $\mu g/m^3$ (43%; NA)	Las Cruces, 2007
	Annual	15.0 $\mu g/m^3$	NA	6.6 $\mu g/m^3$ (44%; NA)	Las Cruces, 2006
Pb	Calendar quarter	1.5 $\mu g/m^3$	NA	0.03 $\mu g/m^3$ (2.0%; NA)	Albuquerque, Bernalillo County, 2004[j]
	Rolling 3-month	0.15 $\mu g/m^3$ [i]	NA	NA	NA

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

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

[c] First and second values in parentheses are background concentration levels as a percentage of NAAQS and SAAQS, respectively. 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.

[d] Effective August 23, 2010.

[e] NA = not applicable or not available.

[f] Effective April 12, 2010.

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

[h] Effective 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.

Footnotes continued on next page.

TABLE 12.1.13.1-2 (Cont.)

[i] Effective January 12, 2009.

[j] This location with the highest observed concentrations in the state of New Mexico is not representative of the Afton SEZ; it is presented to show that Pb is not generally a concern in New Mexico.

Sources: EPA (2010a,b); 20.2.3 NMAC.

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, use of solar facilities to generate electricity would displace air emissions that would otherwise be released from fossil fuel power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Afton 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 12.1.13.3 below identifies SEZ-specific design features of particular relevance to the Afton SEZ.

12.1.13.2.1 Construction

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

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[10] However, no receptors were modeled for PSD analysis at the nearest Class I area, Gila WA, because it is about 81 mi (131 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for AERMOD. Instead, several regularly spaced receptors in the direction of the Gila WA were selected as surrogates for the PSD analysis. For the Afton SEZ, the modeling was conducted based on the following assumptions and input:

- Emissions of 3,000 acres (12.1 km^2) each and 9,000 acres (36.4 km^2) in total, were uniformly distributed in the northeastern portion of the SEZ, close to the nearest residences and the towns of Mesilla and Las Cruces;

- Surface hourly meteorological data were taken from the Las Cruces International Airport and upper air sounding data from Santa Teresa for the 2005 to 2009 period; and

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

Results

The modeling results for concentration increments and total concentrations (modeled plus background concentrations) for both PM_{10} and $PM_{2.5}$ that would result from construction-related fugitive emissions are summarized in Table 12.1.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 611 $\mu g/m^3$, which far exceeds the relevant standard level of 150 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 786 $\mu g/m^3$ would also exceed the standard level at the SEZ boundary. In particular, PM_{10} concentrations are predicted to be about 250 $\mu g/m^3$ at the nearest residences, which are adjacent to the northeastern SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 100 $\mu g/m^3$ at Mesilla; about 50–60 $\mu g/m^3$ at Las Cruces, Picacho, University Park, and San Miguel; and about 40 $\mu g/m^3$ or less at other cities in the Mesilla Valley. Annual average modeled concentration increments and total concentrations (increment plus background) for PM_{10} at the SEZ boundary would be about 84.4 $\mu g/m^3$ and 109 $\mu g/m^3$, respectively, which are higher than the NAAQS level of 50 $\mu g/m^3$, which was revoked by the EPA in December 2006. Annual PM_{10} increments would be much lower, about 25 $\mu g/m^3$ at the nearest residences, about 3 $\mu g/m^3$ at Mesilla, and about 2 $\mu g/m^3$ or lower at all other nearby towns. Total 24-hour $PM_{2.5}$ concentrations would be 51.5 $\mu g/m^3$ at the SEZ boundary, which is higher than the NAAQS level of 35 $\mu g/m^3$; modeled

[10] 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.

TABLE 12.1.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Afton 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 hours	H6H	611	175	786	150	407	524
	Annual	–[d]	84.4	25.0	109	50	169	219
$PM_{2.5}$	24 hours	H8H	36.5	15.0	51.5	35	104	147
	Annual	–	8.4	6.6	15.0	15.0	56	100

[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 12.1.13.1-2.

[d] A dash indicates not applicable.

increments contribute more than twice the background concentration to this total. The total annual average $PM_{2.5}$ concentration would be 15.0 $\mu g/m^3$, which is equivalent to the NAAQS level of 15.0 $\mu g/m^3$. At the nearest residences, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about of about 15 and 2.5 $\mu g/m^3$, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—Gila WA—would be about 15.1 and 0.56 $\mu g/m^3$, or 189 and 14% of the PSD increments for the Class I area, respectively. These surrogate receptors are more than 51 mi (82 km) from the Gila WA, and thus predicted concentrations in Gila WA would be much lower than these values (about 79% of the PSD increments for 24-hour PM_{10}), based on 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 communities would be much 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 (Gila WA). Construction activities are not subject to the PSD program, and the comparison provides only a screen for gauging the magnitude of the impact.

TABLE 12.1.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Afton SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
77,623	6,900–12,420	12,088–21,759	10,848–19,527	26,992–48,585	0.40–0.71	12,030–21,653
Percentage of total emissions from electric power systems in New Mexico[d]			35–64%	35–64%	35–64%	35–64%
Percentage of total emissions from all source categories in New Mexico[e]			21–38%	8.1–15%	–[f]	19–33%
Percentage of total emissions from electric power systems in the six-state study area[d]			4.3–7.8%	7.3–13%	14–24%	4.6–8.3%
Percentage of total emissions from all source categories in the six-state study area[e]			2.3–4.1%	1.0–1.8%	–	1.4–2.6%

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

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

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 1.79, 4.47, 6.6×10^{-5}, and 1,990 lb/MWh, respectively, were used for the state of New Mexico.

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

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

[f] A dash indicates not estimated.

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

Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

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

Construction of a new transmission line has not been assessed for the Afton SEZ, because connection to the existing 345-kV line was assumed to be possible; impacts on air quality would be evaluated at the project-specific level if new transmission construction or line upgrades were to occur. In addition, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary.

12.1.13.2.2 Operations

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

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

Estimates of potential air emissions displaced by solar project development at the Afton SEZ are presented in Table 12.1.13.2-2. Total power generation capacity ranging from 6,900 to 12,420 MW is estimated for the Afton SEZ for various solar technologies (see Section 12.1.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). It is estimated that if the Afton SEZ were fully developed, emissions avoided would range from 35 to 64% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of New Mexico (EPA 2009c). Avoided emissions would be up to 24% 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 38% of SO_2, 15% of NO_x, and 33% of CO_2 emissions in the state of New Mexico (EPA 2009a; WRAP 2009). These emissions would be up to 4.1% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for more than 97% of the total electric power generated in New Mexico. The contribution of coal combustion is about 85%, followed by natural gas combustion of about 12%. Thus, solar facilities built in the Afton SEZ could displace relatively more fossil fuel emissions than those built in other states with less reliance on fossil fuel–generated power.

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

12.1.13.2.3 Decommissioning/Reclamation

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

12.1.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Afton 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.

This page intentionally left blank.

12.1.14 Visual Resources

12.1.14.1 Affected Environment

The proposed Afton SEZ is located in Dona Ana County in southern New Mexico. The southern border of the SEZ is 21 mi (34 km) north of the border with Mexico. The SEZ occupies 77,623 acres (314 km^2) and extends approximately 18 mi (29 km) east to west and almost 12 mi (19 km) north to south. The SEZ is within the Chihuahuan Desert physiographic province, typified by alternating mountains and valleys. Flat valley basins form broad, expanses of desert, generally with grassland and shrubland vegetative cover (EPA 2010c). Afton SEZ is located within the Chihuahuan Basins and Playas Level IV ecoregion, with very small portions near the far eastern boundary within the Rio Grande Floodplain ecoregion. The SEZ ranges in elevation from 4,418 ft (1,346 m) in the northwestern portion to 3,925 ft (1,196 m) in the southeastern portion.

The SEZ is located on West Mesa, immediately west of the Mesilla Valley and Rio Grande. I-10 runs east-west just north of the SEZ, with the Las Cruces Municipal Airport just beyond I-10 north of the SEZ. South and southwest of the SEZ, beyond a volcanic field that includes Aden Crater and Kilbourne Hole, lie the West Potrillo Mountains and the East Potrillo Mountains. North and northwest of the SEZ lie the Sierra de Las Uvas, and the Robledo Mountains, with the Dona Ana Mountains also north of the SEZ, but across the Mesilla Valley. These mountains include peaks generally between 4,500 and 5,000 ft (1,400 and 1,500 m) in elevation, but with some peaks of over 5,000 ft (1,500 m). From north to south, the mesa containing the proposed Afton SEZ extends more than 45 mi (72 km) and is about 18 mi (29 km) wide. The SEZ and surrounding areas are shown in Figure 12.1.14.1-1.

The SEZ is located within a flat, generally treeless mesa, with the strong horizon line and surrounding mountain ranges being the dominant visual features. The surrounding mountains are generally tan in color, but with distant mountains appearing blue to purple. Where vegetation is absent, tan-colored sand is evident, but some areas have sufficiently dense vegetation that the greens and olive-greens of scrubby mesquite and creosotebush are the prevailing colors.

Vegetation is generally sparse in much of the SEZ, with some low areas containing denser mesquite thickets. Vegetation within the SEZ is predominantly scrubland, with creosotebush, mesquite, and other low shrubs dominating the desert floor within the SEZ. During a July 2009 site visit, the vegetation presented a limited range of greens (mostly olive green of creosotebushes) with some browns and grays (from lower shrubs), with medium to coarse textures and generally low visual interest.

No permanent surface water is present within the SEZ.

Cultural disturbances visible within the SEZ include dirt and gravel roads, existing transmission towers, pipeline, and cleared ROWs. A cheese factory, electric power plant, natural gas peaker plant, mining activity at Little Black Mountain, and other developments are visible at the SEZ boundaries. These cultural modifications generally detract from the scenic quality of the

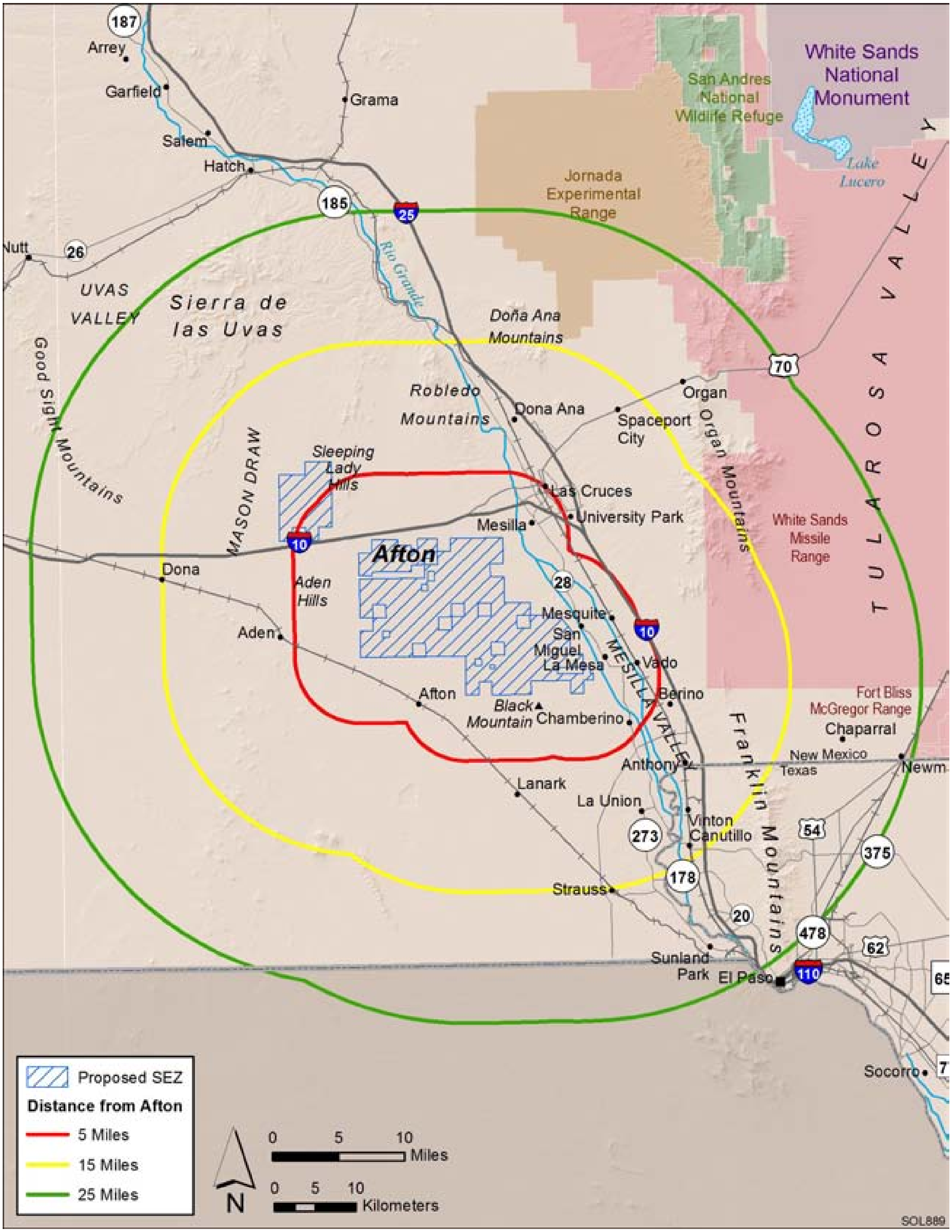

FIGURE 12.1.14.1-1 Proposed Afton SEZ and Surrounding Lands

SEZ, and some are visible from most locations in the SEZ. However, the SEZ is large enough that from some locations within the SEZ, these features are so distant as to have a relatively small effect on views.

The general lack of topographic relief, water, and physical variety results in relatively low scenic value within the SEZ itself; however, because of the flatness of the landscape, the lack of trees, and the breadth of the mesa, the SEZ presents a vast panoramic landscape with sweeping views of the surrounding mountains that add to the scenic values within the SEZ viewshed. In general, the mountains appear to be devoid of vegetation, and their varied and irregular forms, along with their brown to blue colors, provide pleasing visual contrasts to the strong horizontal line, green vegetation, and tan-colored sand of the mesa. Panoramic views of the SEZ are shown in Figures 12.1.14.1-2, 12.1.14.1-3, and 12.1.14.1-4.

The BLM conducted a visual resource inventory (VRI) for the SEZ and surrounding lands in 2010 (BLM 2010c). The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or key observation points (KOPs). Based on these three factors, BLM-administered lands are placed into one of four Visual Resource Inventory Classes, which represent the relative value of the visual resources. Classes I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI map for the SEZ and surrounding lands is shown in Figure 12.1.14.1-5. The VRI values for the SEZ and immediate surroundings are VRI Classes II, III and IV, indicating high, moderate, and low relative visual values, respectively. Most of the SEZ is VRI Class IV, but the far northern portion of the SEZ along the I-10 corridor is VRI Class III, and parts of the far eastern portion of the SEZ on the eastern slope of West Mesa are VRI Class II.

Except for the far eastern portion of the SEZ along the eastern slopes of West Mesa, the inventory indicates low scenic quality for the SEZ and its immediate surroundings, with low scores for landform, color, vegetation, scarcity, presence of water, and cultural modification, but a moderate score for adjacent scenery. The inventory noted that cultural disturbances visible in the SEZ area detracted from the scenic quality. The area along the West Mesa’s eastern slopes was rated as having moderate scenic quality because the variety of vegetation types and colors, as well as scenic mountain views.

Away from the I-10 corridor and eastern slopes of West Mesa, the inventory indicates low sensitivity for the SEZ and its immediate surroundings, and noted its use for ranching and OHV recreation. Contributing factors for the low sensitivity rating included a low level of use, and a low level of public interest. The inventory noted that the area is not known for its scenic quality, but also noted that its sensitivity is increased by the fact that portions of the SEZ are within 15 mi (24 km) of the El Camino Real de Tierra Adentro National Historic Trail and

FIGURE 12.1.14.1-2 Approximately 120° Panoramic View of the Proposed Afton SEZ from Location Near Northern SEZ Boundary Facing East toward Organ Mountains

FIGURE 12.1.14.1-3 Approximately 180° Panoramic View of the Proposed Afton SEZ from Little Mountain Facing West, with Mt. Riley and West Potrillo Mountains at Left, Florida Mountains at Center, and Sleeping Lady Hills and Las Uvas Mountains at Far Right

FIGURE 12.1.14.1-4 Approximately 120° Panoramic View of the Proposed Afton SEZ from West Central Portion of SEZ Facing Southeast, with Organ Mountains at Left

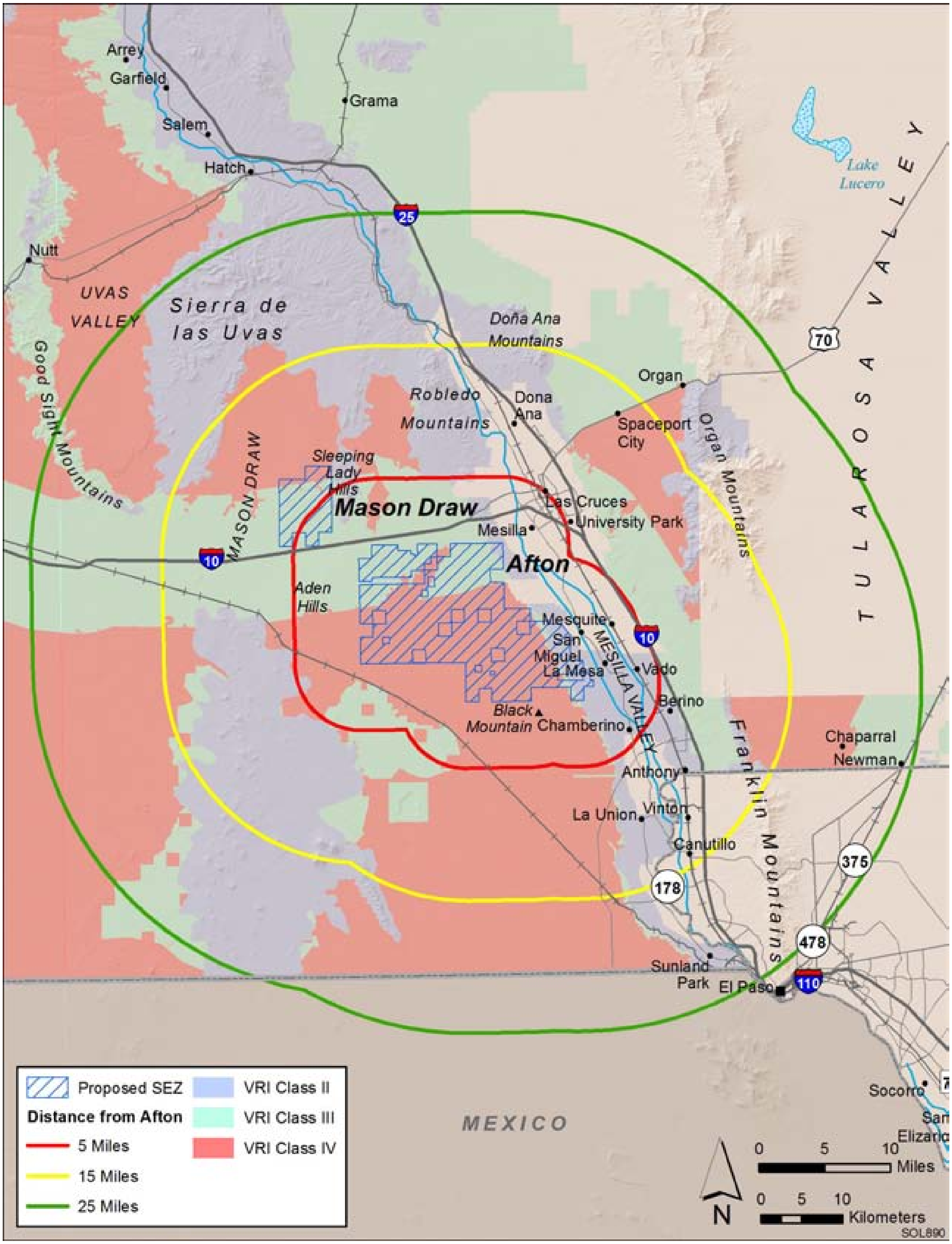

FIGURE 12.1.14.1-5 Visual Resource Inventory Values for the Proposed Afton SEZ and Surrounding Lands

within 5 mi (8 km) of the Aden Lava Flow WSA. The inventory noted the high sensitivity of the I-10 corridor, citing the "relatively intact views" of "classic New Mexico landscapes" as well as the high usage of this major travel corridor for tourists and residents. The far eastern portion of the SEZ along the eastern slopes of West Mesa received a high sensitivity rating because it is in the immediate viewshed of the El Camino Real Scenic Byway, a heavily traveled scenic route with high levels of public interest.

Lands in the Las Cruces FO within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain (197,213 acres [798.093 km^2]) of VRI Class II areas, primarily southwest of the SEZ in the West Potrillo Mountains, north of the SEZ in the Sierra de Las Uvas and Robledos Mountains, and immediately east of the SEZ on the eastern slopes of the West Mesa; (330,742 acres [1,338.47 km^2]) of Class III areas, primarily southwest of the SEZ in the Aden Lava Flow area, and north of the SEZ along the I-10 corridor; and (472,462 acres [1,911.99 km^2]) of VRI Class IV areas, concentrated primarily in the immediate vicinity of the SEZ and to the south of the SEZ.

More information about VRI methodology is available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The Mimbres Resource Management Plan and Final EIS (BLM 1993) indicates that the SEZ is managed as visual resource management (VRM) Class III. VRM Class III objectives include partial retention of landscape character and permit moderate modification of the existing character of the landscape. The VRM map for the SEZ and surrounding lands is shown in Figure 12.1.14.1.2-6. More information about the BLM VRM program is available in Section 5.12 and in *Visual Resource Management,* BLM Manual Handbook 8400 (BLM 1984).

12.1.14.2 Impacts

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

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

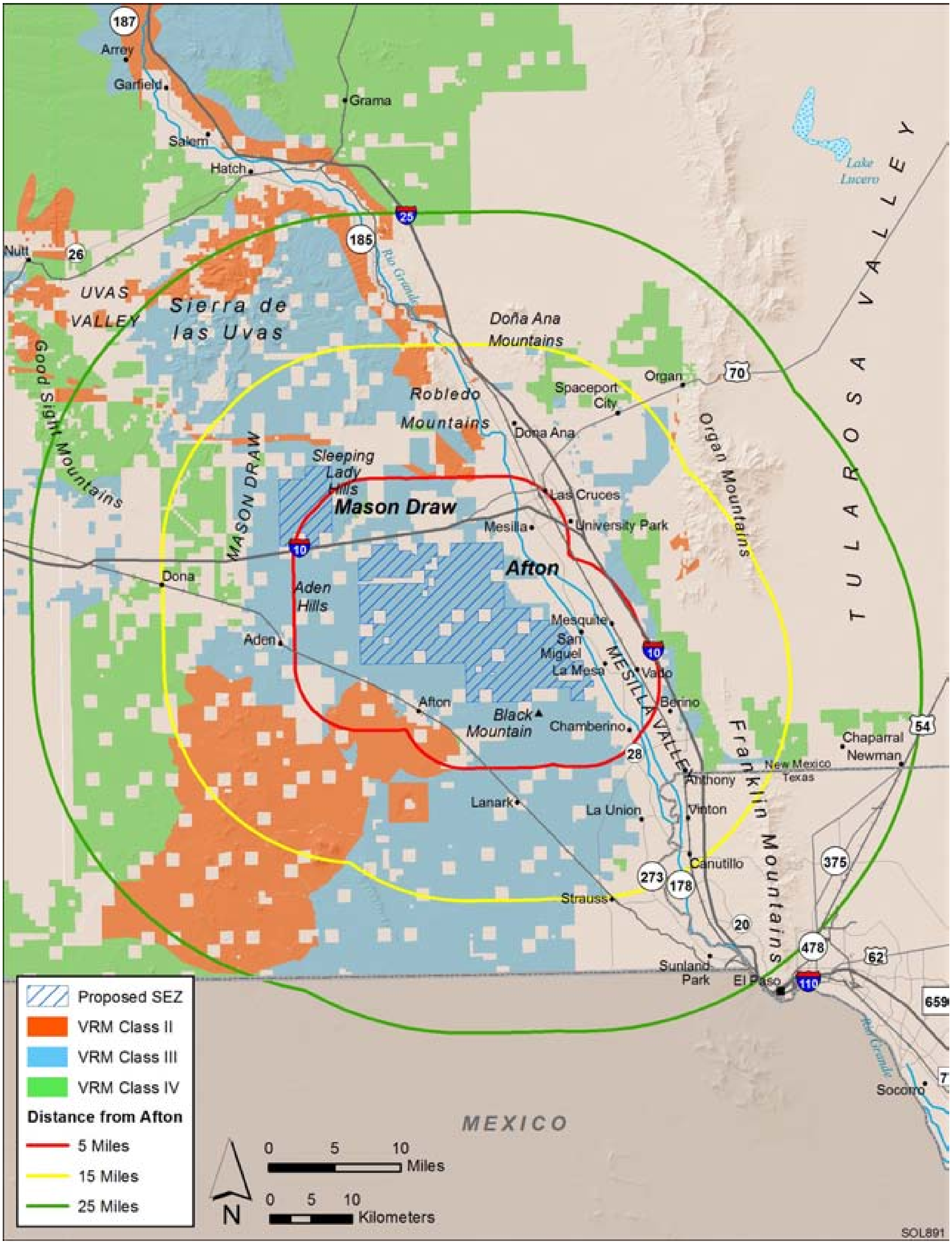

FIGURE 12.1.14.1-6 Visual Resource Management Classes for the Proposed Afton SEZ and Surrounding Lands

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

12.1.14.2.1 Impacts on the Proposed Afton SEZ

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

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 12.1.22.4.13.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as seen from nearby KOPs. As noted above, and shown in

Figure 12.1.14.1-6, the SEZ is currently managed as VRM Class III. 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, but would be important in reducing visual contrasts to the greatest extent possible.

12.1.14.2.2 Impacts on Lands Surrounding the Proposed Afton SEZ

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

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

Figure 12.1.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power

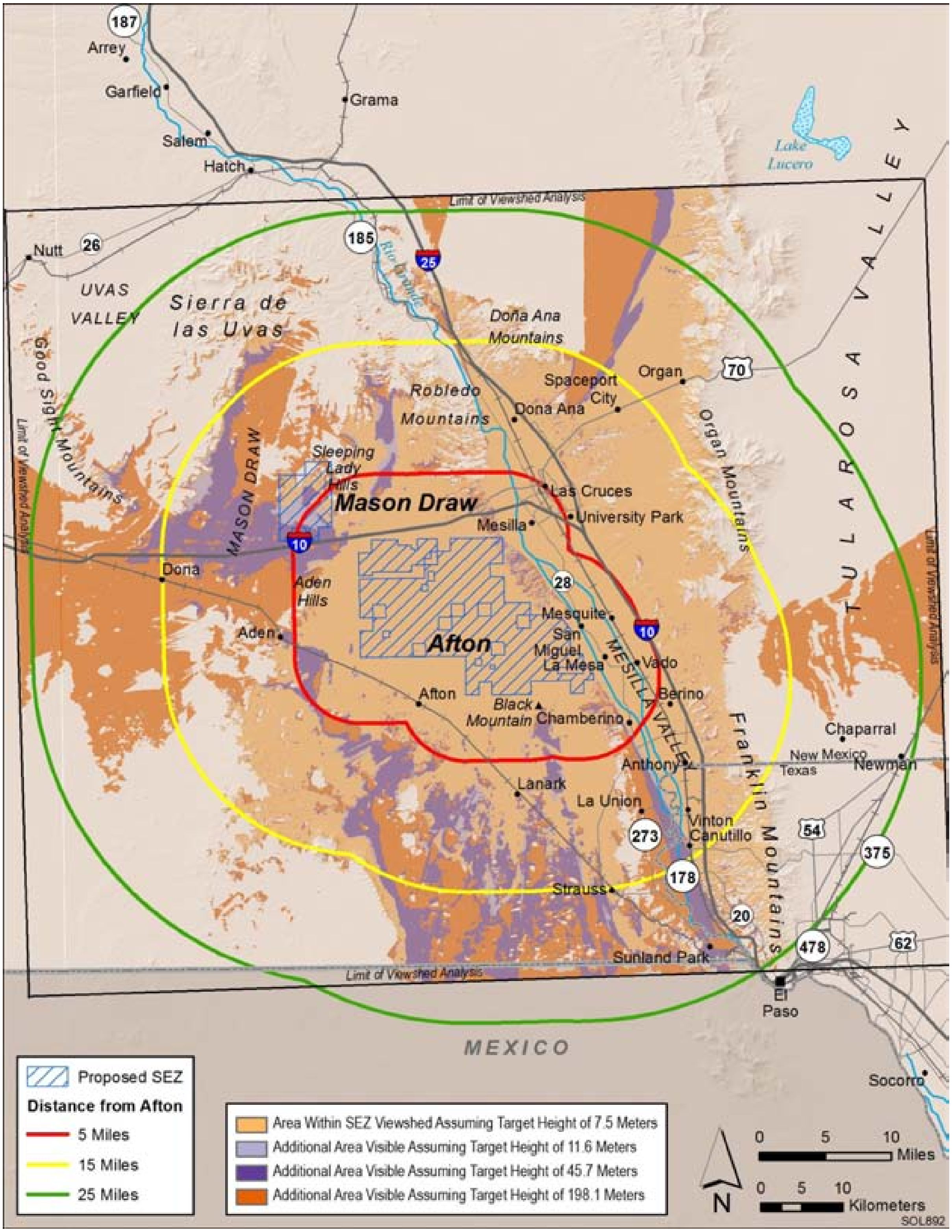

FIGURE 12.1.14.2-1 Viewshed Analyses for the Proposed Afton SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers would 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.

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

Figure 12.1.14.2-2 shows the results of a geographical information system (GIS) analysis that overlays selected federal, state, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds to illustrate which of these sensitive visual resource areas would have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground-midground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analyses were as follows:

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

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

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

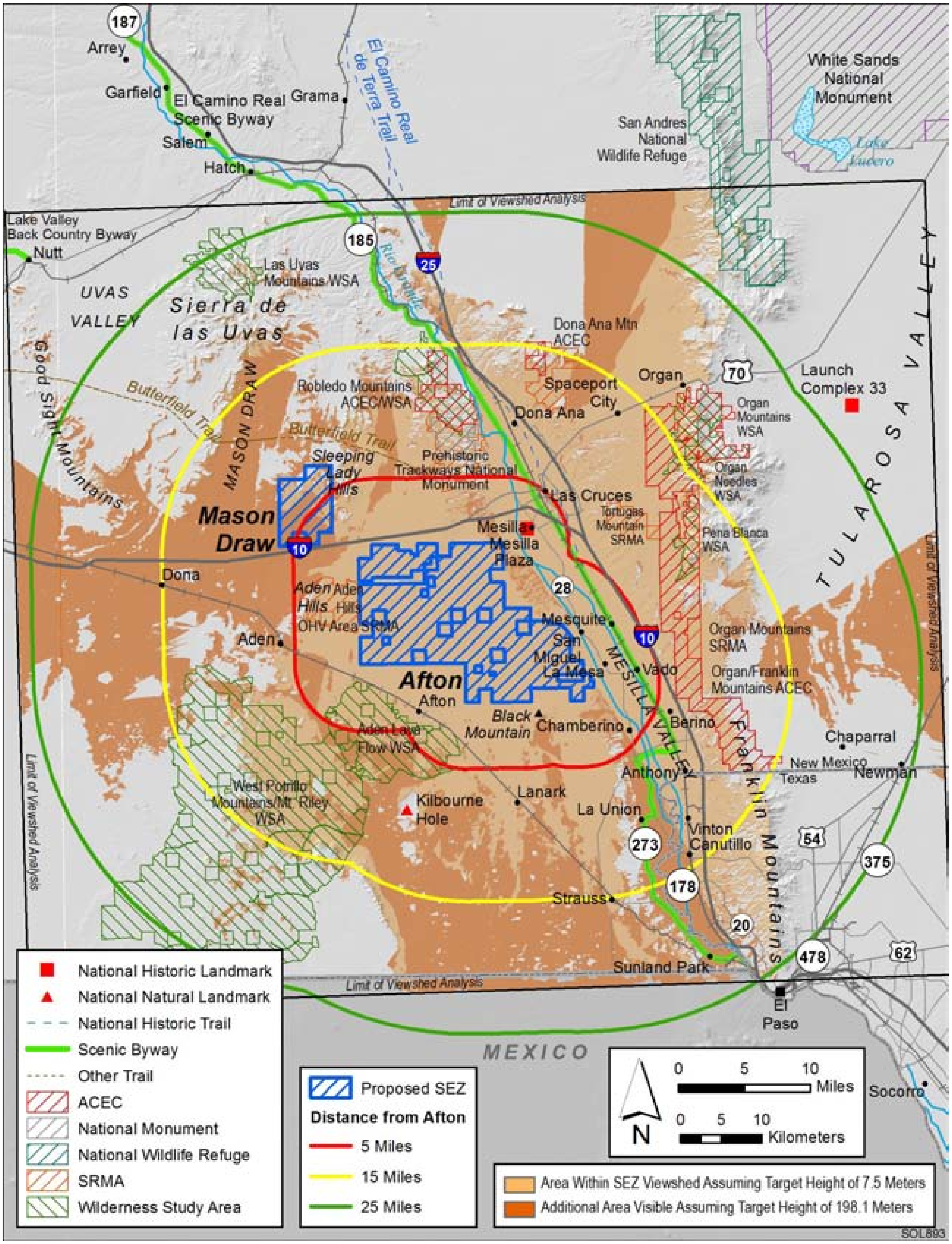

FIGURE 12.1.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Afton SEZ

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Afton SEZ are discussed below. The results of this analysis are also summarized in Table 12.1.14.2-1. Further discussion of impacts on these areas is available in Section 12.1.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and Section 12.1.17 (Cultural Resources).

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

National Monument

- *Prehistoric Trackways National Monument.* The Prehistoric Trackways National Monument covers about 5,255 acres (21.27 km^2) and is 6.2 mi

GOOGLE EARTH™ VISUALIZATIONS

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

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

TABLE 12.1.14.2-1 Selected Potentially Affected Sensitive Visual Resources within 25-mi (40-km) Viewshed of the Proposed Afton SEZ, Assuming a Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[b]		
			Visible between	
Feature Type	Feature Name (Total Acreage/Highway Length[a])	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Monument	Prehistoric Trackways (5,255 acres)	0 acres	3,007 acres (57%)	0 acres
WSAs	Aden Lava Flow (25,978 acres [a])	12,987 acres (50%)	12,581 acres (48%)	2 acres (0.008%)
	Las Uvas Mountains (11,084 acres)	0 acres	0 acres	903 acres (8%)
	Organ Mountains (7,186 acres)	0 acres	185 acres (3%)	3,676 acres (51%)
	Organ Needles (5,936 acres)	0 acres	546 acres 9%	1,803 acres (30%)
	Pena Blanca (4,648 acres)	0 acres	3,734 acres (80%)	4 acres (0.09%)
	Robledo Mountains (13,049 acres)	0 acres	2,617 acres (20%)	5 acres (0.04%)
	West Potrillo Mountains/Mt. Riley (159,323 acres)	0 acres	46,922 acres (30%)	6,029 acres (4%)
SRMAs	Aden Hills OHV Area (8,054 acres)	7,681 acres (95%)	0 acres	0 acres
	Dona Ana Mountain SRMA (8,345 acres)	0 acres	5,226 acres (63%)	154 acres (2%)
	Organ/Franklin Mountains RMZ (60,793 acres)	0 acres	35,708 acres (59%)	7,611 acres (13%)
ACECs designated for outstanding scenic values	Dona Ana Mountains (1,427 acres)	0 acres	747 acres (52%)	0 acres
	Organ Mountains/Franklin Mountains (58,512 acres)	0 acres	33,503 acres (57%)	7,598 acres (13%)
	Robledo Mountains (8,659 acres)	0 acres	1,976 acres (23%)	0 acres

TABLE 12.1.14.2-1 (Cont.)

Feature Type	Feature Name (Total Acreage/Highway Length[a])	Feature Area or Linear Distance[b] Visible within 5 mi	Visible between 5 and 15 mi	15 and 25 mi
National Historic Landmark	Mesilla Plaza	Yes		
National Historic Trail	El Camino Real de Tierra Adentro	12.6 mi	24.7 mi	4.6 mi (within U.S.)
National Natural Landmark	Kilbourne Hole		Yes	
Scenic Byway	El Camino Real	14.9 mi	27.7 mi	9.8 mi

a To convert acres to km², multiply by 0.004047. To convert miles to km, multiply by 1.609.

b Percentage of total feature acreage or road length.

(10.0 km) away at the point of closest approach north of the SEZ. The monument was established in 2009 to conserve, protect, and enhance the unique and nationally important paleontological, scientific, educational, scenic, and recreational resources and values of the Robledo Mountains. It is located at an elevation of about 4,500 feet (1,372 m) and overlaps with the southern portion of the Robledo Mountains ACEC/WSA.

Within 25 mi (40 km), solar energy facilities within the SEZ could be visible from peaks, ridgelines, and portions of the south- and southwest-facing slopes within the national monument. Visible areas of the national monument within the 25-mi (40-km) radius of analysis total about 3,007 acres (12.17 km^2) in the 650-ft (198.1-m) viewshed, or 57% of the total national monument acreage, and 2,421 acres (9.797 km^2) in the 24.6-ft (7.5-m) viewshed, or 46% of the total national monument acreage. The visible area of the national monument extends to about 9.6 mi (15.5 km) from the point of closest approach at the northern boundary of the SEZ.

Figure 12.1.14.2-3 is a Google Earth visualization of the SEZ as seen from the end of an unpaved road atop a hill in the north-central portion of the national monument. The viewpoint is 8.4 mi (13.5 km) from the SEZ and elevated about 670 ft (204 m) above the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aid for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (140-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing about 100 MW of electric generating capacity. Three groups of

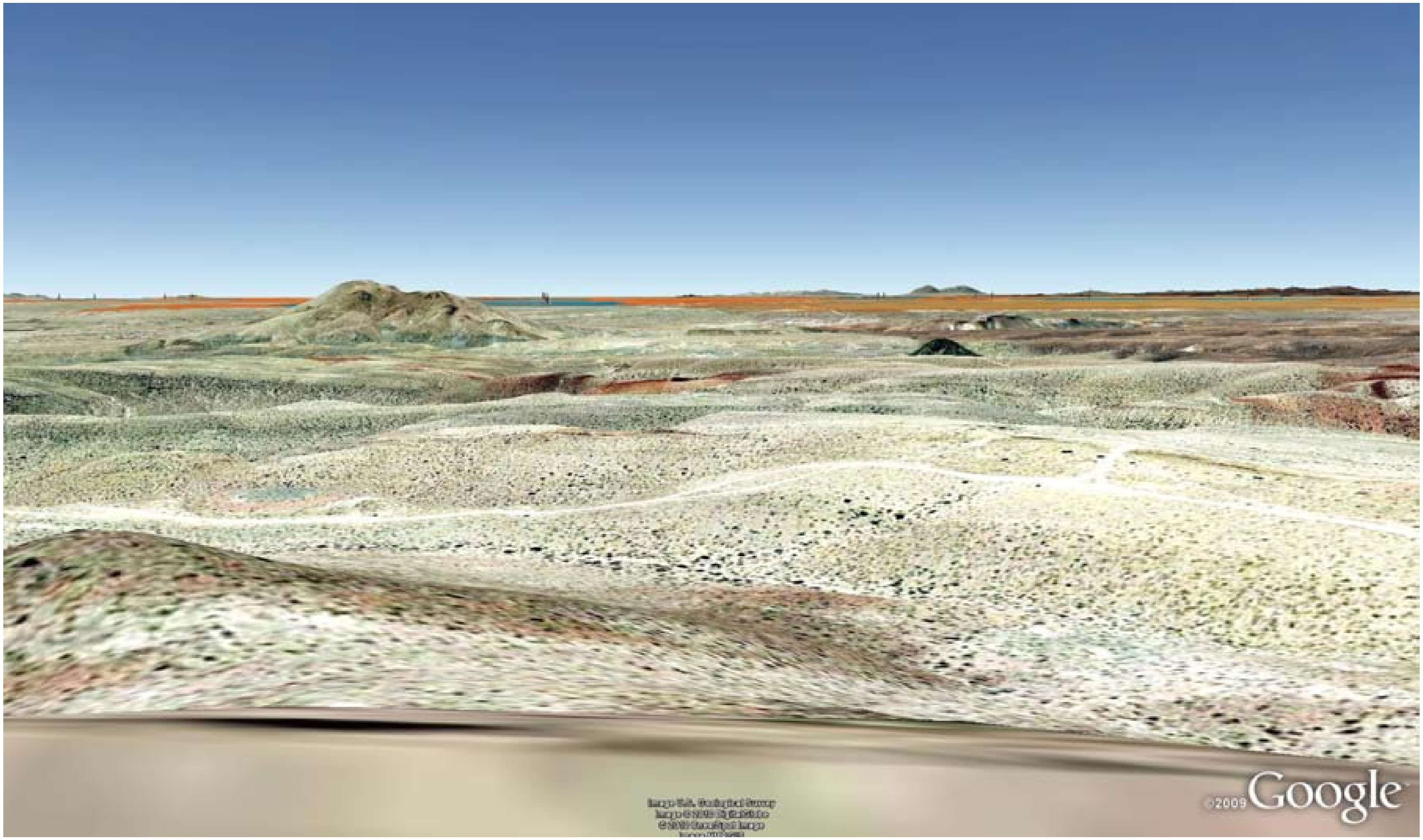

FIGURE 12.1.14.2-3 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint in the North Central Portion of Prehistoric Trackways National Monument

four models and three groups of two models were placed in the SEZ for this and other visualizations shown in this section of the PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The visualization suggests that from this viewpoint, the SEZ would stretch across most of the horizontal field of view. Picacho Mountain would screen views of a small portion of the eastern part of the SEZ. The vertical angle of view would be very low, reducing visual contrast somewhat. Solar facilities in the SEZ would be seen in a narrow band just under the southern horizon. The southern boundary of the SEZ is more than 20 mi (32 km) from the viewpoint. The collector/reflector arrays of solar facilities in most parts of the SEZ would be seen edge-on, which would greatly reduce their apparent size, conceal their strong regular geometry, and repeat the line of the horizon, thus reducing visual contrasts with the surrounding strongly horizontal landscape. However, in the closest portions of the SEZ, the tops of the arrays could be visible, and because the facilities would also be closer, they could cause substantially stronger visual contrasts.

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

Operating power towers in the southern portions of the SEZ would likely be visible as distant points of light against the backdrop of the sky, but operating power towers in the closest portions of the SEZ could be bright enough to attract visual attention. Tower structures in the closest portions of the SEZ could be visible to casual viewers. If more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location at night. Other lighting associated with solar facilities could be visible as well.

While the viewing angle is low, because solar facilities within the SEZ would stretch across nearly the full field of view (under the 80% development scenario analyzed in the PEIS), solar facilities within the SEZ would be expected to cause strong visual contrast levels as seen from this viewpoint.

Figure 12.1.14.2-4 is a Google Earth visualization of the SEZ as seen from a jeep trail on a high ridge in the northwest portion of the NM. The viewpoint is 8.8 mi (14.2 km) from the SEZ, and elevated about 750 ft (230 m) above the SEZ.

The visualization suggests that contrast levels would be similar to those observed from the view shown in Figure 12.1.14.2-3 above. From this viewpoint, the SEZ would stretch across most of the horizontal field of view.

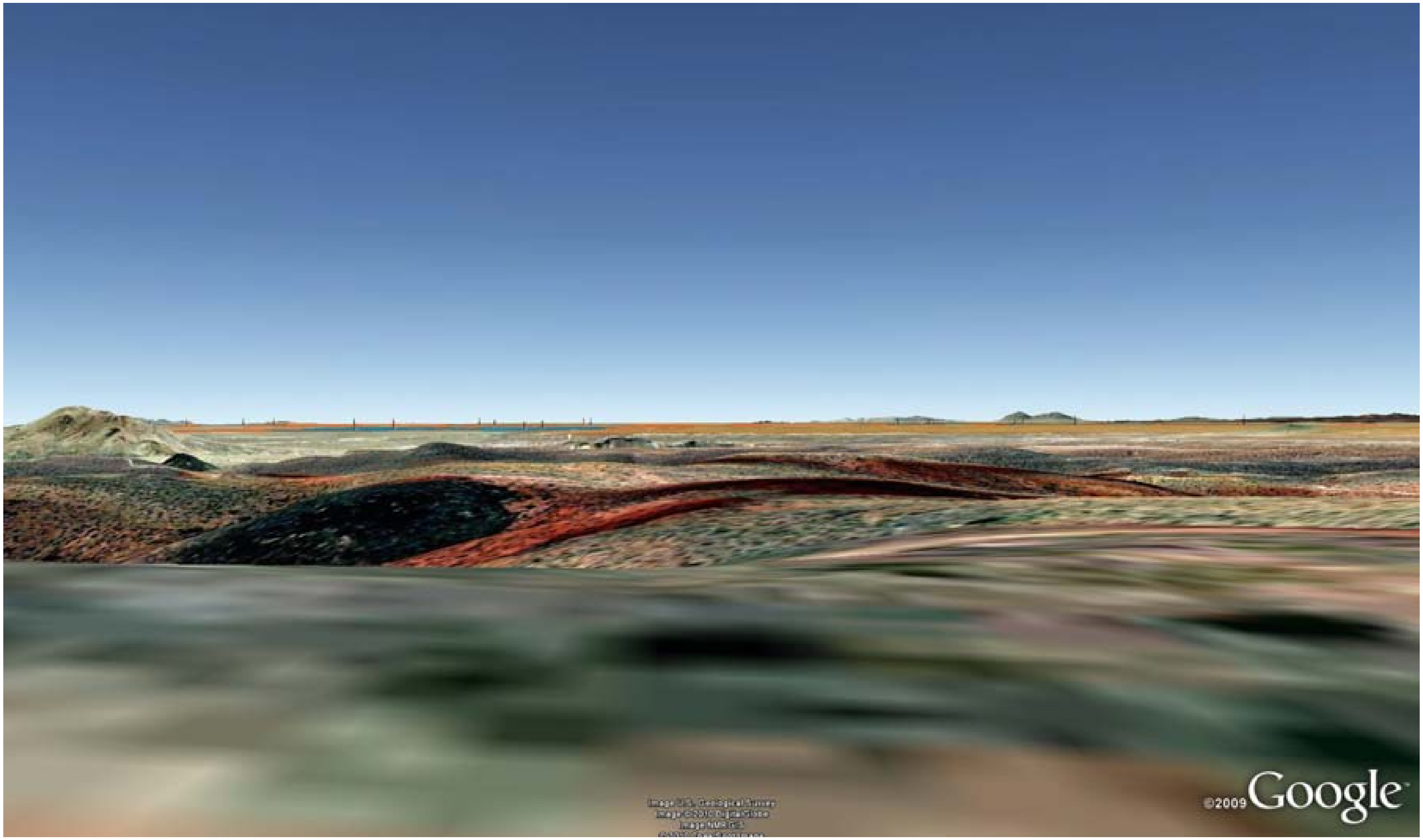

FIGURE 12.1.14.2-4 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint in the North Central Portion of Prehistoric Trackways National Monument

Picacho Mountain would screen views of a small portion of the far eastern part of the SEZ. The vertical angle of view would be very low, reducing visual contrast somewhat. Solar facilities in the SEZ would be seen in a very narrow band just under the southern horizon. The collector/reflector arrays of solar facilities in most parts of the SEZ would be seen edge-on, which would greatly reduce their apparent size, conceal their strong regular geometry, and repeat the line of the horizon, thus reducing visual contrasts with the surrounding strongly horizontal landscape. Operating power towers in the southern portions of the SEZ would likely be visible as distant points of light against the backdrop of the sky, but operating power towers in the closest portions of the SEZ could be bright enough to attract visual attention, and could be conspicuous at night if tall enough to require hazard warning lighting. Tower structures in the closest portions of the SEZ could be visible to casual viewers. While the viewing angle is low, because solar facilities within the SEZ would stretch across nearly the full field of view (under the 80% development scenario analyzed in the PEIS), solar facilities within the SEZ would be expected to cause strong visual contrast levels as seen from this viewpoint.

Figure 12.1.14.2-5 is a Google Earth visualization of the SEZ as seen from the same jeep trail discussed above, but on a somewhat lower ridge in the southwestern portion of the national monument. The viewpoint is 7.5 mi (12.1 km) from the SEZ and elevated about 440 ft (130 m) above the SEZ.

The visualization suggests that from this distance and orientation to the SEZ, the SEZ would nearly fill the horizontal field of view. Contrast levels would be generally similar to those observed from the other viewpoints in the national monument discussed above; however, the viewpoint is closer to the SEZ, so that it would appear slightly larger than it would from the other viewpoints, but the vertical angle of view would be slightly lower, reducing visual contrast this viewpoint, and compensating somewhat for the closer distance.

Solar facilities in the SEZ would be seen in a very narrow band just under the southern horizon. The collector/reflector arrays of solar facilities in most parts of the SEZ would be seen edge-on, which would greatly reduce their apparent size, conceal their strong regular geometry, and repeat the line of the horizon, thus reducing visual contrasts with the surrounding strongly horizontal landscape. Operating power towers in the southern portions of the SEZ would likely be visible as distant points of light against the backdrop of the sky, but operating power towers in the closest portions of the SEZ could be bright enough to attract visual attention. Tower structures in the closest portions of the SEZ could be visible to casual viewers. If more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location at night. Other lighting associated with solar facilities could be visible as well. While the viewing angle is low, because

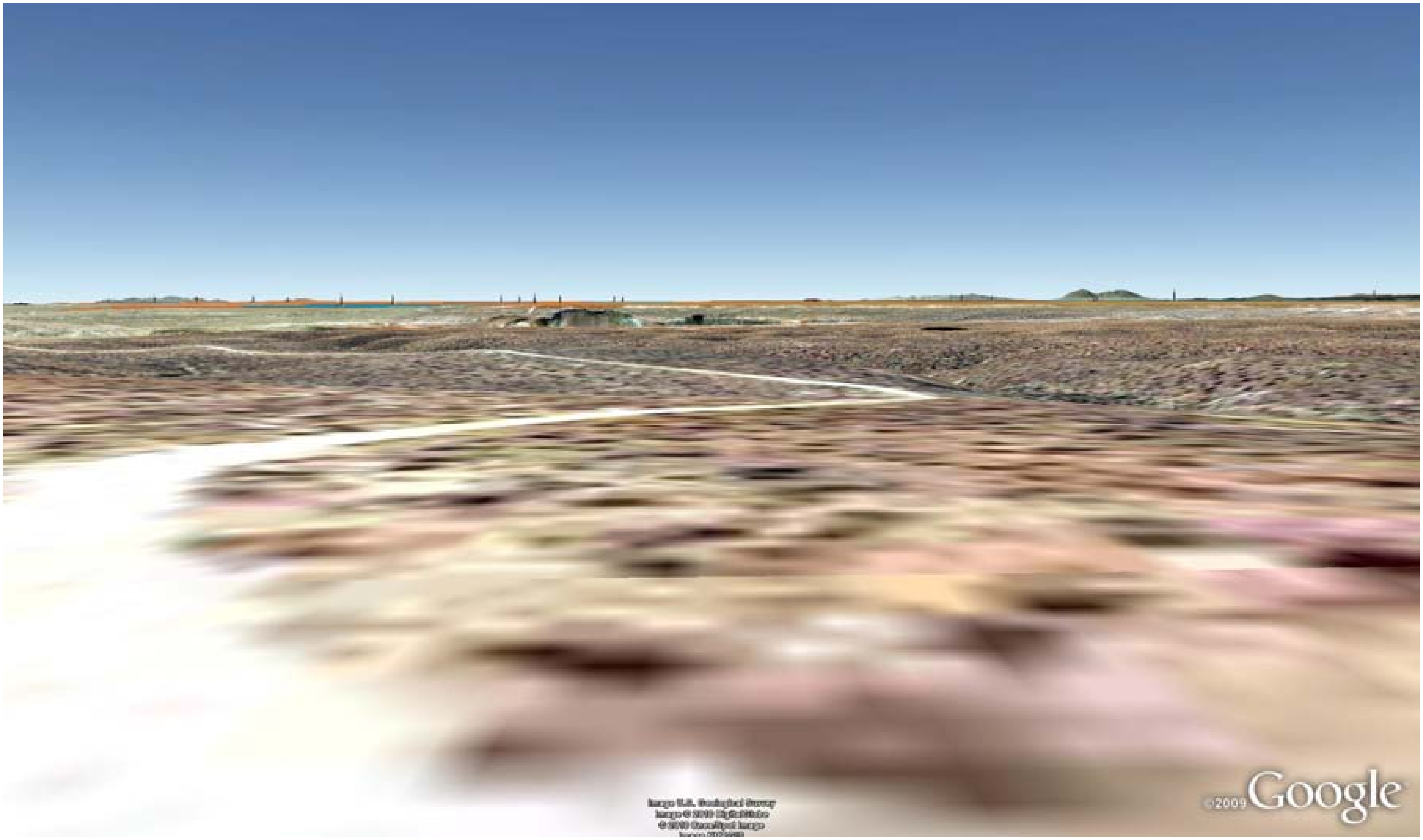

FIGURE 12.1.14.2-5 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint in the Southern Portion of Prehistoric Trackways National Monument

solar facilities within the SEZ would stretch across nearly the full field of view (under the 80% development scenario analyzed in the PEIS), solar facilities within the SEZ would be expected to cause strong visual contrast levels as seen from this viewpoint.

In summary, visual contrasts associated with solar facilities within the SEZ would depend on viewer location in the national monument, the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors. Most of the higher-elevation viewpoints in the national monument would have slightly elevated and generally open views of solar developments in the SEZ. Although viewing angles are low, because of the moderate distance to the SEZ and the SEZ's large size, it would occupy almost the entire horizontal field of view from many locations within the national monument. For most higher-elevation viewpoints this would likely result in strong visual contrast levels from solar facilities within the SEZ under the 80% development scenario analyzed in the PEIS. Lower elevation views from the national monument may be partially screened by landforms, and partial visibility of the SEZ combined lower viewing angles would result in lower levels of visual contrast at most viewpoints.

Wilderness Study Areas

- *Aden Lava Flow.* Aden Lava Flow is a 25,978-acre (105.13-km^2) wilderness study area (WSA) 1.4 mi (2.3 km) south of the SEZ. According to the Mimbres RMP, the area has significant scenic and geologic values as well as interesting wildlife and wildlife features (BLM 1993).

  Within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from most of the WSA (about 25,570 acres [103.48 km^2] in the 650-ft [198.1-m] viewshed, or 98% of the total WSA acreage, and 16,027 acres [64.859 km^2] in the 25-ft [7.5-m] viewshed, or 62% of the total WSA acreage). The visible area of the WSA extends from the point of closest approach to 8.9 mi (14.3 km) from the southern boundary of the SEZ.

  Solar facilities within the SEZ could be visible from almost the entire Aden Lava Flow WSA, although from some portions of the WSA, facility visibility would be limited to taller solar facilities because of screening by intervening topography. Both the WSA and the SEZ are very flat, and at similar elevations, so that there are open but low-angle views from the WSA to the SEZ. Because of the close proximity of the WSA to the SEZ, the SEZ would generally be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ.

Figure 12.1.14.2-6 is a Google Earth visualization of the SEZ as seen from a point in the far northwestern portion of the WSA, about 1.9 mi (3.1 km) south of the SEZ, and near the point of closest approach of the WSA to the SEZ.

As shown in the visualization, because the viewpoint and the SEZ are at essentially the same elevation, the vertical angle of view is extremely low. Collector/reflector arrays for solar facilities within the SEZ would be seen edge-on, which would reduce their apparent size, conceal the arrays' strong regular geometry, and would also cause them to appear to repeat the strong line of the horizon, tending to reduce visual contrast. However, ancillary facilities, such as buildings, cooling towers, transmission towers, and other structures, as well as any plumes would likely be plainly visible, and their forms, lines, and movement (for plumes) projecting above the strong horizontal line of the collector/reflector arrays could attract visual attention, particularly if located in the closest portions of the SEZ.

Operating power tower receivers within the closest portions of the SEZ would likely appear as brilliant, non-point (i.e. having visible cylindrical or rectangular surfaces) light sources atop plainly visible tower structures, projecting over the tops of the mountains north and east of the SEZ, and they could strongly attract visual attention. Power tower receivers in the more distant northern and northeastern portions of the SEZ would have substantially lower levels of impact. If sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that could be visually conspicuous in the area's typically dark night sky conditions, although other lights would likely be visible in surrounding areas. Other lighting associated with solar facilities would likely be visible as well.

Under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, with 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 greatly with the surrounding generally natural-appearing landscape. Under the PEIS development scenario, solar facilities within the SEZ could dominate the view from this location and would be expected to create strong visual contrasts as viewed from this location within the WSA.

Figure 12.1.14.2-7 is a Google Earth visualization of the SEZ as seen from near the peak of a volcanic cone in the southeastern portion of the WSA, about 5.5 mi (8.8 km) south of the SEZ. The closest power tower in the visualization is about 8.8 mi (14.2 km) from the viewpoint.

The viewpoint in the visualization is about 230 ft (70 m) higher in elevation than the nearest portion of the SEZ, but at about 5.5 mi (8.8 km) from the

FIGURE 12.1.14.2-6 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint in Northwestern Portion of Aden Lava Flow WSA

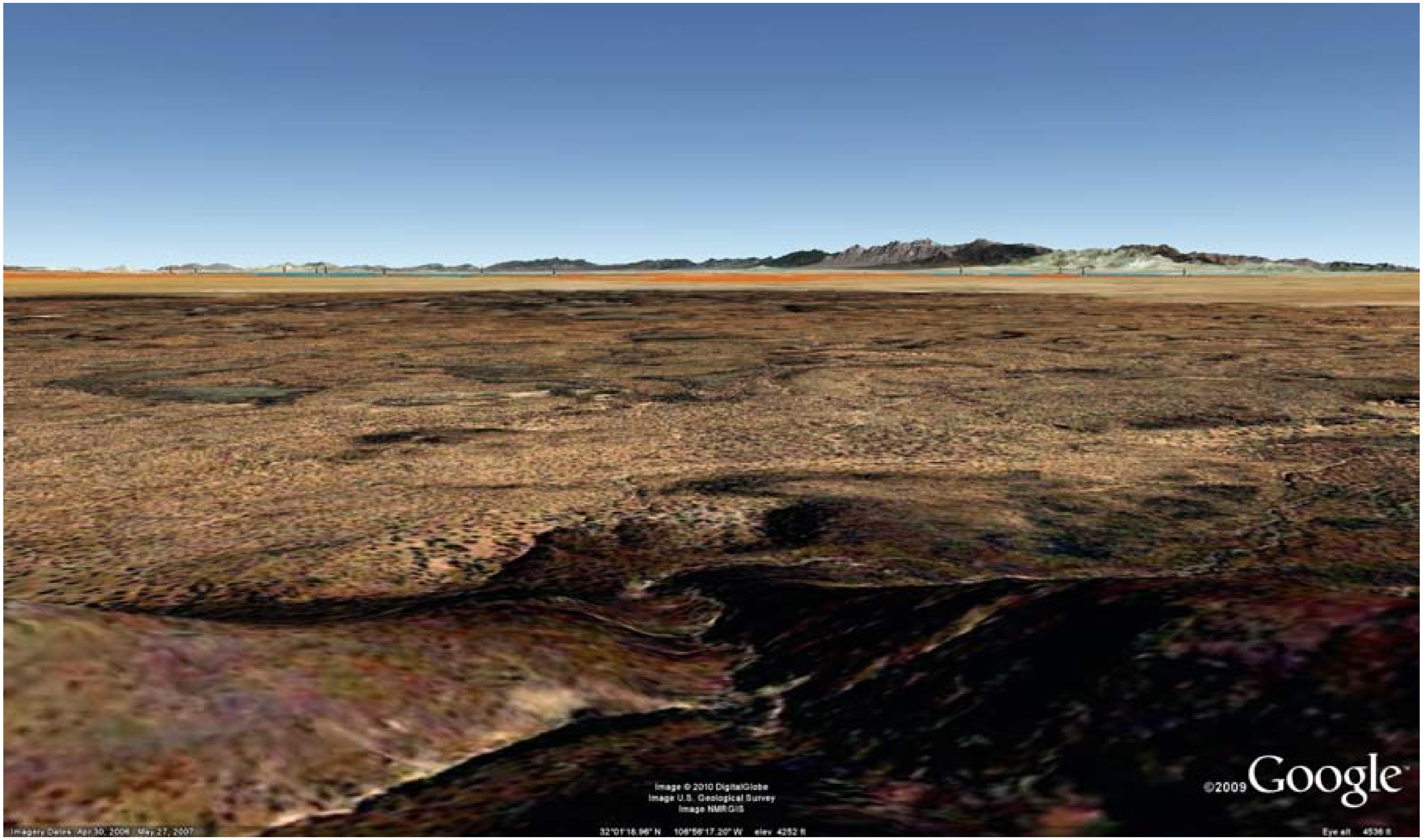

FIGURE 12.1.14.2-7 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint in Southeastern Portion of Aden Lava Flow WSA

SEZ, the vertical angle of view is still very low. Collector/reflector arrays for solar facilities within the SEZ would be seen edge-on, reducing their apparent size, conceal the arrays' strong regular geometry, and causing them to appear to repeat the strong line of the horizon, tending to reduce visual contrast.

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

Operating power tower receivers within the closest portions of the SEZ would likely appear as very bright, non-point light sources atop visible tower structures, against the backdrop of the mountains north and east of the SEZ or onto a sky backdrop. Power tower receivers in the more distant northern portions of the SEZ would have lower levels of impact. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that would likely be visible, but there could be other lights visible in the SEZ area. Other lighting associated with solar facilities could be visible as well.

This viewpoint is farther from the SEZ than that shown in Figure 12.1.14.2-6. However, since the SEZ would occupy so much of the horizontal field of view, strong visual contrasts from solar energy development within the SEZ would be expected at this viewpoint under favorable viewing conditions. The actual level of contrast would depend on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors.

From some viewpoints in the WSA, generally within the southeastern portion or on the southwest sides of the hills within the WSA, topographic screening would limit visibility of solar facilities within the SEZ to the upper portions of transmission towers, power towers, and other tall facility components. These viewpoints would be subject to lower levels of visual contrast, generally in the weak to moderate range, than locations with more open views of the SEZ.

In summary, the WSA is very close to the proposed SEZ. Because the WSA and SEZ are very flat, there is generally little screening by topography between the WSA and SEZ, so that locations within the WSA would have open views of the SEZ. Although the vertical angle of view is low, the SEZ is so large that viewed from the nearby WSA, it would stretch across much of the horizon, resulting in strong visual contrast for most locations within the WSA.

- *Las Uvas Mountains.* The Las Uvas Mountains WSA is an 11,084-acre (44.855-km^2) WSA located 20.7 mi (33.3 km) northwest of the SEZ. Within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the southeastern portions of the WSA (about 903 acres [3.7 km^2] in the 650-ft [198.1-m] viewshed, or 8% of the total WA acreage, and 642 acres [2.60 km^2] in the 25-ft [7.5-m] viewshed, or 6% of the total WA acreage). The visible area of the WSA extends to 24 mi (39 km) from the northwestern boundary of the SEZ.

  Limited portions of the SEZ are visible from scattered high-elevation areas within the southeastern portion of Las Uvas Mountains WA near Chivatos and Road Canyons. Mountains southeast of the SEZ screen most of the SEZ from view at these viewpoints. With the extensive screening, and at distances beyond 20 mi (32 km) from the SEZ, low-height solar facilities within the SEZ would likely be inconspicuous, but unscreened operating power towers could be visible as distant points of light against a backdrop of sky or the very distant Organ Mountains. At night, if the towers were sufficiently tall, they would have red flashing lights or white or red flashing strobe lights that would likely be visible, but there could be other lights visible in the SEZ area. Under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would be expected to create weak levels of visual contrast as seen from viewpoints within the Las Uvas Mountains WSA.

- *Organ Mountains.* Organ Mountains is a 7,186-acre (29.08-km^2) WSA located 15 mi (24 km) northeast of the SEZ at the point of closest approach. The Organ Mountains are renowned for their many scenic attractions, including steep-sided crevices, canyons, spires, and a number of perennial springs. During the summer, the hills are carpeted with bright green grasses. The many recreational opportunities in the Organ Mountains include hiking, backpacking, horseback riding, and wildlife observation. The Organ Mountains area also is an internationally famous destination for rock climbing. Visitation is heavy, particularly in fall and spring.

  Within 25 mi (40 km), solar energy facilities within the SEZ could be visible from portions of the western and southern slopes of the mountains within the WSA. Visible areas of the WSA within the 25-mi (40-km) radius of analysis total about 3,861 acres (15.63 km^2) in the 650-ft (198.1-m) viewshed, or 54% of the total WSA acreage, and 3,842 acres (15.55 km^2) in the 24.6-ft (7.5-m) viewshed, or 54% of the total WSA acreage. The visible area of the WSA extends to about 18 mi (30 km) from the point of closest approach at the northeast boundary of the SEZ.

  Except for the lowest elevations on the western bajadas of the Organ Mountains, viewpoints within the WSA on the west- and southwest-facing slopes of the Organ Mountains would have elevated and unobstructed views of the SEZ. Solar facilities within the SEZ would be plainly visible across Las

Cruces and surrounding communities in the Mesilla Valley. It should be noted that the Mesilla Valley is an urbanized and visually cluttered landscape that would be prominent in views of the SEZ from the WSA, both during the day and at night.

Figure 12.1.14.2-8 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the upper slopes of Baylor Peak in the northern portion of the WSA, about 17.8 mi (28.6 km) from the northeast corner of the SEZ. The viewpoint is elevated about 3,500 ft (1,070 m) with respect to the SEZ.

The visualization shows that despite the nearly 18-mi (29-km) distance to the SEZ from this viewpoint, the SEZ fills most of the horizontal field of view. However, the vertical angle of view is relatively low, and solar facilities within the SEZ would appear in a narrow band on the plateau beyond the Mesilla Valley to the southwest.

The collector/reflector arrays of solar facilities within the SEZ would be seen nearly edge-on, which would reduce their apparent size, and they would repeat the line of the horizon in the strongly horizontal landscape, which would tend to reduce visual contrasts from the arrays. Taller solar facility components such as transmission towers would likely be visible if located in he closer portions of the SEZ, but they would not be expected to be prominent. Operating power towers in the SEZ would likely be visible as points of light against the backdrop of West Mesa, but at 18+ mi (29+ km), the tower structures might not be visible. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that would likely be visible, but they would be seen across the brightly lit skies over the urbanized Mesilla Valley. Depending on solar facility location within the SEZ, the types of solar facilities and their designs, and other visibility factors, moderate to strong visual contrasts from solar energy development within the SEZ would be expected at this location.

Figure 12.1.14.2-9 is a Google Earth visualization of the SEZ as seen from the far western border of the WSA just east of Baylor Canyon Road, and at a much lower elevation than Baylor Peak. The viewpoint is 15 mi (24 km) from the SEZ, and elevated about 750 ft (230 m) above the SEZ.

The visualization suggests that from this viewpoint, topographic screening of the viewpoint by the bajada slope south would screen much of the southern portion of the SEZ from view. At 15 mi (24 km) from the SEZ, but at a much lower elevation than the previously described viewpoint, the angle of view would be very low, and the collector/reflector arrays of solar facilities in the visible portion of the SEZ would be seen edge on, which would reduce associated visual contrast levels. Operating power towers in the SEZ would likely be visible as points of light against the backdrop of sky or the mountains southwest of the SEZ. At 15 mi (24 km), tower structures would

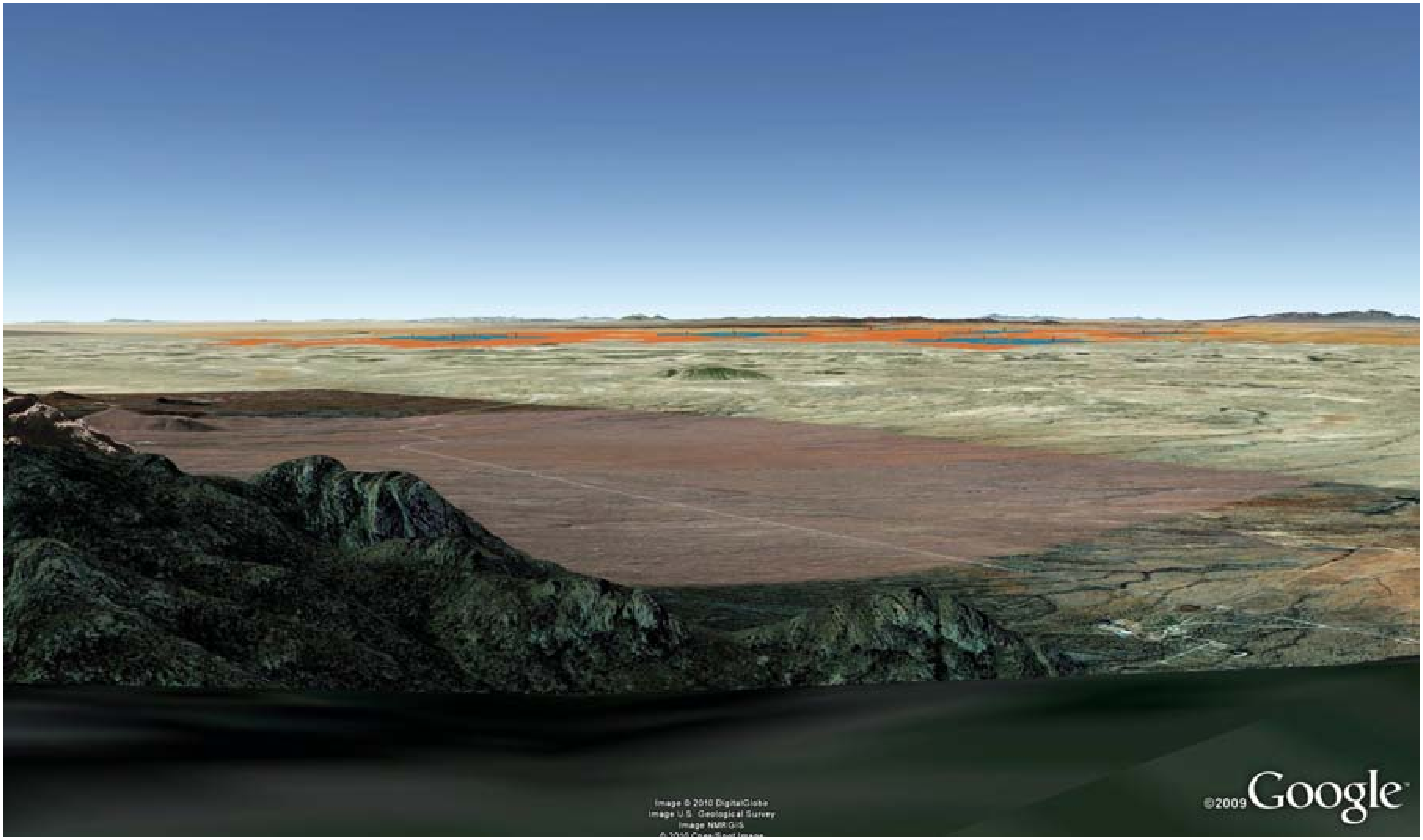

FIGURE 12.1.14.2-8 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on Baylor Peak within Organ Mountains WSA

FIGURE 12.1.14.2-9 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint near Baylor Canyon Road within Organ Mountains WSA

likely be visible but not noticeable to casual viewers. If more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location at night. Primarily because of screening of the SEZ and the low vertical angle of view at this viewpoint, solar facilities within the SEZ would be expected to cause weak visual contrast levels.

In summary, most of the higher-elevation viewpoints on the western side of the Organ Mountains would have elevated and open views of solar developments in the SEZ. Despite the long distance to the SEZ, because of the SEZ's large size, it would occupy most of the horizontal field of view, resulting in moderate to strong visual contrast levels from solar facilities within the SEZ under the 80% development scenario analyzed in the PEIS. Lower elevation views from the WSA may be partially screened by landforms, and partial visibility of the SEZ combined with long distance and low viewing angles would result in lower levels of visual contrast at most viewpoints.

- *Organ Needles.* Organ Needles is a 5,936-acre (24.02-km^2) WSA located 13 mi (21 km) northeast of the SEZ at the point of closest approach. According to the 1993 Mimbres RMP (BLM 1993), the scenic values of this portion of the Organ Mountains are outstanding. Visitation to the area is heavy, particularly in the spring and fall, but is concentrated on the developed trails.

  Within 25 mi (40 km), solar energy facilities within the SEZ could be visible from the western portion of the WSA. Visible areas of the WSA within the 25-mi (40-km) radius of analysis total about 2,349 acres (9.506 km^2) in the 650-ft (198.1-m) viewshed, or 40% of the total WSA acreage, and 2,333 acres (9.441 km^2) in the 24.6-ft (7.5-m) viewshed, or 39% of the total WSA acreage. The visible area of the WSA extends to about 17 mi (28 km) from the northeastern boundary of the SEZ.

  The Organ Needles WSA is adjacent to the Organ Mountains WSA (see above) and has similar topography. Therefore, the visual contrast levels observed from viewpoints in the Organ Needles WSA would be expected to be generally similar to those observed at similarly situated viewpoints within the Organ Mountain WSA (i.e., moderate to strong contrast at higher elevation viewpoints with open views to the SEZ, and lower contrast levels at lower elevation viewpoints at the base of the Organ Mountains). Solar facilities within the SEZ would be visible across Las Cruces and surrounding communities in the Mesilla Valley, an urbanized and visually cluttered landscape.

  Figure 12.1.14.2-10 is a Google Earth visualization of the SEZ as seen from an unpaved road near Modoc Mine just north of Fillmore Canyon near the

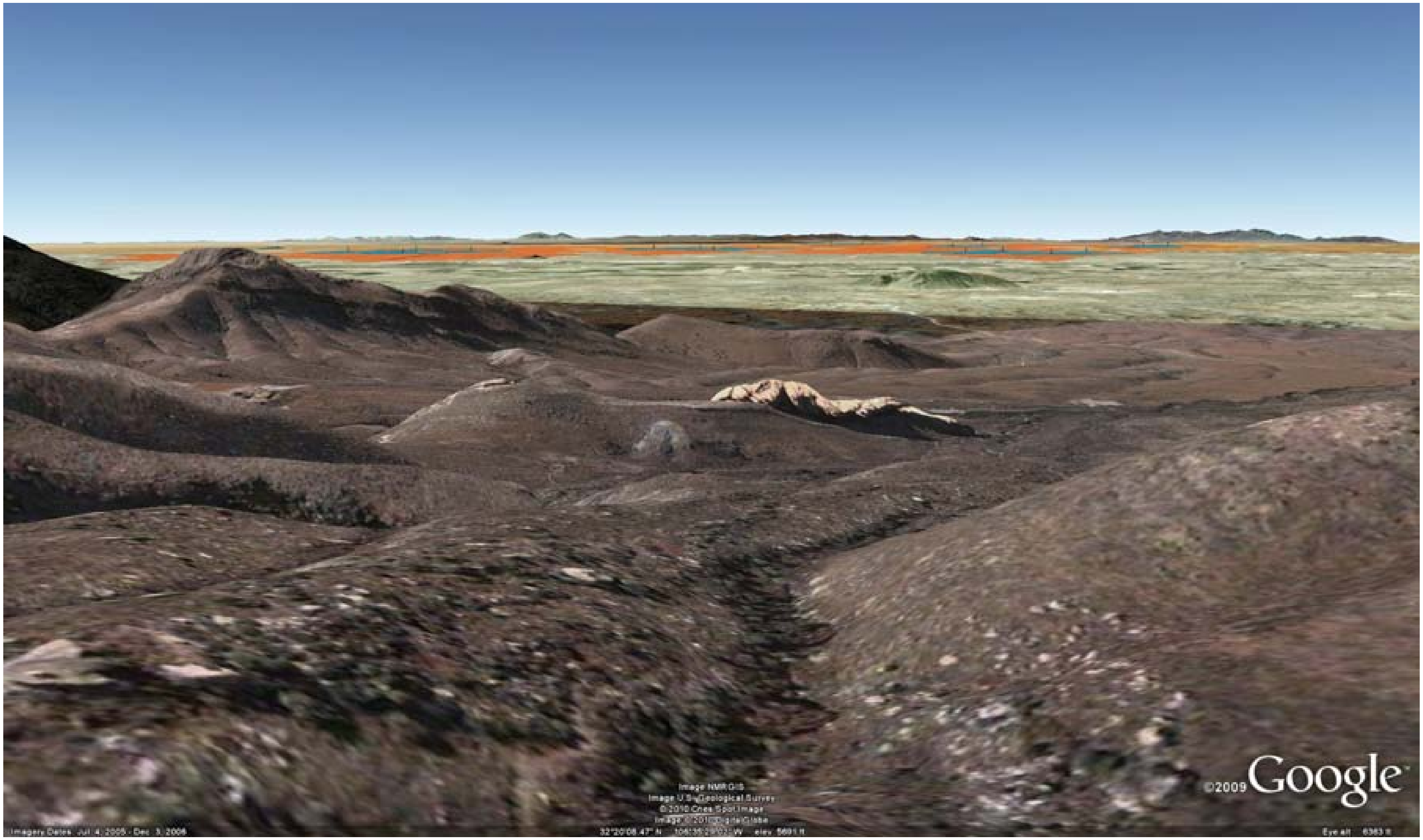

FIGURE 12.1.14.2-10 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint near Modoc Mine in Organ Needles WSA

southern border of the WSA. The viewpoint is 16 mi (26 km) from the SEZ and elevated about 2,000 ft (610 m) above the SEZ.

The visualization suggests that from this viewpoint, the SEZ would stretch across much of the horizontal field of view, although the far southern portion of the SEZ would be screened by mountains relatively close to the viewpoint. Because of the long distance to the SEZ and despite the elevation difference between the viewpoint and the SEZ, the vertical angle of view is low, reducing visual contrast somewhat. Solar facilities in the SEZ would be seen in a narrow band just under the mountains on the western horizon. Operating power towers in the SEZ would likely be visible as points of light against the backdrop of West Mesa. At 14mi (23.0 km), tower structures would likely be visible but not noticeable to casual viewers. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that would likely be visible, but would be seen across the brightly lit skies over the urbanized Mesilla Valley. Other lighting associated with solar facilities could be visible as well. Under the 80% development scenario analyzed in the PEIS solar facilities within the SEZ would be expected to cause strong visual contrast levels as seen from this viewpoint.

Figure 12.1.14.2-11 is a Google Earth visualization of the SEZ as seen from Dripping Springs Road in the far southwestern portion of the WSA, and at a lower elevation than the Modoc Mine Viewpoint. The viewpoint is 14 mi (23 km) from the SEZ and elevated about 1,100 ft (340 m) above the SEZ. Dripping Springs Road is an access route to the scenic and heavily visited Dripping Springs area on the southern border of the WSA.

The visualization suggests that from this portion of Drippings Springs Road, the SEZ would stretch across much of the horizontal field of view, despite some screening of the far southern portions of the SEZ. Because of the long distance to the SEZ, the vertical angle of view is very low, reducing visual contrast. Solar facilities in the SEZ would be seen in a narrow band just under the mountains on the western horizon. Operating power towers in the SEZ would likely be visible as points of light against the backdrop of West Mesa or the mountains southwest of the SEZ. At 14 mi (23.0 km), tower structures would likely be visible but not noticed by casual viewers. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that would likely be visible, but they would be seen across the brightly lit skies over the urbanized Mesilla Valley. Other lighting associated with solar facilities could be visible as well. Under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would be expected to cause moderate to strong visual contrast levels as seen from this viewpoint.

In summary, many of the higher-elevation viewpoints on the western side of the Organ Mountains within the Organ Needles WSA would have elevated

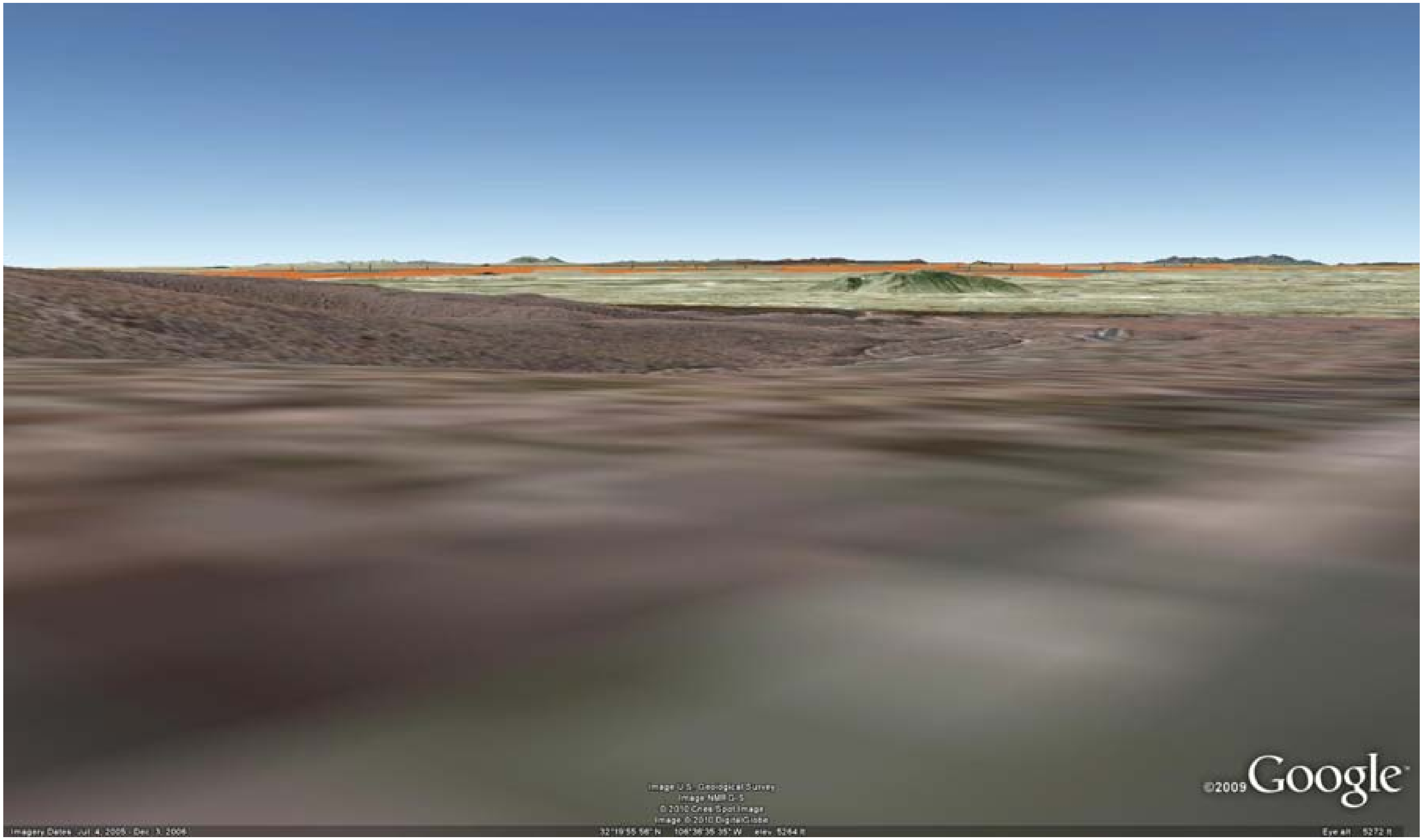

FIGURE 12.1.14.2-11 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on Dripping Springs Road Adjacent to Organ Needles WSA

and open views of solar developments in the SEZ. Despite the long distance to the SEZ, because of the SEZ's large size, it would occupy most of the horizontal field of view, resulting in moderate to strong visual contrast levels from solar facilities within the SEZ under the 80% development scenario analyzed in the PEIS. Lower-elevation views from the WSA may be partially screened by landforms, and partial visibility of the SEZ combined with long distance and low viewing angles would result in lower levels of visual contrast at most, but not all, viewpoints.

- *Pena Blanca.* Pena Blanca is a 4,648-acre (18.81 km^2) WSA located 13 mi (21 km) east of the SEZ at the point of closest approach. According to the 1993 Mimbres RMP (BLM 1993), the scenic values of this portion of the Organ Mountains are outstanding. The WSA provides opportunities for primitive and unconfined types of recreation, including hiking, camping, backpacking, hunting, sightseeing, photography, and wildlife observation.

  Within 25 mi (40 km), solar energy facilities within the SEZ could be visible from the west-facing mountains of the WSA. Visible areas of the WSA within the 25-mi (40-km) radius of analysis total about 3,738 acres (15.13 km^2) in the 650-ft (198.1-m) viewshed, or 80% of the total WSA acreage, and 3,698 acres (14.97 km^2) in the 24.6-ft (7.5-m) viewshed, or 80% of the total WSA acreage. The visible area of the WSA extends about 15 mi (24 km) from the northeastern boundary of the SEZ.

  The SEZ would be in full view in much of the Pena Blanca WSA. Visual contrasts for these viewpoints would be similar to or slightly greater than those described above for the Organ Mountains and Organ Needles WSAs, because those WSAs are similar in topography to, and located just north of, Pena Blanca WSA. For viewpoints within Pena Blanca WSA, the SEZ would occupy most of the horizontal field of view; the vertical angle of view would be low, but because of the large size of the SEZ, moderate to strong visual contrasts would be expected for high-elevation viewpoints with unobstructed views of the SEZ.

  Low-elevation viewpoints within the WSA would be less subject to screening than low elevation viewpoints in the Organ Mountains and Needles WSAs. Figure 12.1.14.2-12 is a Google Earth visualization of the SEZ as seen from an unpaved road in the Indian Caves area in the far southwestern portion of the WSA. The viewpoint is located about 10 mi (16 km) from the SEZ, and it is about 500 ft (150 m) higher in elevation than the SEZ.

  The visualization suggests that from this viewpoint, the SEZ would stretch across nearly the entire horizontal field of view, although the vertical angle of view would be very low. Solar facilities within the SEZ would appear in a thin band just under the mountains to the southwest of the SEZ. Collector/reflector arrays of solar facilities within the SEZ would be seen edge-on and would

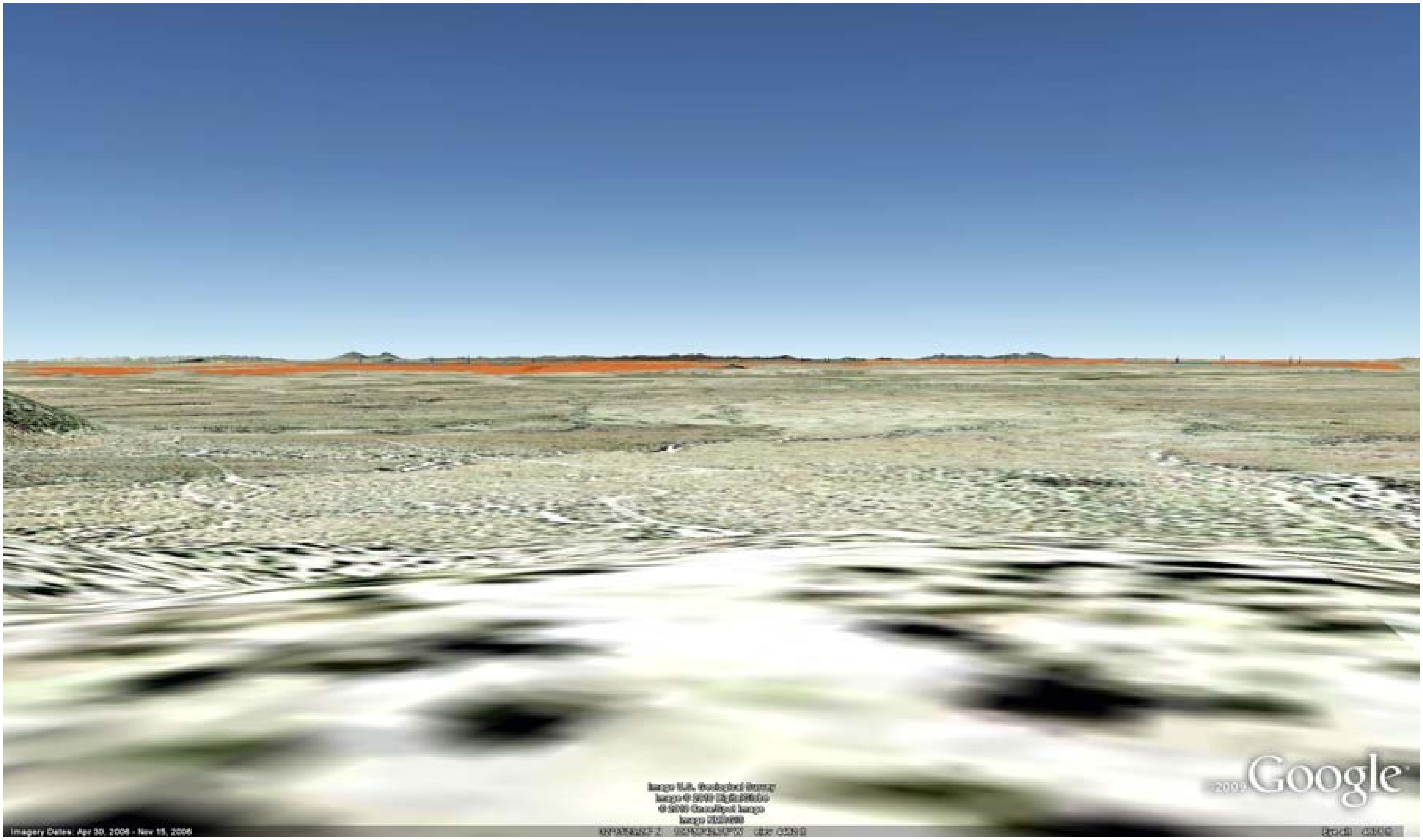

FIGURE 12.1.14.2-12 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Pena Blanca WSA

appear as thin lines, greatly reducing their apparent size. Ancillary facilities, such as buildings, transmission components, cooling towers, and other features, as well as plumes (if present), would likely be visible above the collector/reflector arrays. Their forms, colors, and lines would contrast with the strongly horizontal arrays, but they would not be expected to be visually prominent at distances exceeding 10 mi (16 km). Operating power towers in the SEZ would likely be visible as points of light against the backdrop of the sky or the mountains southwest of the SEZ. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that would likely be visible, but they would be seen across the brightly lit skies over the urbanized Mesilla Valley. Under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would be expected to cause moderate to strong visual contrast levels as seen from this viewpoint.

In summary, many of the higher-elevation viewpoints on the western side of the Organ Mountains within the Pena Blanca WSA would have elevated and open views of solar developments in the SEZ. Because of the SEZ's large size, it would occupy most of the horizontal field of view, resulting in moderate to strong visual contrast levels from solar facilities within the SEZ under the 80% development scenario analyzed in the PEIS. Lower-elevation views from the WSA could be partially screened by landforms, but most viewpoints would have open views of the SEZ, and despite the low viewing angles, would likely be subject to moderate to strong visual contrasts from solar facilities in the SEZ.

- *Robledo Mountains*. Robledo Mountains is a 13,049-acre (52.807-km^2) WSA located 8.3 mi (13.4 km) north of the SEZ at the point of closest approach.

  Within 25 mi (40 km), solar energy facilities within the SEZ could be visible from peaks and south-facing slopes of the Robledo Mountains in the WSA, primarily in the central portions of the WSA, but to a lesser extent in the southern portions as well. Visible areas of the WSA within the 25-mi (40-km) radius of analysis total about 2,622 acres (10.6 km^2) in the 650-ft (198.1-m) viewshed, or 20% of the total WSA acreage, and 2,007 acres (8.1 km^2) in the 24.6-ft (7.5-m) viewshed, or 15% of the total WSA acreage. The visible area of the WSA extends to about 14 mi (23 km) from the northern boundary of the SEZ.

  Figure 12.1.14.2-13 is a Google Earth visualization of the SEZ as seen from the end of an unpaved road atop a hill in the far southern portion of the WSA. The viewpoint is near the point of closest approach of the WSA to the SEZ. The viewpoint is 8.4 mi (13.5 km) from the SEZ and is elevated about 670 ft (204 m) above the SEZ.

  The visualization suggests that from this viewpoint, the SEZ would stretch across most of the horizontal field of view. Picacho Mountain would screen

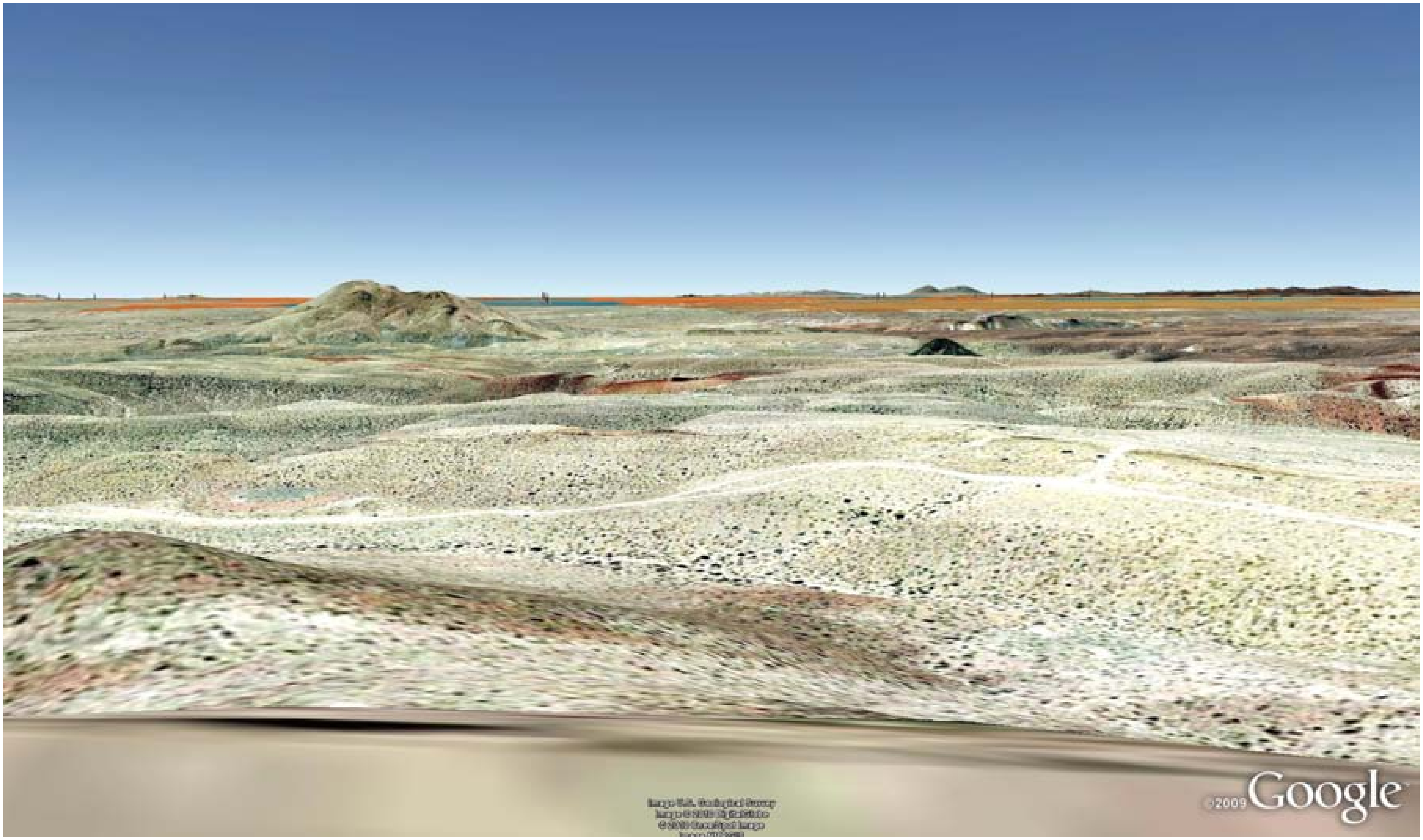

FIGURE 12.1.14.2-13 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint in Far Southern Portion of Robledo Mountains WSA

views of a small portion of the eastern part of the SEZ. The vertical angle of view would be very low, reducing visual contrast somewhat. Solar facilities in the SEZ would be seen in a narrow band just under the southern horizon. The southern boundary of the SEZ is more than 20 mi (32 km) from the viewpoint. The collector/reflector arrays of solar facilities in most parts of the proposed SEZ would be seen edge-on, which would greatly reduce their apparent size, conceal their strong regular geometry, and repeat the line of the horizon. This would reduce visual contrasts with the surrounding strongly horizontal landscape. However, in the closest portions of the SEZ, the tops of the arrays could be visible, and because the facilities would also be closer, they could cause substantially stronger visual contrasts. Operating power towers in the southern portions of the SEZ would likely be visible as distant points of light against the backdrop of the sky, but operating power towers in the closest portions of the SEZ could be bright enough to attract visual attention. Tower structures in the closest portions of the SEZ could be visible to casual viewers. If more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location at night. Other lighting associated with solar facilities could be visible as well.

While the viewing angle is low, because solar facilities within the proposed SEZ would stretch across nearly the full field of view, under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would be expected to cause strong visual contrast levels as seen from this viewpoint.

Figure 12.1.14.2-14 is a Google Earth visualization of the SEZ as seen from the end of a jeep trail atop a high mountain ridge in the west-central portion of the WSA. The viewpoint is near the point of closest approach of the WSA to the SEZ. The viewpoint is 12 mi (19 km) from the SEZ and is elevated about 1,500 ft (460 m) above the SEZ.

In general, the appearance of solar facilities within the SEZ would be similar in nature to, but with somewhat lower levels of visual contrast than, the viewpoint for the visualization shown in Figure 12.1.14.2-10. The increased distance to this viewpoint is offset by the increased elevation with respect to the SEZ, so that the vertical angle of view would be slightly higher for this viewpoint. The SEZ would stretch across much of the horizontal field of view.

Solar facilities in the SEZ would be seen in a narrow band just under the southern horizon. The southern boundary of the SEZ is almost 24 mi (39 km) from the viewpoint. The collector/reflector arrays of solar facilities in most parts of the SEZ would be seen edge-on, which would reduce their apparent size, conceal their strong regular geometry, and repeat the line of the horizon, thus reducing visual contrasts with the surrounding strongly horizontal landscape. However, the tops of the arrays could be visible for facilities closer to the viewpoint, and they could cause stronger visual contrasts. Taller solar

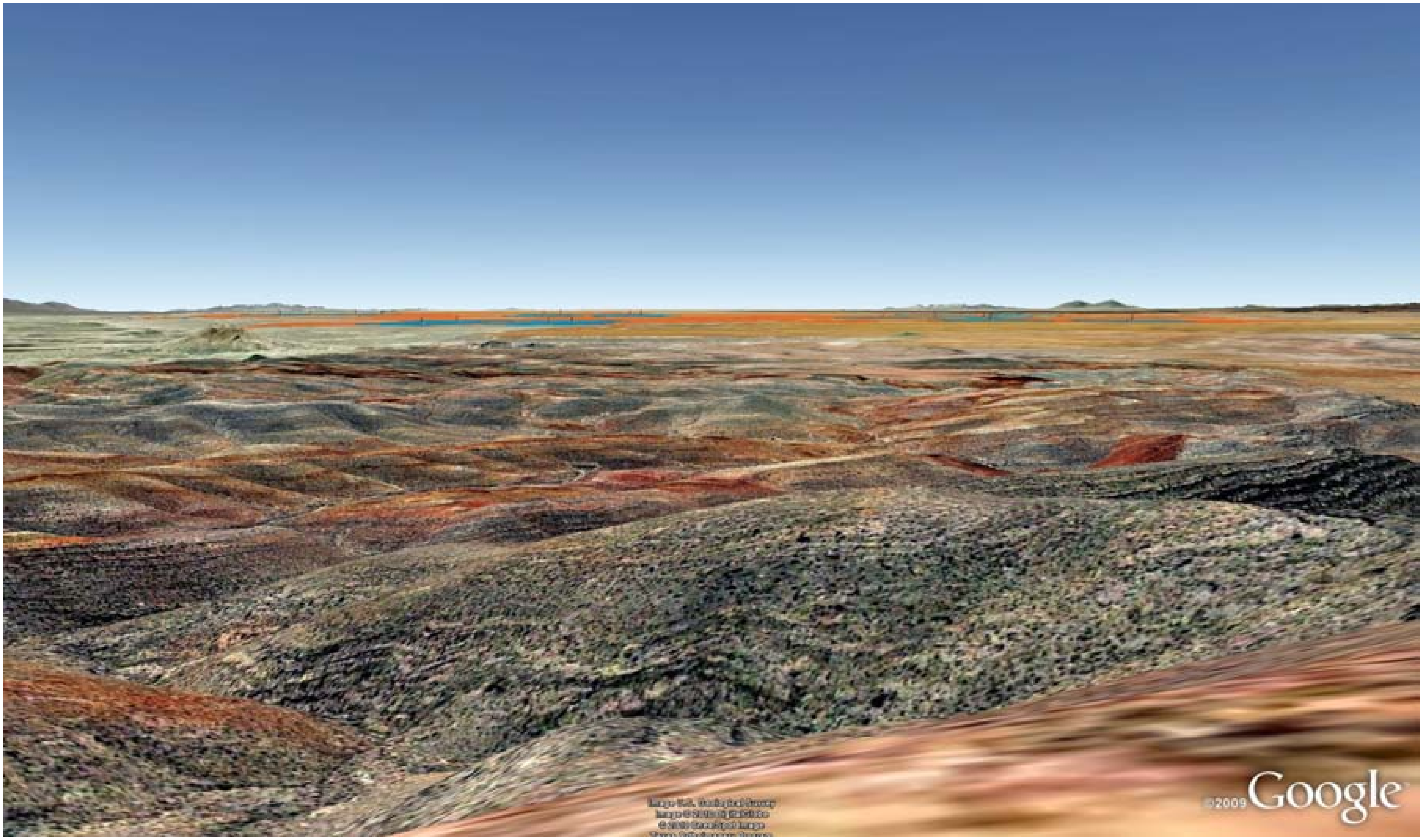

FIGURE 12.1.14.2-14 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint in the West-Central Portion of Robledo Mountains WSA

facility components could be visible, depending on lighting, but might not be noticed by casual observers.

Operating power towers in the southern portions of the SEZ would likely be visible as distant points of light against the backdrop of the sky, but operating power towers in the closest portions of the SEZ could be bright enough to attract visual attention during the day and, if more than 200 ft (61 m) tall, would have navigation warning lights at night that would likely be visible from this location Tower structures in the closest portions of the SEZ could be visible but might not be noticed by casual viewers.

While the viewing angle is low, because solar facilities within the SEZ would stretch across most of the horizontal field of view under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would be expected to cause strong visual contrast levels as seen from this viewpoint.

Lower levels of visual contrast than those described above would be likely for lower elevation viewpoints, which would be subject to screening by intervening terrain, and for viewpoints the far northern portions of the WSA, which would be more distant from the SEZ.

In summary, many of the viewpoints on the peaks and south-facing slopes of the WSA would have elevated and open views of solar developments in the SEZ. Because of the SEZ's large size, it would occupy most of the horizontal field of view, and under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would be likely to present strong visual contrast levels to viewers at these and similar locations within the WSA. It should be noted that some areas within the WSA could also have views of solar facilities within the Mason Draw SEZ, which could increase the perceived visual impacts associated with solar energy development in the landscape setting.

- *West Potrillo Mountains/Mt. Riley.* West Potrillo Mountains/Mt. Riley is a 159,323-acre (644.8-km^2) WSA located 5.7 mi (9.2 km) southwest of the SEZ at the point of closest approach.

  Within 25 mi (40 km), solar energy facilities within the SEZ could be visible primarily from the northeastern portion of the WSA. Visible areas of the WSA within the 25-mi (40-km) radius of analysis total about 52,951 acres (214.29 km^2) in the 650-ft (198.1-m) viewshed, or 33% of the total WSA acreage, and 37,662 acres (152.41 km^2) in the 24.6-ft (7.5-m) viewshed, or 24% of the total WSA acreage. The visible area of the WSA extends to about 23 mi (37 km) from the western boundary of the SEZ.

  Figure 12.1.14.2-15 is a Google Earth visualization of the SEZ as seen from the summit of Riley Mountain in the far eastern portion of the WSA. The viewpoint is about 14 mi (23 km) south of the southwestern corner of the

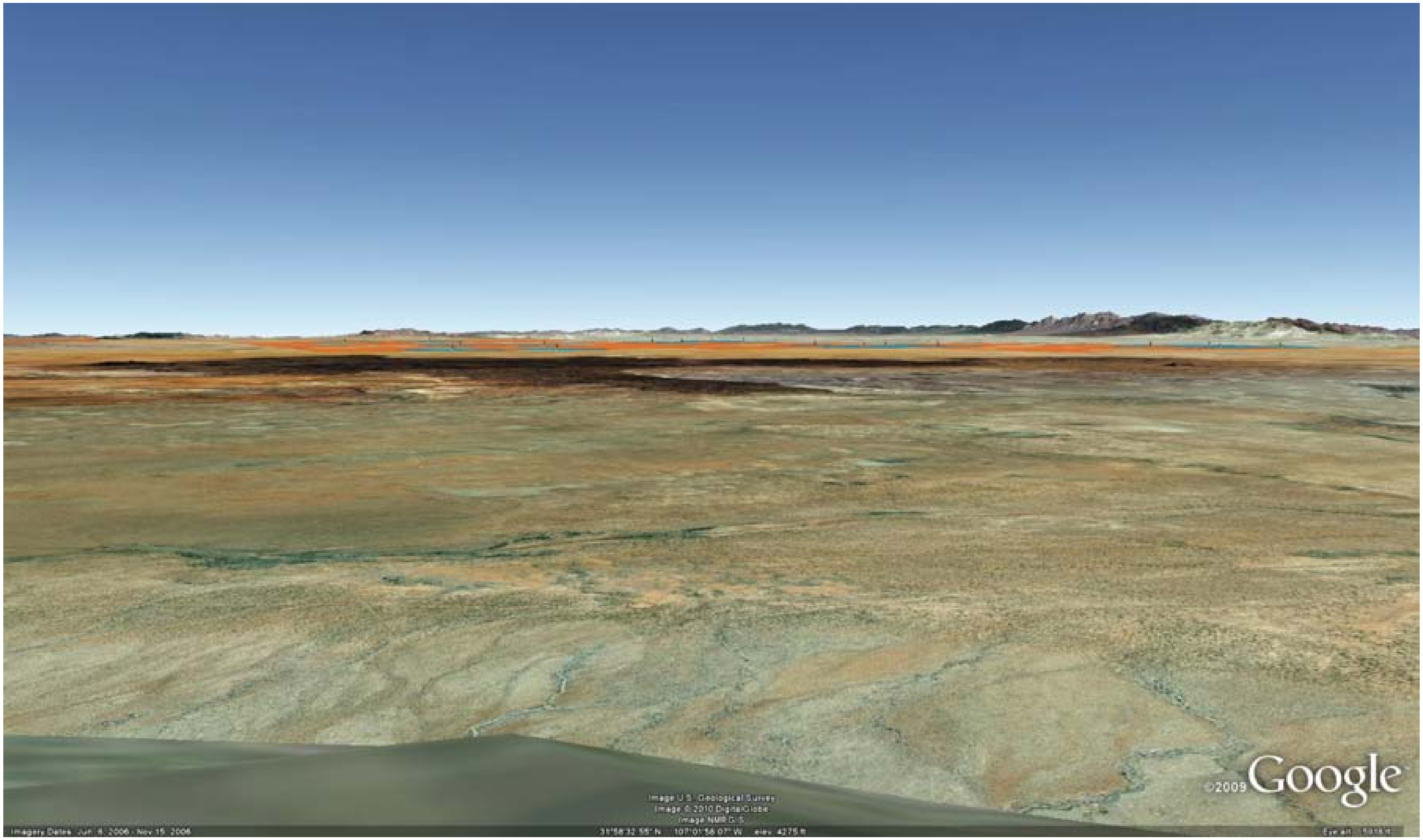

FIGURE 12.1.14.2-15 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Mt. Riley in the West Potrillo Mountains/Mt. Riley WSA

western portion of the SEZ. The viewpoint is elevated about 1,700 ft (520 m) above the SEZ.

The visualization suggests that from viewpoint, the SEZ would stretch across most of the horizontal field of view, with solar facilities within the Mason Draw SEZ potentially visible in the distance west of the proposed Afton SEZ. The vertical angle of view would be very low, reducing visual contrast somewhat. Solar facilities in the SEZ would be seen in a narrow band in the vast plain that contains the SEZ. The collector/reflector arrays of solar facilities in the SEZ would be seen edge-on, or nearly so, which would greatly reduce their apparent size, conceal their strong regular geometry, and repeat the line of the horizon, thus reducing visual contrasts with the surrounding strongly horizontal landscape. Taller solar facility components, such as transmission towers, could be visible as well.

Operating power towers in the northern portions of the SEZ would likely be visible as distant points of light against the backdrop of the sky, but operating power towers in the closest portions of the SEZ could be substantially brighter. Tower structures in the closest portions of the SEZ could be visible, but would not likely be noticed by casual viewers. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that would likely be visible, but there would be other lights visible in the SEZ area. Other lighting associated with solar facilities could be visible as well.

While the viewing angle is very low, because solar facilities within the SEZ would stretch across nearly the full field of view under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would be expected to cause strong visual contrast levels from this viewpoint.

Figure 12.1.14.2-16 is a Google Earth visualization of the SEZ as seen from the summit of a volcanic cone in the far northern portion of the WSA. The viewpoint is about 10 mi (16 km) west-southwest of the far southwestern corner of the SEZ. The viewpoint is elevated about 1,250 ft (380 m) above the SEZ.

The visualization suggests that from viewpoint, the SEZ would stretch across most of the horizontal field of view, with solar facilities within the proposed Mason Draw SEZ potentially visible in the distance west of the proposed Afton SEZ, but likely out of the immediate field of view for viewers looking directly toward the proposed Afton SEZ. The vertical angle of view would be very low, reducing visual contrast substantially. Solar facilities in the SEZ would be seen in a very narrow band in the vast plain that contains the SEZ. The collector/reflector arrays of solar facilities in the SEZ would be seen edge-on, or nearly so, which would greatly reduce their apparent size, conceal their strong regular geometry, and repeat the line of the horizon, thus reducing

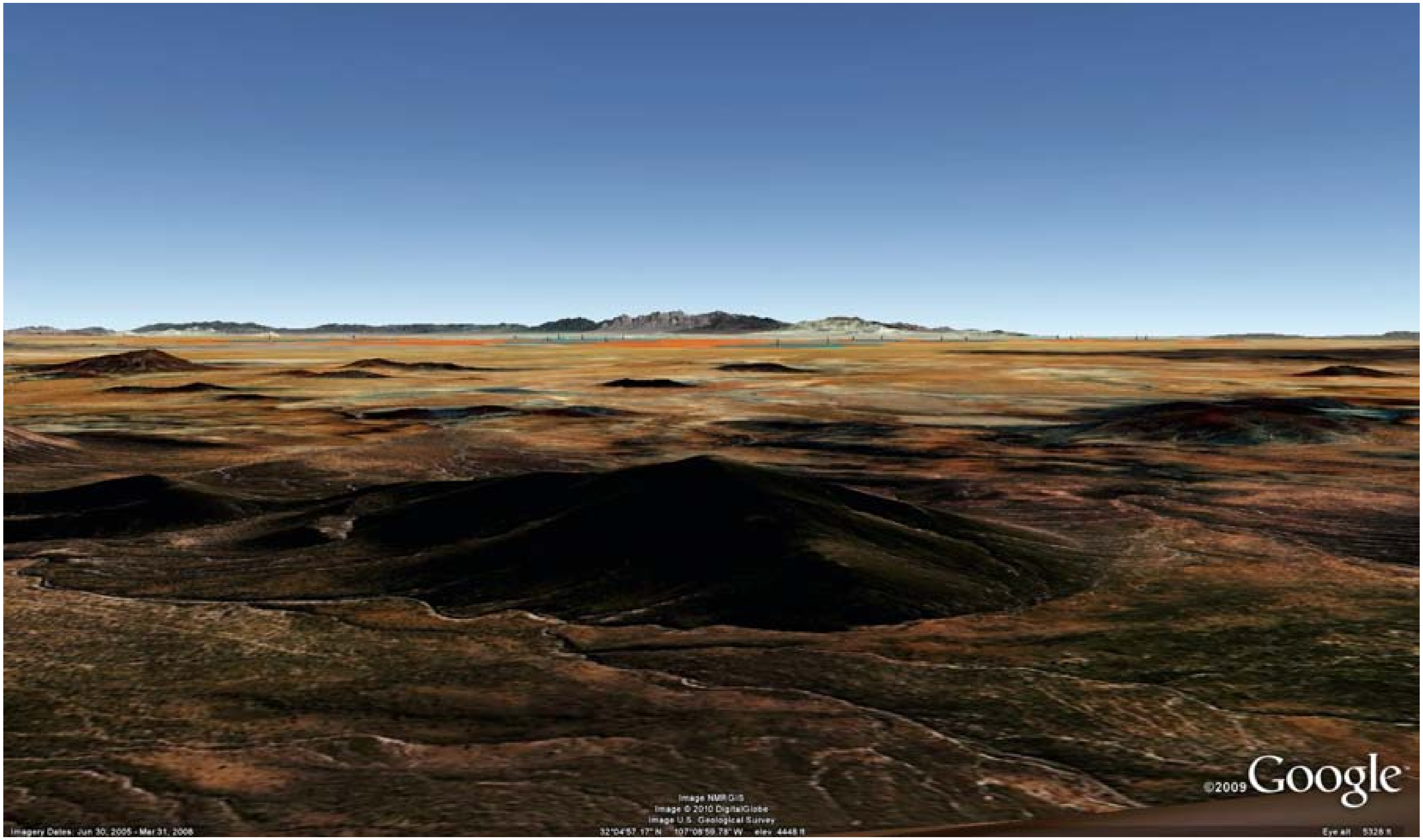

FIGURE 12.1.14.2-16 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Unnamed Hill in the Northern Portion of West Potrillo Mountains WSA

visual contrasts with the surrounding strongly horizontal landscape. Operating power towers in the northern portions of the SEZ would likely be visible as distant points of light under the Organ Mountains east of the SEZ, but operating power towers in the closest portions of the SEZ could be substantially brighter. Tower structures in the closest portions of the SEZ would likely be visible and might be noticed by casual viewers. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that would likely be visible, but there would be other lights visible in the SEZ area. Other lighting associated with solar facilities could be visible as well.

The viewing angle is very low, but because solar facilities within the SEZ would stretch across most of the field of view under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would be expected to cause moderate to strong visual contrast levels as seen from this viewpoint.

Lower levels of visual contrast than those described above would be likely for viewpoints at lower elevation, which would be subject to screening by intervening terrain, and for viewpoints in the southwestern portions of WSA, which would be more distant from the SEZ.

In summary, many of the higher-elevation viewpoints in the northeastern portion of the WSA would have open views of solar developments in the SEZ. Because of the SEZ's large size, it would occupy most of the horizontal field of view, and under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would be likely to present moderate to strong visual contrast levels to viewers at these and similar locations within the WSA. It should be noted that some areas within the WSA could also have views of solar facilities within the Mason Draw SEZ, which could increase the perceived visual impacts associated with solar energy development in the landscape setting.

Special Recreation Management Areas

- *Aden Hills*. The 8,054-acre (32.59-km^2) Aden Hills SRMA is designated for OHV use adjacent to the western boundary of the SEZ. Annual usage is estimated at 10,000 visitors. About 7,680 acres (31.08 km^2), or 95% of the SRMA, are within the 650-ft (198.1-m) viewshed of the SEZ, and 7,044 acres (28.51 km^2), or 88% of the SRMA, are within the 24.6-ft (7.5-m) viewshed. The portion of the SRMA within the viewshed extend to beyond 4.6 mi (7.4 km) from the SEZ.

  Almost the entire SRMA has unobstructed views of the SEZ, although there are some depressions where at least partial screening of the SEZ might occur, and some of the far western portions of the SRMA are screened by the Aden Hills. In general, however, visitors to the SRMA would have solar facilities within the SEZ in plain view to the east and would be within the BLM VRM Program's foreground-midground distance of 3 to 5 mi (5 to 8 km). Furthermore, the proposed Mason Draw SEZ is located only 2.4 mi (3.9 km) north of the northernmost point in the SRMA and is visible from most of the SRMA. Therefore, if solar facilities were built within the Mason Draw SEZ, they could potentially add substantially to the visual impacts associated with development in the proposed Afton SEZ. This would be more likely for the highest elevation viewpoints within the SRMA.

Figure 12.1.14.2-17 is a Google Earth visualization of the SEZ as seen from a remnant road in the far northeastern portion of the SRMA. The viewpoint is about 0.4 mi (0.6 km) west of the western boundary of the SEZ's northwest corner. The viewpoint is at about the same elevation as nearby portions of the SEZ.

The visualization suggests that from this very short distance to the SEZ, the SEZ is far too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole visible portion of the SEZ. Two individual power tower facility models are visible at center; a cluster of four power tower facility models are visible at the far right. The closest model is 2.6 mi (4.2 km) from the view point, the second model is 3.9 mi (6.3 km), and the center of the four-tower cluster at right is about 9 mi (14 km) from the viewpoint. Because the viewpoint and SEZ elevation are essentially the same, the vertical angle of view is low enough that the collector/reflector arrays of solar facilities within the SEZ would likely repeat the horizontal line of the horizon.

Taller solar facility components, such as buildings, transmission components, STGs, cooling towers, and plumes (if present), would likely project above the collector/reflector arrays and could be visually conspicuous, depending on their forms, lines, colors, and surface textures. Structural details of close-by facilities could be discernable, adding to visual complexity.

If power towers were present within the SEZ, at short distances the receivers would likely appear as very bright to brilliant non-point sources of light against the backdrop of the sky above the mountains on the eastern side of Mesilla Valley, while at the longest distances visible here they would likely appear as points of light below the southern horizon against the backdrop of the Organ and Franklin Mountains. For power towers in the closest portion of the SEZ, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). If sufficiently tall, power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that would be visible at night and could be conspicuous, but there could be other lights visible in the

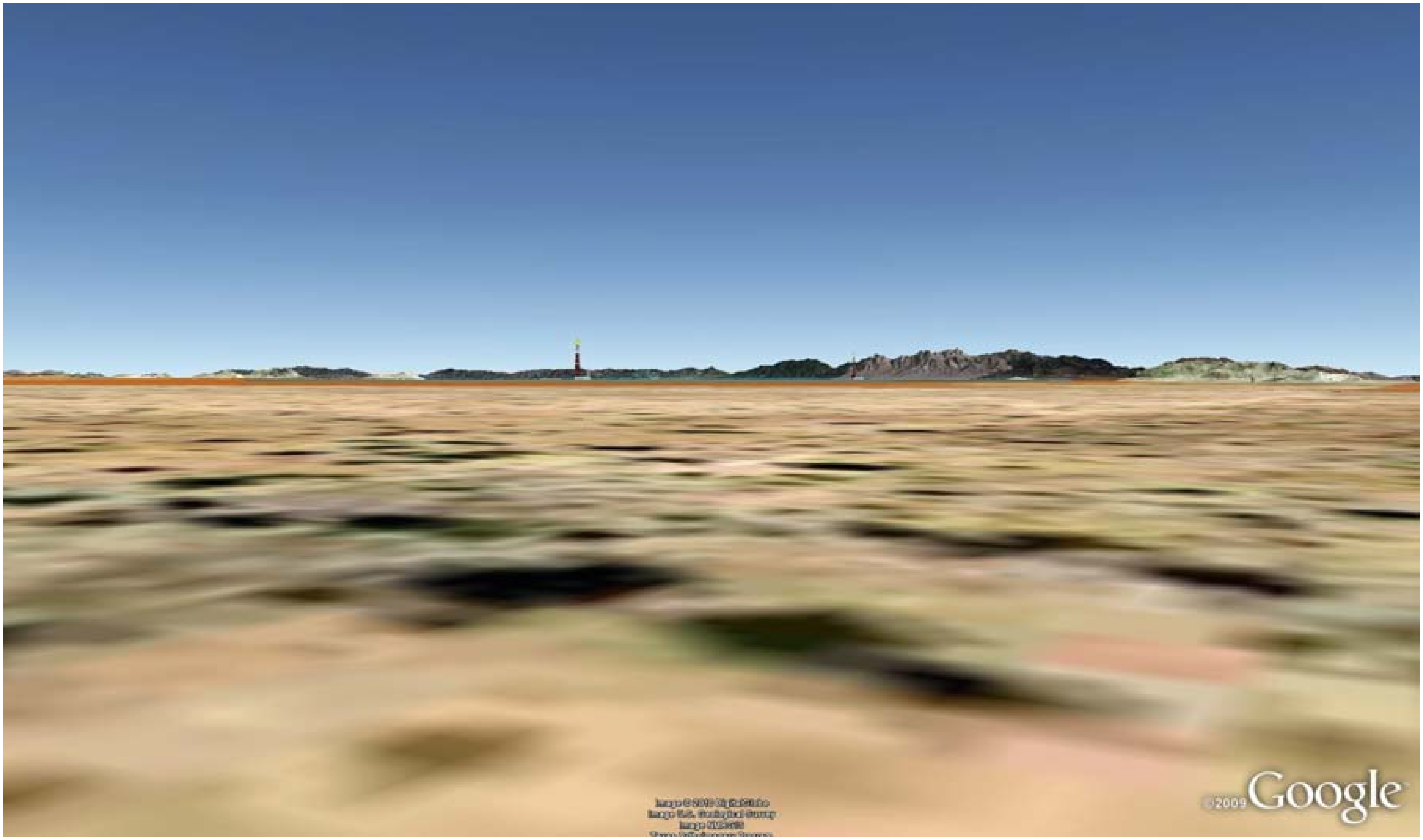

FIGURE 12.1.14.2-17 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint in the Far Northeastern Portion of the Aden Hills SRMA

SEZ area, particularly to the north in the direction of the I-10 and the Mason Draw SEZ. Other lighting associated with solar facilities could be visible as well.

The potential visual contrast expected for this viewpoint would vary depending on project locations, technologies, and site designs, but because the viewpoint is very close to the SEZ, the SEZ would fill up much of the field of view, and while one or a few solar facilities within the SEZ might only give rise to moderate levels of visual contrast, under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities, such as transmission towers and lines, substations, power block components, and roads, that would contribute to visual impacts. The lack of uniformity in facility components could result in a visually complex landscape, vast in scope but with low visual unity. This essentially industrial-appearing landscape would contrast greatly with the surrounding natural-appearing lands and would likely dominate the view from this location. Under the PEIS 80% development scenario, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this and other locations in the SRMA close to the SEZ.

Figure 12.1.14.2-18 is a Google Earth visualization of the SEZ as seen from a road in the Aden Hills in the northwestern portion of the SRMA. The viewpoint is about 2.5 mi (4.0 km) west of the western boundary of the northwest corner of the SEZ. The viewpoint is about 360 ft (110 m) higher in elevation than the nearby portions of the SEZ.

The visualization suggests that even from 2 mi (3.2 km) farther away from the SEZ, the SEZ is still too large to be encompassed in one view; viewers would need to turn their heads to scan across the whole SEZ. Numerous power tower facility models are visible across the breadth of the SEZ. The viewpoint is slightly elevated with respect to the SEZ, and the tops of the nearest collector/reflector arrays (depending on height) could be visible, which would make them appear slightly larger and could increase the chances of reflections from the numerous reflective surfaces that would be in view. The vertical angle of view is low enough, however, that the collector/reflector arrays of solar facilities within the SEZ would likely repeat the horizontal line of the horizon.

Taller solar facility components, such as buildings, transmission components, STGs, cooling towers, and plumes (if present), would likely project above the collector/reflector arrays and for close-by facilities could be visually conspicuous, depending on their forms, lines, colors, and surface textures. Structural details of close-by facilities could be discernable, adding to visual complexity.

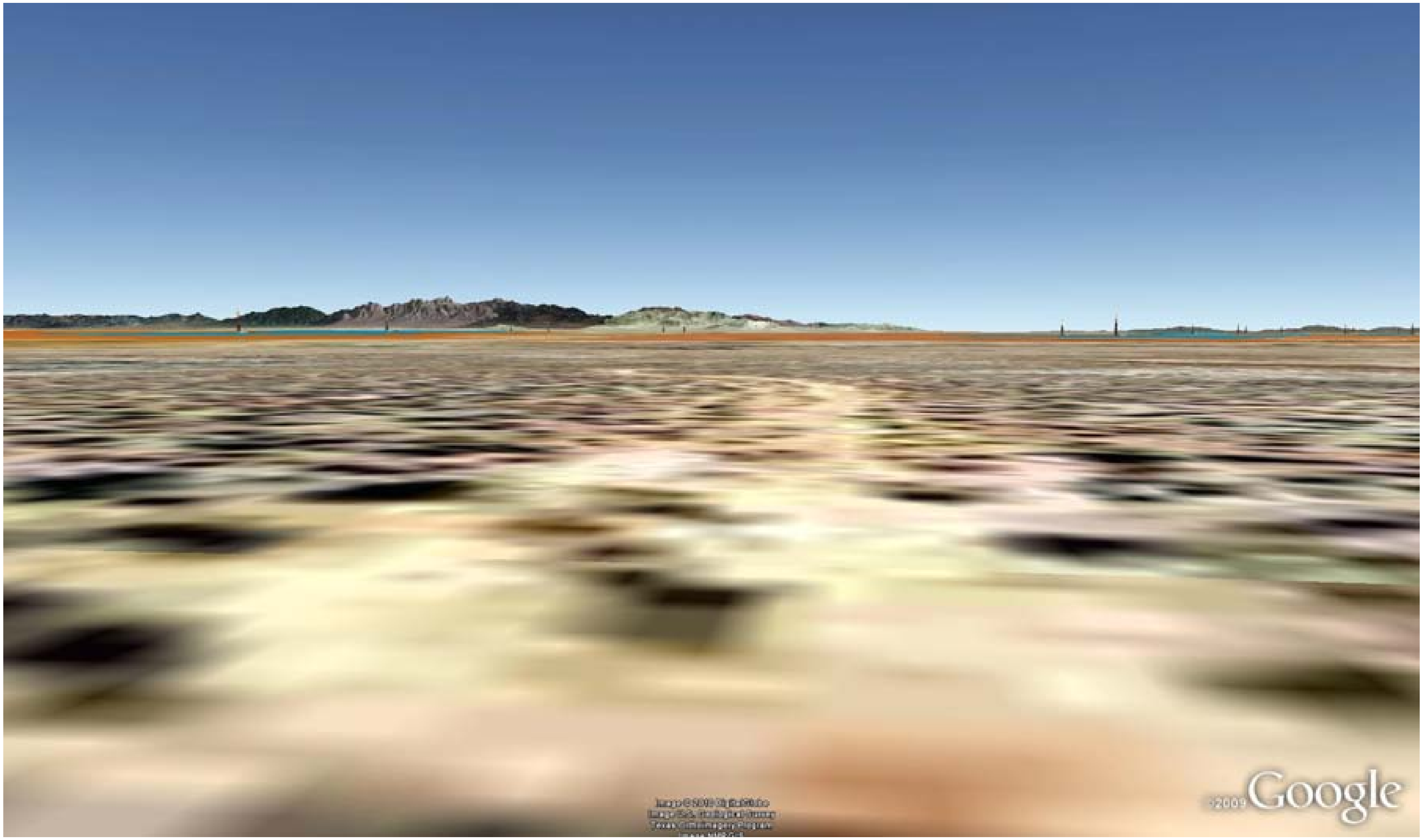

FIGURE 12.1.14.2-18 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint in the Northwest Portion of the Aden Hills SRMA

If power towers were present within the SEZ, at short distances the receivers would likely appear as very bright non-point sources of light against the backdrop of the sky or the mountains on the eastern side of Mesilla Valley. Power towers on the east side of the SEZ would likely appear as points of light against the backdrop of the Organ and Franklin Mountains. At night, if sufficiently tall, power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that would be visible, and could be conspicuous, but there could be other lights visible in the SEZ area, particular to the north in the direction of the I-10 and the Mason Draw SEZ. Other lighting associated with solar facilities could be visible as well.

The potential visual contrast expected for this viewpoint would vary depending on project locations, technologies, and site designs, but because the viewpoint is close to the SEZ, the SEZ would fill up much of the field of view, and because the viewpoint is slightly elevated, more of the facilities would be visible. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this and similar elevated locations in the SRMA.

In summary, the SRMA is very close to the SEZ and would have open views of solar facilities within the SEZ. Generally speaking, regardless of viewpoint elevation, solar facilities in the SEZ would be so visually prominent that they would be expected to dominate views from the SRMA to the east and would contrast very strongly with the surroundings, as seen from most of the SRMA.

- *Dona Ana Mountains*. Dona Ana Mountains is an 8,345-acre (33.77-km^2) BLM-designated SRMA 10 mi (16 km) northeast of the SEZ at the point of closest approach. The mountains offer a number of hiking trails, 15 mi (24 km) of mountain biking trails, and 7 mi (11 km) of horseback trails.

  Visibility of solar facilities within the proposed Afton SEZ would be from the south- and southwest-facing slopes of the Dona Ana Mountains, portions of the plain south and east of the mountains, and the south slope of a lone hill northeast of the community of Dona Ana. The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 5,380 acres (21.77 km^2), or 65% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes 4,219 acres (17.07 km^2), or 51% of the total SRMA acreage. The visible area extends from the point of closest approach to 16 mi (26 km) into the SRMA.

  Figure 12.1.14.2-19 is a Google Earth visualization of the SEZ as seen from a turnout on an unpaved road on the side of a hill in the southern portion of the SRMA. The road is used by OHVs. The viewpoint is 12 mi (19 km) from the northeast corner of the SEZ and is elevated 130 ft (40 m) with respect to the SEZ.

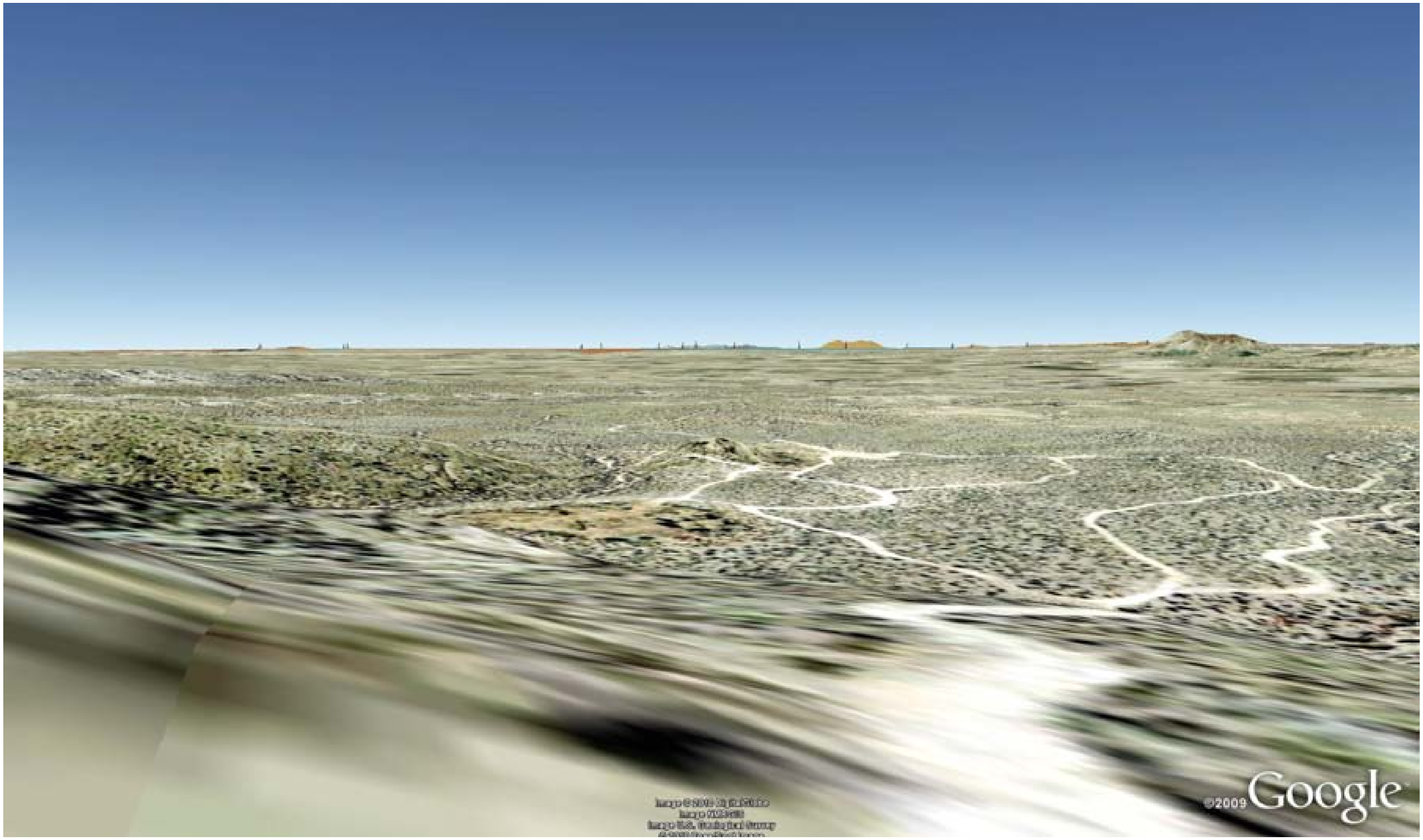

FIGURE 12.1.14.2-19 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an OHV Road in the Southern Portion of the Dona Ana SRMA

From this viewpoint, solar facilities within the SEZ would stretch across almost the full horizontal field of view. Picacho Mountain and neighboring hills would screen the far western portion of the SEZ from view. Because the viewpoint is only slightly elevated with respect to the SEZ, however, the vertical angle of view is extremely low, and solar facilities within the SEZ would appear in a very narrow band on the West Mesa beyond the community of Dona Ana. The urban development within Dona Ana would be visible in the foreground.

The collector/reflector arrays of solar facilities within the SEZ would be seen edge-on, which would greatly reduce their apparent size, and they would repeat the line of the horizon in this strongly horizontal landscape, which would tend to reduce visual contrasts from the arrays. Taller solar facility components such as transmission towers would likely be visible, especially if located in the closer portions of the SEZ.

Operating power towers in the farther portions of the SEZ would likely be visible as points of light against the sky or the mountains southwest of the SEZ, and the tower structures might not be visible. Operating power towers in the closest portion of the SEZ would be much brighter and could attract visual attention, with the tower structures visible beneath the receivers. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that could be visually conspicuous, but they would be seen above the numerous lights of the community of Dona Ana. Other lighting associated with solar facilities could be visible as well.

While the SEZ would stretch across most of the horizontal field of view, the vertical angle of view is so low that low-height solar facilities within the SEZ, such as parabolic trough and PV arrays, might be difficult to distinguish on the horizon; however, taller facilities, and especially operating power towers, could be seen stretching across the horizon.

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

Figure 12.1.14.2-20 is a Google Earth visualization of the SEZ as seen from the summit of Dona Ana Peak in the northwest portion of the SRMA. The viewpoint is 14 mi (22 km) from the northeast corner of the SEZ and is elevated 1,650 ft (500 m) with respect to the SEZ.

From this viewpoint, solar facilities within the SEZ would stretch across almost the full horizontal field of view. The viewpoint is elevated with respect to the SEZ; however, the vertical angle of view is low, and solar facilities within the SEZ would appear in a narrow band on the mesa beyond the

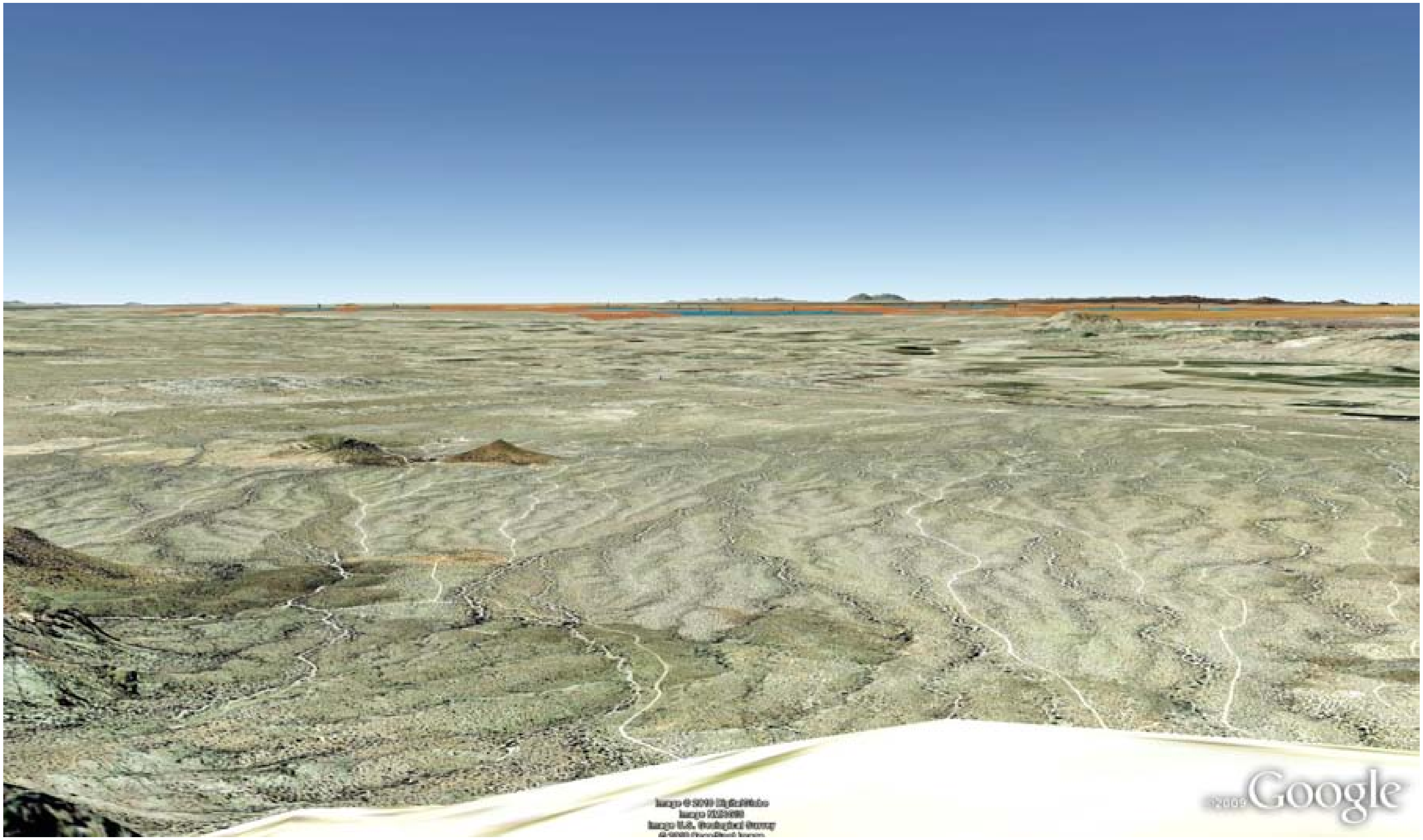

FIGURE 12.1.14.2-20 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Summit of Dona Ana Peak in the Dona Ana SRMA

community of Dona Ana. The urban development within Dona Ana would be visible in the foreground.

The collector/reflector arrays of solar facilities within the SEZ would be seen nearly edge-on, which would reduce their apparent size, and they would repeat the line of the horizon in this strongly horizontal landscape, which would tend to reduce visual contrasts from the arrays. Taller solar facility components such as transmission towers would likely be visible, especially if located in the nearer portions of the SEZ. Operating power towers in the farther portions of the SEZ would likely be visible as points of light against the sky or the mountains southwest of the SEZ, and the tower structures would not likely be visible. Operating power towers in the closest portion of the SEZ would be much brighter, with the tower structures visible beneath the receivers, although unlikely to be noticed by casual observers. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that would be visible, but that would be seen above the lights of the community of Dona Ana.

The SEZ would stretch across most of the horizontal field of view, and while the vertical angle of view is low, facilities throughout the SEZ would likely be visible under favorable viewing conditions, although facilities in the farthest portions of the SEZ might be hard to distinguish. Depending on solar facility location within the SEZ, the types of solar facilities and their designs, and other visibility factors, moderate to strong visual contrasts from solar energy development within the SEZ would be expected at this location.

In summary, solar facilities in the SEZ would be visible from much of the SRMA. For lower elevation viewpoints, the vertical angle of view is so low that it would be expected to reduce substantially the visual contrast associated with solar facilities within the SEZ, although the SRMA is close enough to the SEZ that the SEZ would stretch across most of the southern horizon, and moderate visual contrast would be expected. Because of the slightly higher vertical viewing angles, visual contrast levels would likely be greater for higher-elevation viewpoints in the SRMA, even though they might be farther from the SEZ.

- *Organ/Franklin Mountains.* Organ/Franklin Mountains is a BLM-designated SRMA 6.1 mi (9.8 km) east of the SEZ at the point of closest approach.

  Much of 60,793-acre (246.02-km^2) Organ/Franklin Mountains SRMA is within the viewshed of the SEZ, as it includes portions of the lower slopes and high peaks of the Organ Mountains, as well as peaks in the Franklin Mountains, with open views of the SEZ across Mesilla Valley. The area of the SRMA within the 650-ft (198.1-m) viewshed of the SEZ includes 43,319 acres (175.31 km^2), or 71% of the total SRMA acreage. The area of the SRMA within the 24.6-ft (7.5-m) viewshed of the SEZ includes

41,974 acres (169.86 km^2), or 69% of the total SRMA acreage. The visible area extends from the point of closest approach to more than 15 mi (24 km) into the SRMA.

The Organ/Franklin Mountains SRMA is wholly contained within the Organ/Franklin Mountains ACEC, and impacts on the SRMA would be the same as those described below for the Organ/Franklin Mountains ACEC.

ACECs Designated for Outstandingly Remarkable Scenic Values

- *Dona Ana Mountains.* The 1,427-acre (5.775-km^2) Dona Ana Mountains ACEC is 13 mi (21 km) north of the SEZ at the closest point of approach. The ACEC's scenic value is noted in the Mimbres RMP (BLM 1993). The jagged peaks of the Dona Ana Mountains are highly scenic and are within view of most of the northern Mesilla Valley and the northeast portion of Las Cruces. Scenic quality is of more than local significance and is enjoyed by hundreds of thousands of motorists on I-25 annually (BLM 1993). About 745 acres (3.02 km^2), or 52% of the ACEC, is within the 650-ft (198.1-m) viewshed of the SEZ, and 735 acres (2.97 km^2), or 52% of the total ACEC acreage, is in the 24.6-ft (7.5-m) viewshed. The visible area of the ACEC extends approximately 15 mi (24 km) from the northern boundary of the SEZ.

  The Dona Ana Mountains ACEC is wholly contained within the northern portion of the Dona Ana Mountains SRMA and impacts on the ACEC are the same as those described above for the Dona Ana Mountains SRMA.

- *Organ Mountains/Franklin Mountains.* The 58,512-acre (236.79-km^2) Organ/Franklin Mountains ACEC is 6.1 mi (9.8 km) east of the SEZ at the closest point of approach. The ACEC extends about 29 mi (47 km) north to south, from just south of the community of Organ to the Texas border. It is much narrower east to west, generally about 3 mi (5 km) wide, but up to almost 8 mi (13 km) wide in the northernmost section of the ACEC. The ACEC includes portions of the lower western slopes of the Organ Mountains, high peaks in the Organ Mountains, lands in the gap between the Organ and Franklin Mountains, and all but the northernmost portion of the Franklin Mountains down to the Texas border. The ACEC's scenic value is noted in the Mimbres RMP (BLM 1993). The two mountain ranges comprise some of the most spectacular scenery in southern New Mexico, with extensive viewsheds containing both interstate highways and large metropolitan populations. About 41,101 acres (166.33 km^2), or 70% of the ACEC, is within the 650-ft (198.1-m) viewshed of the SEZ, and 39,780 acres (160.98 km^2), or 68% of the total ACEC acreage, is in the 24.6-ft (7.5-m) viewshed. The visible area of the ACEC extends to more than 18 mi (29 km) from the eastern boundary of the SEZ.

Figure 12.1.14.2-21 is a Google Earth visualization of the SEZ as seen from a ridge 0.4 mi (0.6 km) northeast of Modoc Mine just west of the Needles in the Organ Mountains in the northern portion of the ACEC. The viewpoint is about 17 mi (27 km) from the northeast corner of the SEZ. The viewpoint is elevated about 3,350 ft (1,020 m) with respect to the SEZ.

The visualization shows that despite the nearly 17-mi (27-km) distance to the SEZ from this viewpoint, the SEZ fills most of the horizontal field of view. However, the vertical angle of view is relatively low, and solar facilities within the SEZ would appear in a band on the West Mesa beyond the Mesilla Valley to the southwest.

The angle of view is high enough that the tops of collector/reflector arrays of solar facilities within the SEZ would be visible, which would make their large size and strong regular geometry more apparent, which would tend to increase visual contrasts. Taller solar facility components such as transmission towers might be visible if located in the closer portions of the SEZ, but would not be expected to be prominent.

Operating power towers in the SEZ would likely be visible as points of light against the backdrop of West Mesa, but at 17+ mi (27+ km) the tower structures themselves might not be visible. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that would likely be visible, but they would be seen above the numerous lights of the urbanized Mesilla Valley.

Depending on solar facility location within the SEZ, the types of solar facilities and their designs, and other visibility factors, because of the large apparent size of the SEZ and the elevated viewpoint, moderate to strong visual contrasts from solar energy development within the SEZ would be expected at this location.

Figure 12.1.14.2-22 is a Google Earth visualization of the SEZ as seen from a transmission line road about 0.8 mi (1.3 km) west of Bishop Cap, a low, isolated mountain west of the southern end of the Organ Mountains, and in the central portion of the ACEC. The viewpoint is about 8.1 mi (13.1 km) from the nearest point on the eastern side of the SEZ. The viewpoint is elevated about 150 ft (46 m) with respect to the SEZ.

The viewpoint for this visualization is much closer to the SEZ, but also much lower in elevation than the viewpoint for the visualization shown in Figure 12.1.14.2-21. From this viewpoint, solar facilities within the SEZ would stretch across almost the full horizontal field of view. Because the viewpoint is only slightly elevated with respect to the SEZ, however, the vertical angle of view is very low, and solar facilities within the SEZ would

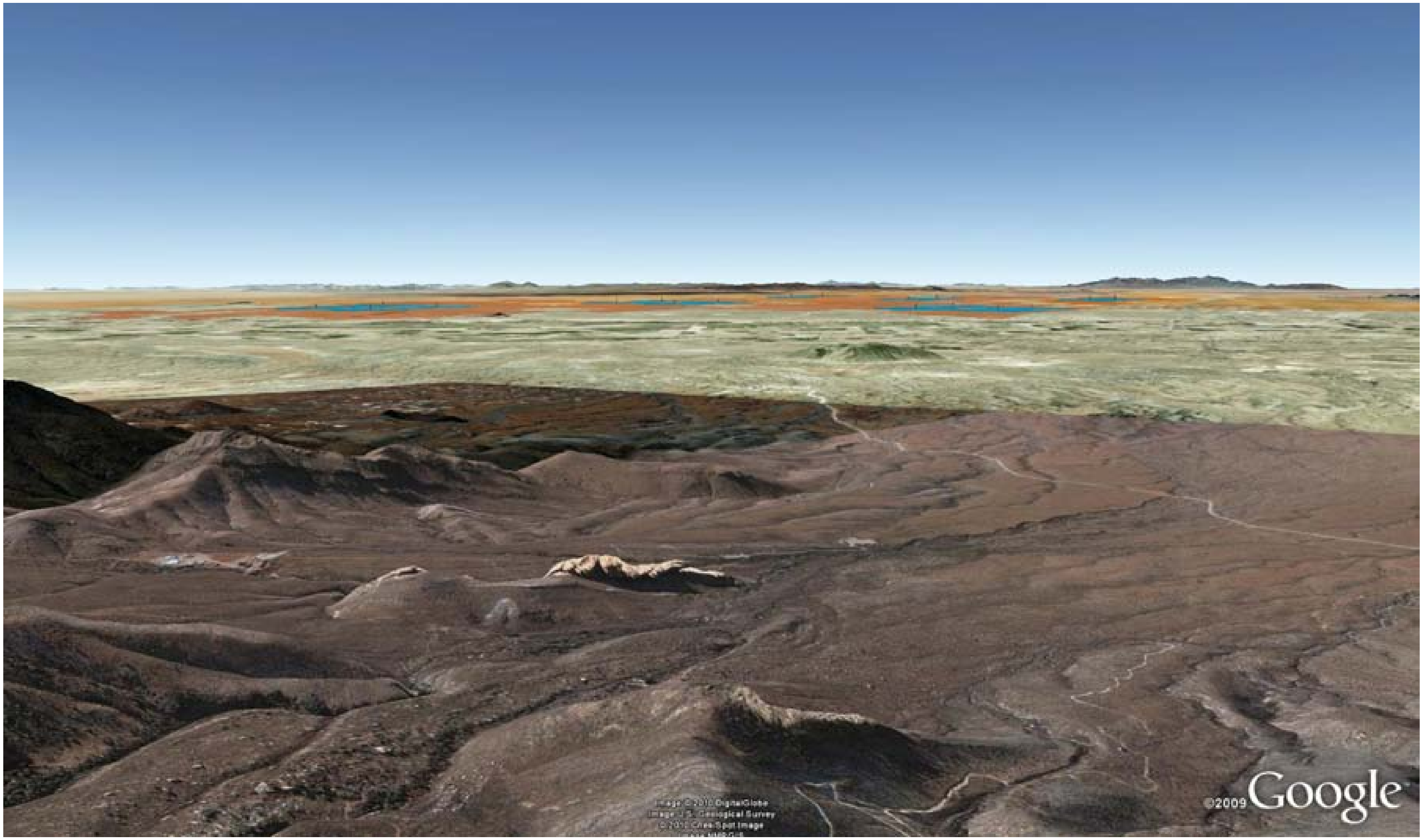

FIGURE 12.1.14.2-21 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Point Northeast of Modoc Mine in Organ/Franklin Mountains ACEC

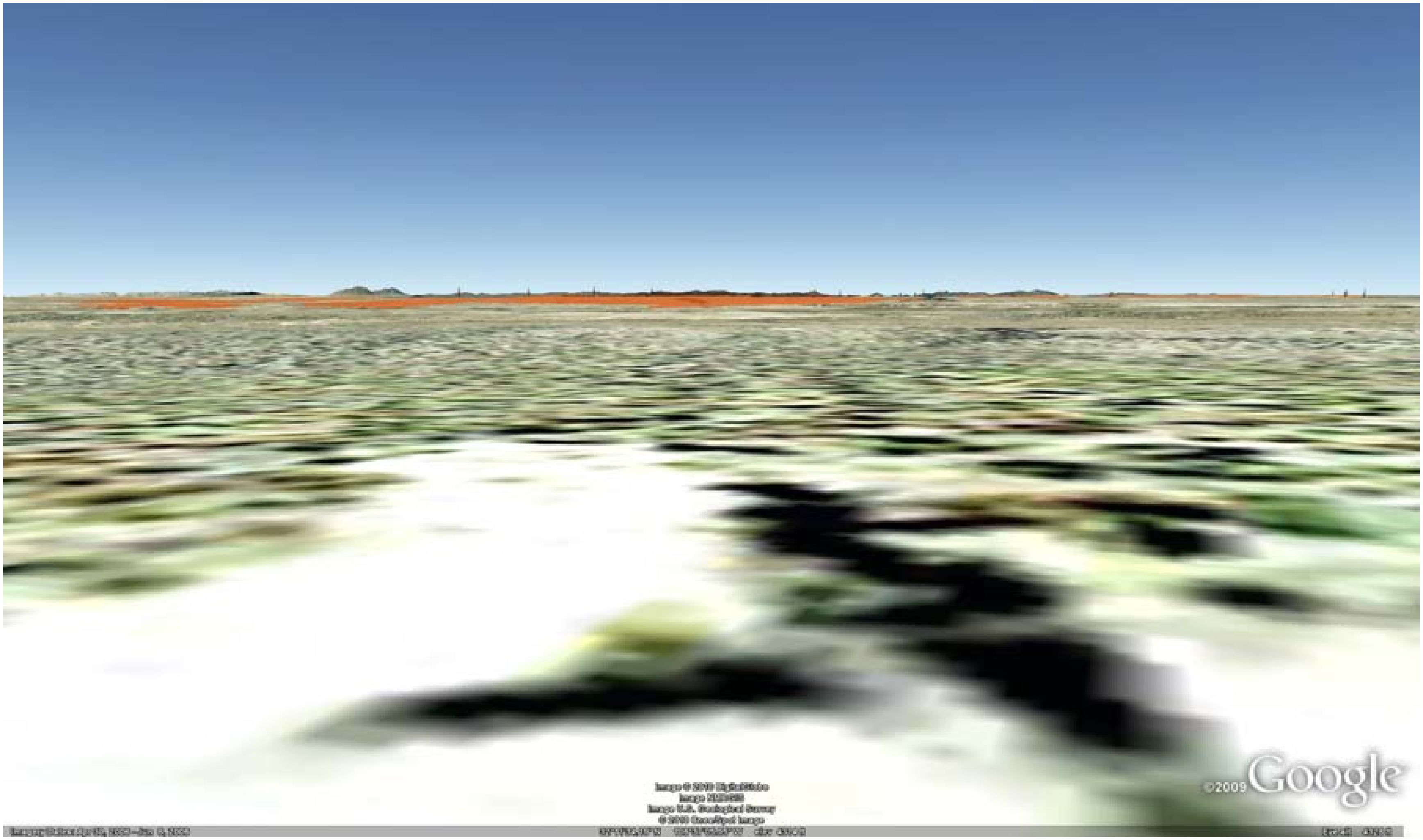

FIGURE 12.1.14.2-22 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Transmission Line Road West of the Organ/Franklin Mountains ACEC

appear in a narrow band on the West Mesa beyond the Mesilla Valley to the southwest.

The collector/reflector arrays of solar facilities within the SEZ would be seen edge-on, which would greatly reduce their apparent size, and they would repeat the line of the horizon in this strongly horizontal landscape, which would tend to reduce visual contrasts from the arrays. Taller solar facility components such as transmission towers would likely be visible, especially if located in the nearer portions of the SEZ, and in the closest parts of the SEZ, they could attract visual attention.

Operating power towers in the farther portions of the SEZ would likely be visible as points of light against the sky or the mountains west of the SEZ, and the tower structures might not be visible. Operating power towers in the closest portion of the SEZ would be much brighter, and could attract visual attention, with the tower structures visible beneath the receivers. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that could be visually conspicuous, but would be seen above the numerous lights of the urbanized Mesilla Valley. Other lighting associated with solar facilities could be visible as well.

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

Figure 12.1.14.2-23 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from North Anthony's Nose, a peak in the Franklin Mountains, in the southern portion of the ACEC. The viewpoint is about 12 mi (19 km) from the southeast corner of the SEZ. The viewpoint is elevated about 1,200 ft (370 m) with respect to the SEZ.

The visualization suggests that from this viewpoint, solar facilities within the SEZ would occupy a substantial portion of the horizontal field of view. Despite the elevated viewpoint, the vertical angle of view is low, and solar facilities within the SEZ would appear in a narrow band on the West Mesa beyond the Mesilla Valley to the west.

The collector/reflector arrays of solar facilities within the SEZ would be seen nearly edge-on, which would reduce their apparent size, and they would repeat the line of the horizon in this strongly horizontal landscape, which would tend to reduce visual contrasts from the arrays. Taller solar facility components such as transmission towers would likely be visible, especially if located in the closer portions of the SEZ, and in the closest parts of the ACEC, they could attract visual attention.

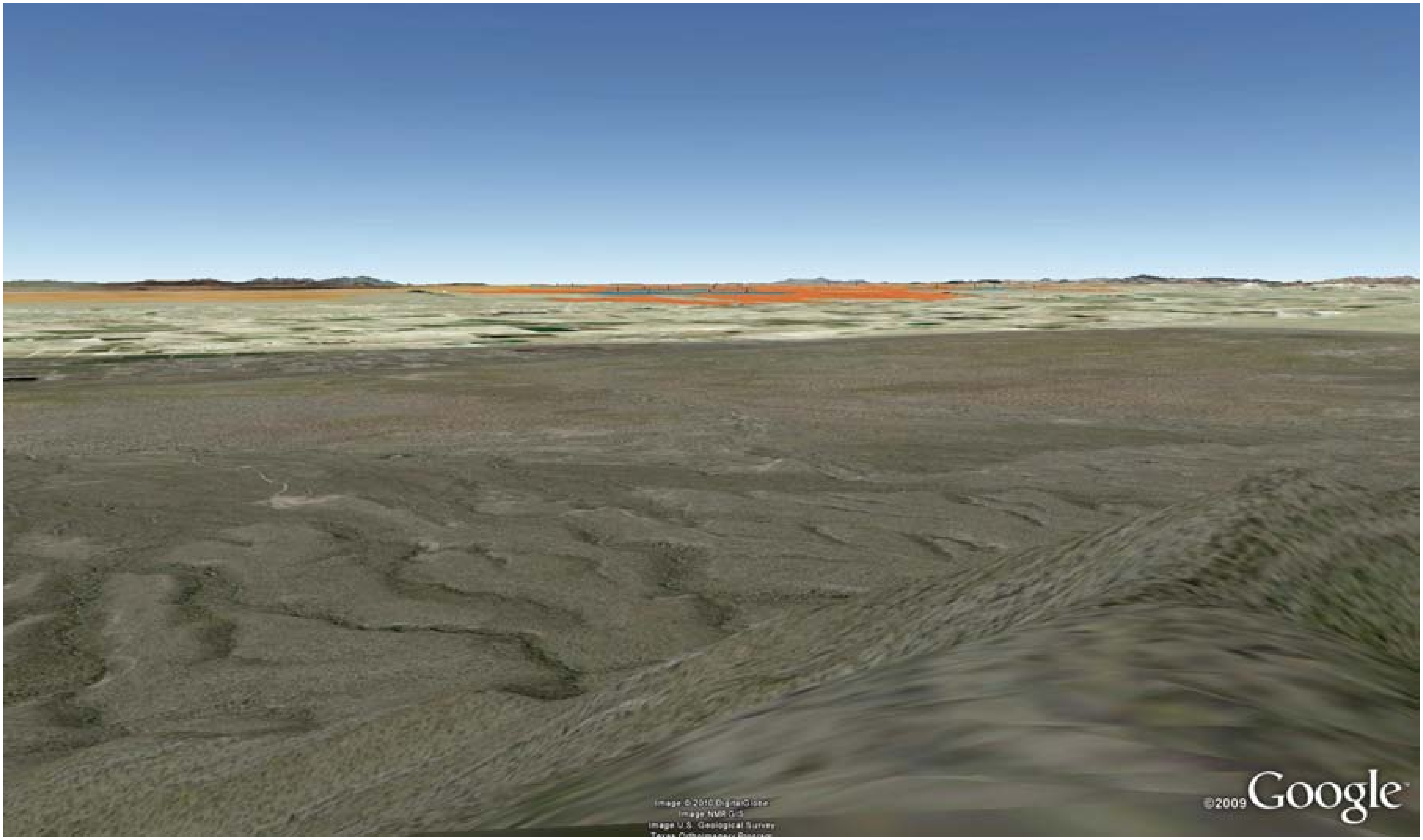

FIGURE 12.1.14.2-23 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Peak of North Anthony's Nose in the Organ/Franklin Mountains ACEC

Operating power towers in the farther portions of the SEZ would likely be visible as points of light against the background of West Mesa, the sky, or the mountains northwest of the SEZ. The tower structures might not be visible. Operating power towers in the closest portion of the SEZ would be much brighter, and could attract visual attention, with the tower structures visible beneath the receivers. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that could be visually conspicuous, but would be seen above the numerous lights of the urbanized Mesilla Valley. Other lighting associated with solar facilities could be visible as well.

The vertical angle of view from this viewpoint is low, and solar facilities within the SEZ would not occupy most of the horizontal field of view. Depending on solar facility location within the SEZ, the types of solar facilities and their designs, and other visibility factors, moderate visual contrasts from solar energy development within the SEZ would be expected at this location.

In summary, most of the ACEC would have open views of solar developments in the SEZ. Because of the SEZ's large size, it would occupy most of the horizontal field of view from the western portion of the ACEC. However, the western portion of the ACEC is at somewhat lower elevation than the eastern parts, which would decrease the vertical angle of view toward the SEZ, tending to diminish contrast. Under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would likely present strong visual contrast levels to viewers at these and similar locations within the ACEC. At some of the more distant viewpoints in the ACEC, moderate levels of visual contrast would be expected, primarily because the SEZ would occupy a smaller portion of the horizontal field of view.

- *Robledo Mountains.* The 8,659-acre (35.04-km^2) Robledo Mountains ACEC is 8.5 mi (13.6 km) north of the SEZ at the closest point of approach. The ACEC's scenic value is noted in the Mimbres RMP (BLM 1993). The Robledos also provide a spectacular scenic quality to the inhabitants of the northern Mesilla Valley. The scenery is enjoyed by hundreds of thousands of travelers on I-25 annually. About 1,971 acres (7.976 km^2), or 23% of the ACEC, is within the 650-ft (198.1-m) viewshed of the SEZ, and 1,561 acres (6.3 km^2), or 18% of the total ACEC acreage, is in the 24.6-ft (7.5-m) viewshed. The visible area of the ACEC extends to about 14 mi (23 km) from the northern boundary of the SEZ.

  The Robledo Mountains ACEC is wholly contained within the Robledo Mountains WSA, and impacts on the ACEC are the same as those described above for the Robledo Mountains WSA.

National Historic Landmark

- *Mesilla Plaza.* Mesilla Plaza has been on the National Register of Historic Places since 1982, and it also is a National Historic Landmark. Mesilla (population of 2,200) is the best-known and most visited historical community in southern New Mexico. All of the plaza is within the 650-ft (198.1-m) and 24.6-ft (7.5-m) viewsheds of the SEZ.

  Figure 12.1.14.2-24 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from Mesilla Plaza. The viewpoint is about 2.7 mi (4.4 km) northeast of the northeast corner of the SEZ. The viewpoint is about 65 ft (20 m) lower in elevation than the nearest point in the SEZ, and it is about 315 ft (95 m) below the mesa edge about 3.5 mi (5.6 km) southwest of the viewpoint.

  The visualization shows that the far northeastern portion of the SEZ projects beyond the edge of West Mesa. Solar facilities in this portion of the SEZ would be in full view from Mesa Plaza.

  Outside of this directly visible portion of the SEZ, the visibility of solar facilities from the Plaza would depend on their proximity to the edge of West Mesa. Taller solar facilities, such as cooling towers, transmission towers, and power towers, could be seen from the Plaza if they were located sufficiently close to the edge of the mesa. Because of the size of the SEZ and its close proximity to the plaza, if these taller facilities were very close to the eastern edge of the SEZ, they could be seen above the edge of the mesa for a stretch of almost 15 mi (24 km), mostly south of the Plaza. Outside of the far northeastern portion of the SEZ, if only low-height facilities such as PV systems were located along the eastern edge of the SEZ, those facilities would be screened by the edge of the mesa and could not be seen from the Plaza.

  If solar facilities within the SEZ were located in the far northeastern corner of the SEZ, they would occupy a moderate portion of the horizontal field of view. Because of the low elevation of the viewpoint, solar facilities within the SEZ would appear in a narrow band on the mesa beyond the Mesilla Valley to the west. If collector/reflector arrays were located in this sloped portion of the SEZ, their strong regular geometry could be visible and could potentially attract attention. At night, lighting associated with solar facilities within the SEZ could be visible from the Plaza as well.

  If power towers were located in this visible nearby portion of the SEZ, they could appear as brilliant non-point light sources. Because of their elevation, they would be highly likely to command visual attention, particularly in the morning, as the tower structures would be front-lit, thus adding short but potentially strong vertical line and color contrasts to the strongly horizontal mesa edge. Lower, but potentially still high, levels of contrast could be caused

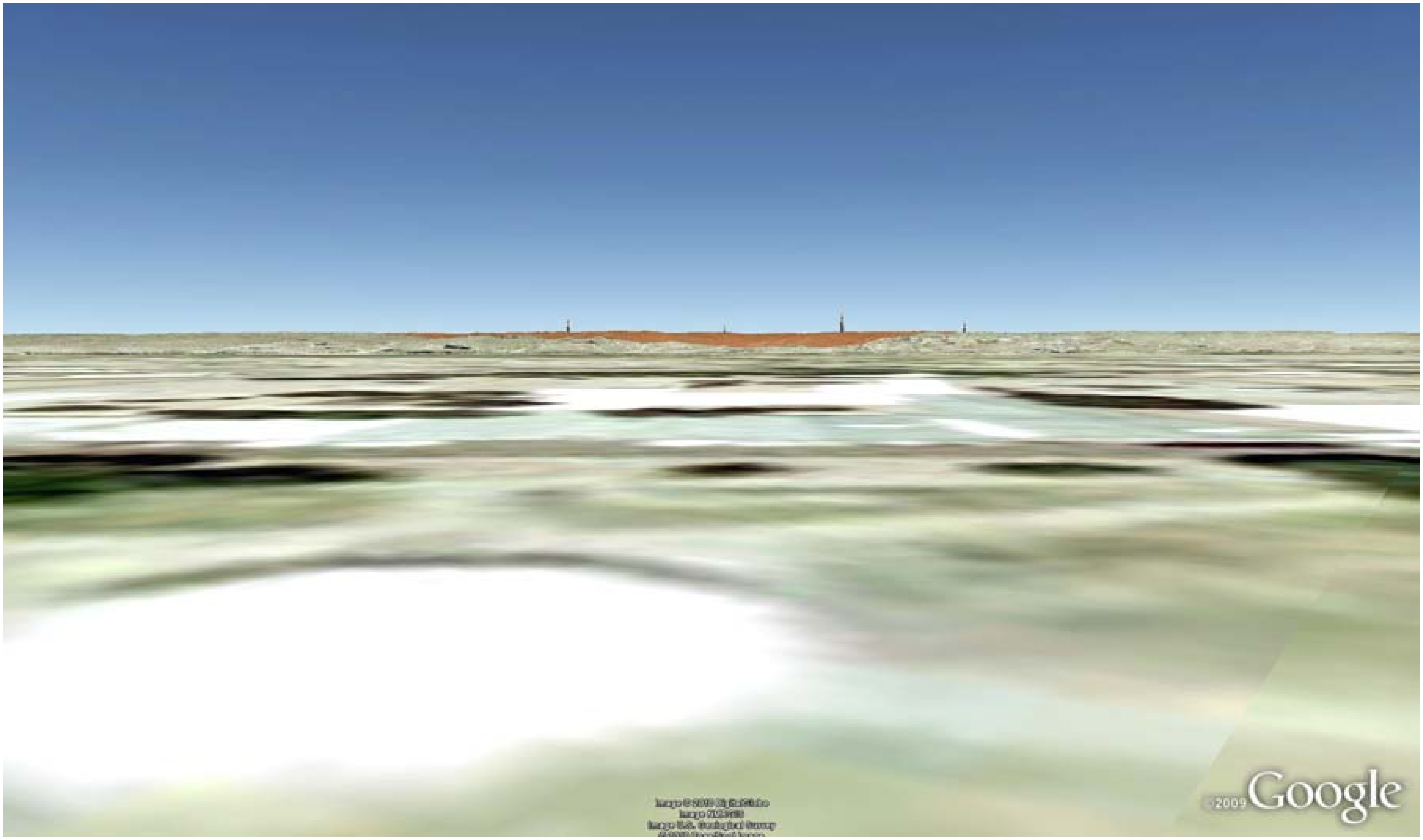

FIGURE 12.1.14.2-24 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Mesilla Plaza National Historic Landmark

by power towers farther from the viewpoint, but close enough to the mesa edge to be visible above the valley slopes. At night, if sufficiently tall, visible power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that could be conspicuous, given their prominent and elevated location, but the Plaza is in a well-lit urban location and numerous lights would be visible throughout the valley.

The potential visual contrast expected for this viewpoint would vary greatly depending on project locations (especially with respect to their proximity to the edge of West Mesa), technologies, and site designs, but because the Plaza is close to the SEZ, solar development within the SEZ could be prominent in the field of view and could strongly attract visual attention from the Plaza. Under the PEIS 80% development scenario, solar facilities within the SEZ would be expected to create moderate to strong visual contrasts as viewed from the Plaza, with stronger contrast levels expected if multiple power tower receivers were visible above West Mesa.

Note that Mason Draw SEZ would also be visible from the Plaza, and if solar facilities were built in that SEZ, they could potentially contribute to visual impacts experienced at the Plaza.

National Natural Landmark

- *Kilbourne Hole.* A remnant of an ancient volcanic explosion, Kilbourne Hole was designated a National Natural Landmark in 1975. This crater is in a desert basin between the Potrillo Mountains and the Rio Grande, 9.3 mi (15.0 km) south-southwest of the SEZ. The crater measures 1.7 mi (2.7 km) long by more than 1 mi (1.6 km) across and is several hundred feet deep.

  Views of the SEZ from inside the Kilbourne Hole crater would be completely screened by the crater walls; however, there is a ridge around nearly the entire crater, and the SEZ would be visible from the ridgeline and north-facing slopes of most of the ridge. A trail runs along the top of much of the ridge.

  Figure 12.1.14.2-25 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the trail on top of the ridge on the north side of the crater, near the point of closest approach to the SEZ. The viewpoint is about 8.0 mi (12.8 km) southwest of the southwest corner of the SEZ and is about 115 ft (35 m) higher in elevation than the nearest point in the SEZ.

  The visualization suggests that from this viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Because of the small elevation difference between the viewpoint and the SEZ, the vertical angle of view would be extremely low, so that if collector/reflector arrays for solar facilities in the

FIGURE 12.1.14.2-25 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Kilbourne Hole National Natural Landmark

SEZ were visible, they would be seen edge on. The edge-on view would have the effect of decreasing the apparent size of a facility and would conceal the strong regular geometry of the arrays, thus reducing the contrast with the surrounding natural-appearing landscape. The edge-on appearance would also make the arrays appear to repeat the strong line of the horizon from this viewpoint, which would tend to decrease visual contrast.

Ancillary facilities, such as transmission towers, buildings, STGs, cooling towers, and plumes (if present) could be visible projecting above the collector/reflector arrays, and their forms, lines, and colors (and movement if plumes were present) could create noticeable contrasts with the strongly horizontal arrays, but would not be likely to strongly attract visual attention.

If operating power towers were visible in the SEZ, the receivers of power towers in the southern parts of the SEZ could be visible as bright points of light atop visible tower structures, which would be seen as short vertical elements against either a sky background or mountain backdrop as seen from this location. More distant tower receivers would be fainter, and the tower structures might not be visible under some viewing conditions. At night, if sufficiently tall, the towers could have red flashing lights, or white or red flashing strobe lights that would likely be visible, but there could be other lights visible in the SEZ vicinity. Other lighting associated with solar facilities could be visible as well.

The vertical angle of view toward the SEZ from this viewpoint is very low, but solar facilities within the SEZ would occupy most of the horizontal field of view looking north and northeast. Depending on solar facility location within the SEZ, the types of solar facilities and their designs, and other visibility factors, moderate to strong visual contrasts from solar energy development within the SEZ would be expected at this and other locations along the top of the ridge around the north side of Kilbourne Hole. Contrast at locations along the ridge on the east, west, and south sides or the crater would generally be lower, due in part to increased distance to the SEZ but primarily because of partial or full screening of the SEZ by other portions of the crater rim.

National Historic Trail

- *El Camino Real de Tierra Adentro.* El Camino Real de Tierra Adentro is a congressionally designated historic trail that extends 404 mi (650 km) from El Paso, Texas, to Ohkay Owingeh Pueblo, New Mexico. Historically, the trail began in Mexico City, Mexico. The historic trail passes within 3.2 mi (5.2 km) east of the SEZ at the point of closest approach. About 42 mi (68 km) of the trail are within the 650-ft (198.1-m) viewshed of the SEZ. Approximately 40 mi (64 km) of the trail are within the 24.6 ft (7.5 m) viewshed. The distance to the SEZ ranges from the point of closest approach to 20 mi (32 km) north of northern boundary of the SEZ.

In the vicinity of the SEZ, the El Camino Real de Tierra Adentro extends north from Anthony, New Mexico, through the Mesilla Valley. The trail shares the same route as the El Camino Real National Scenic Byway for a number of miles, and then it roughly parallels I-10, and I-25, with generally similar visual contrast levels expected from solar energy development within the SEZ as described for those entities below. Much of the byway route through the Mesilla Valley is in rural or urbanized landscapes, with substantial levels of cultural disturbance visible. Views from the byway are sometimes screened briefly by orchards of tall trees that line the roads in the valley, particularly away from Las Cruces.

In the vicinity of Anthony (slightly less than 10 mi [16 km] from the SEZ), the trail follows the route of State Route 478. From the trail in the vicinity of Anthony, the SEZ would occupy a moderate amount of the horizontal field of view, and depending on the location, technology type, and height of facilities within the SEZ, contrast levels would be expected to be at weak to moderate levels. At about 10 mi (16 km) from the SEZ, when operating, power tower receivers would likely appear as bright points of light atop visible tower structures. The vertical angle of view would be quite low, so that visible collector/reflector arrays would be seen edge-on. They would appear as thin (but potentially bright) lines paralleling the rim of the mesa and would repeat the line of the mesa rim, thereby reducing contrast. Ancillary facilities, such as buildings, transmission towers, and other features, as well as plumes, could be visible if located in the eastern portions of the SEZ. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that could attract attention, but would be seen above the numerous lights of Las Cruces and the surrounding communities. Other lighting associated with solar facilities could be visible as well.

Figure 12.1.14.2-32 (see below under analysis for I-10) is a Google Earth visualization of the SEZ as seen from I-10 just east of Anthony, about 1 mi (2 km) from the trail in Anthony. The view of the SEZ as seen from the trail in Anthony would be nearly identical to the view shown in Figure 12.1.14.2-32, and a detailed description of that view is given below. Depending on the location, technology type, and height of facilities within the SEZ, contrasts would be expected to be at weak to moderate levels.

North of Anthony, the trail route extends more or less parallel to the irregular eastern boundary of the SEZ. As portions of the SEZ are located slightly east of the rim of West Mesa, lower-height solar facilities in this portion of the SEZ would be visible, as would taller solar facilities outside of this area but close to the rim of the mesa, and the expected contrasts would quickly rise to moderate or strong levels.

Figure 12.1.14.2-26 is a visualization of solar facilities within the SEZ as seen from the trail at the intersection of State Routes 478 and 226, just west of Berino. The viewpoint is 5.5 mi (8.8 km) from, and about 115 ft (35 m) lower in elevation than, the nearest point in the SEZ.

The visualization shows that the far eastern portion of the SEZ projects beyond the edge of West Mesa. Solar facilities in this portion of the SEZ would be in full view from the trail at this point.

Outside of this directly visible portion of the SEZ, the visibility of solar facilities from this viewpoint would depend on their proximity to the edge of West Mesa. Taller solar facilities, such as cooling towers, transmission towers, and power towers, could be seen from this viewpoint on the trail if they were located sufficiently close to the edge of the mesa. Because of the size of the SEZ and its close proximity to the plaza, if these taller facilities were very close to the eastern edge of the SEZ, they could be seen above the edge of the mesa. Outside of the directly visible portion of the SEZ, if only low-height facilities such as PV systems were located along the eastern edge of the SEZ, those facilities would be screened by the edge of the mesa and could not be seen from the trail at this location.

If solar facilities within the SEZ were located in the far eastern portion of the SEZ, they could occupy a large portion of the horizontal field of view. Because of the low elevation of the viewpoint with respect to the visible portions of the SEZ, solar facilities within the SEZ would appear in a narrow band on the mesa beyond the Mesilla Valley to the west.

If power towers were located in the directly visible portion of the SEZ, they could appear as very bright points of light atop visible tower structures. Because of their elevation, they would likely attract visual attention, particularly in the morning, because the tower structures would be partially or fully front-lit, thus adding short but potentially strong vertical line contrasts to the strongly horizontal mesa edge. Lower levels of contrast could be caused by power towers farther from the viewpoint, but close enough to the mesa edge to be visible above the valley slopes. At night, if sufficiently tall, visible power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that could be conspicuous, given their prominent and elevated location, but the viewpoint is in a relatively well-lit urban location, and there would be numerous lights visible throughout the valley.

The potential visual contrast expected for this viewpoint would vary greatly depending on project locations (especially with respect to their proximity to the edge of West Mesa), technologies, and site designs, but because the trail is close to the SEZ, solar development within the SEZ could be prominent in the field of view and could attract visual attention from the trail. Under the PEIS 80% development scenario, solar facilities within the SEZ would be expected

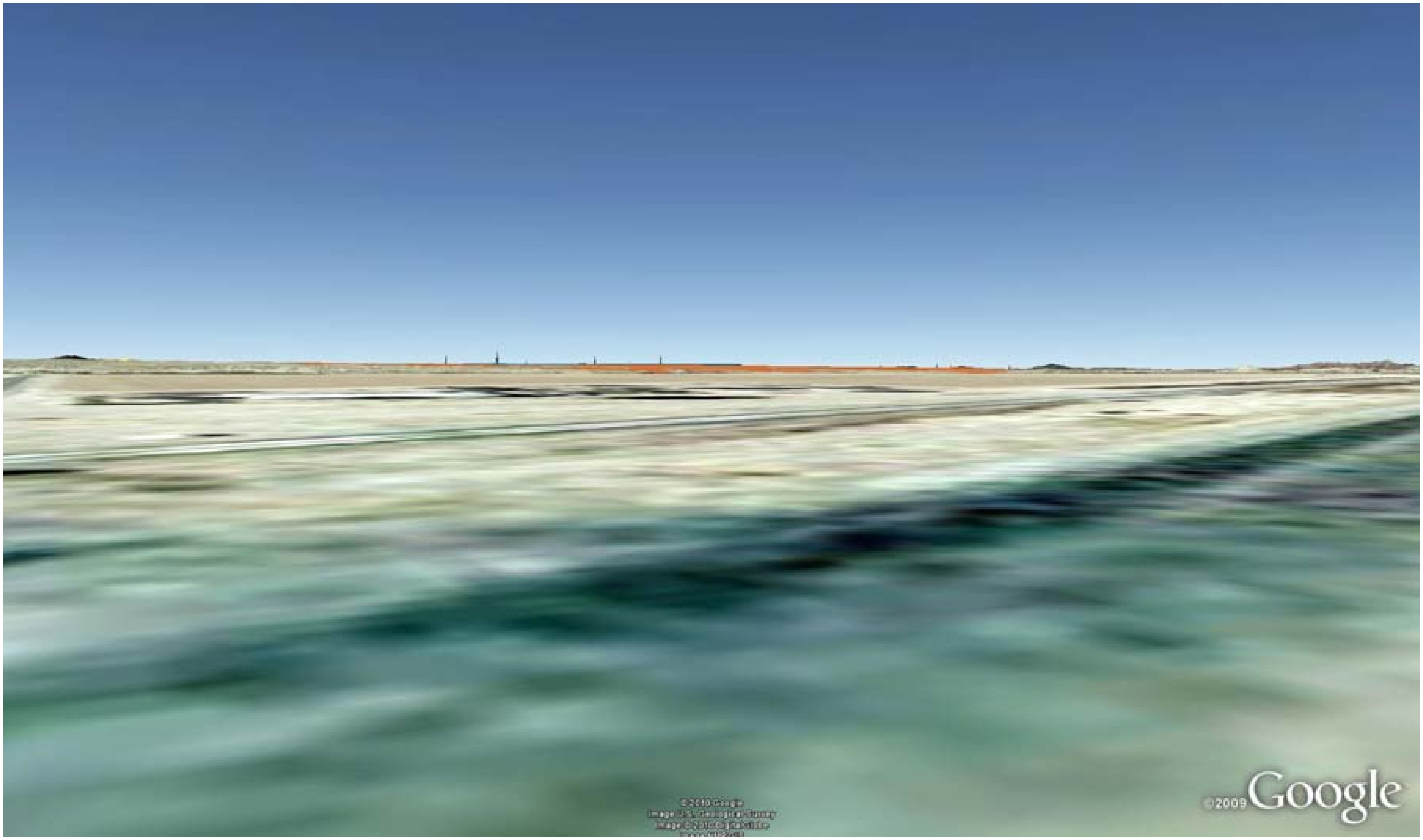

FIGURE 12.1.14.2-26 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the El Camino Real de Tierra Adentro National Historic Trail near Berino

to create moderate to strong visual contrasts as viewed from the trail at this location, with stronger contrast levels expected if there were multiple power tower receivers visible above West Mesa.

In the vicinity of Vado (about 3.5 mi [5.7 km] from the SEZ), the SEZ would stretch across much of the western horizon visible from the trail, and under the 80% development scenario analyzed in the PEIS, strong visual contrast levels from solar facilities would be expected for trail users in this area.

Under the 80% development scenario analyzed in the PEIS, visual contrast levels from solar facilities in the SEZ would likely be maximized in the vicinity of Mesquite, about 3.1 mi (5.1 km) from the closest point in the SEZ. Figure 12.1.14.2-27 is a visualization of solar facilities within the SEZ as seen from the trail at the intersection of State Routes 478 and 228 in Mesquite. The viewpoint is at the same elevation as the nearest point in the SEZ, so there would be open but low-angle views from the trail to the SEZ.

Because of the close proximity of the trail to the SEZ, the SEZ would be too large to be encompassed in one view; viewers would need to turn their heads to scan across the whole SEZ. The visualization shows that the far eastern portion of the SEZ projects beyond the edge of West Mesa in two areas—a very large portion of the eastern edge of the SEZ would be visible directly west of the viewpoint, and a very small portion would be visible to the north, where the northeastern corner of the SEZ projects over the mesa rim.

Solar facilities in the large, nearby portion of the SEZ would be in full view from the trail at this viewpoint. If collector/reflector arrays were located in these sloped portions of the SEZ, their strong regular geometry could be visible. Collector/reflector arrays for solar facilities at higher elevations within the SEZ would be seen edge-on, which would reduce their apparent size, conceal the arrays' strong regular geometry, and would also cause them to appear to repeat the strong line of the horizon, thus tending to reduce visual contrast. However, ancillary facilities, such as buildings, cooling towers, transmission towers, and other features, as well as any plumes, would likely be plainly visible. Their forms, lines, and movement (for plumes) projecting above the strong horizontal line of the collector/reflector arrays could attract visual attention, particularly if located in the closest portions of the SEZ.

If power towers were located in the directly visible portion of the SEZ, they could appear as very bright non-point light sources atop visible tower structures. Because of their elevation, they would be likely to strongly attract visual attention, particularly in the morning, as the tower structures would be front-lit, thus adding short but potentially strong vertical line contrasts to the strongly horizontal mesa edge. Lower levels of contrast could be caused by power towers farther from the viewpoint, but close enough to the mesa edge

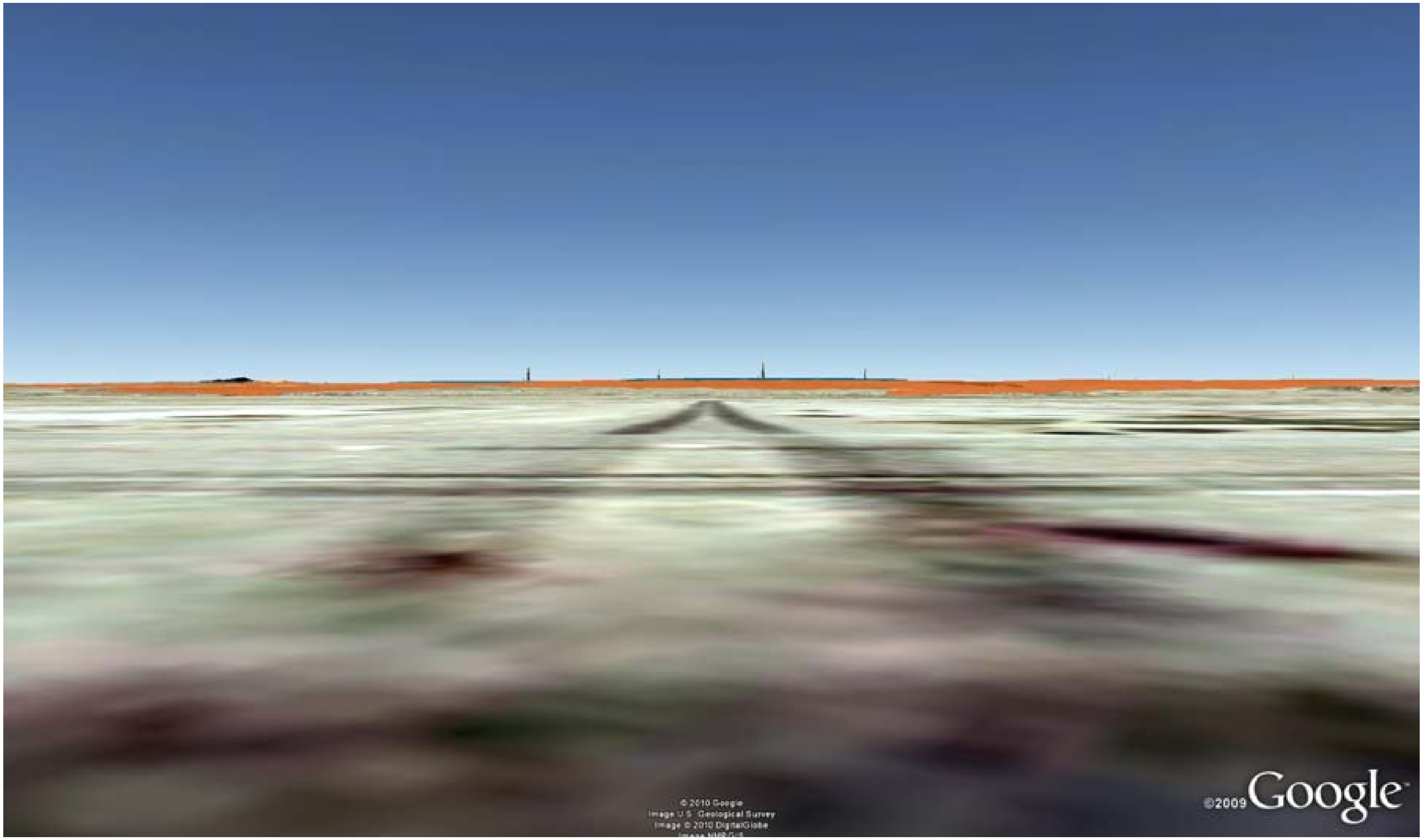

FIGURE 12.1.14.2-27 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the El Camino Real de Tierra Adentro National Historic Trail in Mesquite

to be visible above the valley. At night, if sufficiently tall, visible power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that could be very conspicuous, given their prominent and elevated location, but the viewpoint is in a relatively well-lit urban location, and there would be numerous lights visible throughout the valley.

Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ could dominate views toward the western side of the Mesilla Valley from this location and would be expected to create strong visual contrasts as viewed from this location on the trail.

As trail users travel north out of Mesquite, contrast levels would drop to moderate levels within about 3 mi (5 km) as they moved away from the main part of the eastern side of the SEZ. At about 4.0 mi (6.4 km) north of Mesquite, the trail leaves State Route 478 and cuts across agricultural fields into La Cruces, roughly following Solano Drive until again crossing agricultural lands from Las Cruces to Dona Ana. Contrast levels would decline slowly as the trail runs northward. In the vicinity of Mesilla, the trail passes the northern boundary of the SEZ, and after this point, because the SEZ would be behind viewers (but visible to the left of the trail for a time), views of the SEZ would likely decrease in frequency and duration.

Figure 12.1.14.2-30 (see below) is a Google Earth visualization of the SEZ as seen from I-25 at the interchange at Dona Ana, about 0.5 mi (0.8 km) east of the trail in this area. The view of the SEZ from the trail in the Dona Ana area would be nearly identical to the view shown in Figure 12.1.14.2-30, as described below. Depending on the location, technology type, and height of facilities within the SEZ, contrasts would be expected to be at weak to moderate levels and would drop further as trail users progressed to the northern portions of Mesilla Valley.

Southbound travelers on the trail would have a generally similar visual experience to northbound travelers, but with a more gradual buildup of contrast because of the longer and straighter approach toward the SEZ in the 24.6 ft (7.5 m) SEZ viewshed. Upon reaching the vicinity of Vado, southbound travelers would have passed the SEZ, and contrast would quickly drop off from the strong levels seen at Vado.

Scenic Byway

- *El Camino Real.* El Camino Real is a congressionally designated scenic byway that extends 299 mi (481 km) from the U.S.–Mexico border to Santa Fe. The scenic byway passes within 3.2 mi (5.1 km) east of the SEZ at the point of closest approach. About 52 mi (84 km) of the byway are within the 650-ft (198.1-m) viewshed of the SEZ, with about 22 mi (35 km) in the 24.6 ft

(7.5 m) viewshed of the SEZ. The distance between the byway and SEZ ranges from the point of closest approach to over 24 mi (39 km) south of the southeastern boundary of the SEZ.

In the vicinity of the SEZ, the El Camino Real National Scenic Byway extends north from EL Paso through the Mesilla Valley. The byway shares the same route as the El Camino Real de Tierra Adentro National Historic Trail for a number of miles, and then roughly parallels I-10, and I-25, with generally similar visual contrast levels expected from solar energy development within the SEZ as described for those entities above and below. Much of the byway route through the Mesilla Valley is in rural or urbanized landscapes, with substantial levels of cultural disturbance visible. Views from the byway are sometimes screened briefly by orchards of tall trees that line the roads in the valley, particularly away from Las Cruces.

The southern portion of the byway follows New Mexico State Route 273, turns east briefly at La Union for about 1.0 mi (1.6 km), then follows State Route 28 north for about 5 mi (8 km) before turning east again at State Route 168. At this point, the byway enters the 24.6-ft (7.5-m) viewshed of the SEZ; however, northbound travelers would be facing east, away from the SEZ at this point. The byway follows State Route 168 east for about 3 mi (5 km), then turns north at State Route 478, and follows that route past the SEZ. Just after crossing I-10, the trail follows State Route 188 and then State Route 185 north and slightly west until it leaves the viewshed about 3.5 mi (5.6 km) north of Radium Springs.

For the first 22 mi (35 km) of the byway, visibility of solar facilities within the SEZ would be limited to taller solar facilities located in the eastern portion of the SEZ, as most of the SEZ would be screened from view by the rim of West Mesa. The upper portions of taller power towers could be visible from the byway as points of light just over the rim of West Mesa or landforms between the byway and the Mesa. The upper portions of transmission towers and shorter power towers could also be visible from some locations. If more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from the byway at night. Expected visual contrast levels would be minimal to weak.

Shortly after entering the 24.6-ft (7.5-m) SEZ viewshed, the byway turns north on State Route 478, so that the byway is facing more or less parallel to the irregular eastern boundary of the SEZ. Because portions of the SEZ are located slightly east of the rim of West Mesa, lower-height solar facilities in this portion of the SEZ would be visible, and in addition, taller solar facilities outside of this area but close to the rim of the mesa could be visible as well. The expected contrasts would quickly rise to moderate or strong levels.

Figure 12.1.14.2-26 (see above under discussion of impacts on El Camino Real de Tierra Adentro National Historic Trail) is a visualization of solar facilities within the SEZ as seen from the byway at the intersection of State Routes 478 and 226, just west of Berino. The viewpoint is common to both the byway and the El Camino Real de Tierra Adentro National Historic Trail, and the discussion above for the latter provides a description of the view from this location.

In the vicinity of Vado (about 3.5 mi [5.7 km] from the SEZ), the SEZ would stretch across much of the western horizon visible from the byway, and under the 80% development scenario analyzed in the PEIS, strong visual contrast levels from solar facilities would be expected for byway users in this area.

Under the 80% development scenario, visual contrast levels from solar facilities in the SEZ would likely be maximized in the vicinity of Mesquite, about 3.1 mi (5.1 km) from the closest point in the SEZ. Figure 12.1.14.2-27 (see above under discussion of impacts on El Camino Real de Tierra Adentro National Historic Trail) is a visualization of solar facilities within the SEZ as seen from the byway at the intersection of State Routes 478 and 228 in Mesquite. The viewpoint is common to both the byway and the El Camino Real de Tierra Adentro National Historic Trail, and the discussion above for the latter provides a description of the view from this location.

As byway users travel north out of Mesquite, away from the main part of the eastern side of the SEZ, contrast levels would drop to moderate levels within about 3 mi (5 km). Contrast levels would then decline slowly. Eventually, the northeastern corner of the SEZ would come more fully into view, so that it would add somewhat to contrast levels seen from the byway, but contrast would not likely exceed moderate levels.

Near Mesilla, the byway veers slightly west to follow State Route 188. However, at this point vehicles would have passed the northern boundary of the SEZ, so the number and duration of views from northbound vehicles would decrease because the SEZ would be behind the vehicle (but visible to the left of the vehicle for a time). Contrast from solar facilities in the SEZ would likely fall to weak levels as seen from the byway in the vicinity of Dona Ana and would drop further as travelers progress to the northern portions of Mesilla Valley.

Southbound travelers on the byway would have a generally similar visual experience to northbound travelers, but with a more gradual buildup of contrast because of the longer and straighter approach toward the SEZ in the 24.6-ft (7.5-m) SEZ viewshed. Upon reaching the vicinity of Vado, southbound travelers would have passed the SEZ, and contrast would drop off quickly from the strong levels seen at Vado, as the byway would leave the 24.6-ft (7.5-m) viewshed about 6 mi (10 km) south of Vado.

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

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by other facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. Currently a 345-kV transmission line is within the proposed SEZ, so construction and operation of a transmission line outside the proposed SEZ would not be required. However, construction of transmission lines within the SEZ to connect facilities to the existing line would be required. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 345-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. Note that depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

Impacts on Selected Other Lands and Resources

Butterfield Trail. The Butterfield Trail is an historic mail and passenger stagecoach trail that ran between Memphis, Tennessee, St Louis, Missouri, and San Francisco, California. The trail was an important route that connected the eastern United States to the western frontier. The trail's trace passes just north of both the Afton and Mason Draw SEZs, and solar facilities in both SEZs could be visible to trail users. About 15 mi (24 km) of the trail passes through the proposed Afton SEZ 25-mi (40-km) viewshed, with 3.4 mi (5.5 km) in the 24.6-ft (7.5-m) viewshed. Much of trail within the proposed Afton SEZ viewshed is also in the proposed Mason Draw SEZ viewshed and could potentially be subject to visual impacts from solar development in both SEZs. The proposed Mason Draw SEZ is closer to the Butterfield Trail than the proposed Afton SEZ.

The trail enters the 25-mi (40 km) viewshed of the proposed Afton SEZ about 5.5 trail mi (8.9 km) west of the Mesilla Valley near Picacho Peak, and about 5.2 mi (8.4 km) north of the SEZ. The trail ascends from a shallow canyon onto the West Mesa, where solar facilities within the SEZ would be in view. For westbound trail users, barring screening by the scrub vegetation common to the area or screening by small undulations in local topography, the upper portions of sufficiently tall power towers in the far northern portion of the SEZ could come into view above the southern horizon just west of the ruins of a Butterfield Trail stagecoach stop about 5.5 mi (8.8 km) north of the SEZ. At this point and at many points along the trail, visual contrasts from solar facilities in the proposed Afton SEZ would be minimal to weak. If sufficiently tall, at night, visible power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that could be noticeable, but there could be other lights visible in the vicinity of the SEZ, especially around I-10, which is located between the trail and the SEZ.

After a short distance, views of the solar SEZ would be largely obscured by a low ridge between the trail and the SEZ. Figure 12.1.14.2-28 is a Google Earth visualization of the SEZ as seen from the Butterfield Trail west of the ridge. The viewpoint is about 1.1 mi (1.8 km) west of the stagecoach stop. The viewpoint is about 6 mi (10 km) north of the SEZ and is about 110 ft (34 m) higher in elevation than the nearest point in the SEZ.

The visualization shows that at this viewpoint, barring screening by the scrub vegetation common to the area or screening by small undulations in local topography, power towers in the western portion of the SEZ would likely be in view above the southern horizon. Solar facilities in the eastern portion of the SEZ would be screened by the ridge mentioned above.

Lower-height facilities could be visible, but the vertical angle of view would be very low. Collector/reflector arrays would be seen edge-on, if at all, and would appear as very thin lines on the southern horizon, repeating the strong horizon line, which would reduce contrasts. Ancillary facilities, such as buildings, STGs, and other power block components, cooling towers, and transmission facilities, as well as plumes (if present), could be visible above the collector/reflector arrays and could add form, color, and line contrast, especially for facilities in the northern portion of the SEZ.

If operating power towers in far northern portion of the SEZ were in view, they would likely appear as bright lights atop visible tower structures and would likely attract visual attention for viewers looking south from the trail, especially if multiple towers were visible. Power towers in the far southern portion of the SEZ could still be visible but would be less bright and very low to the horizon, and thus more likely to be screened by vegetation and small undulations in local topography. If more than 200 ft (61 m) tall, power towers would have navigation warning lights that could be visible from this location at night. Other lighting associated with solar facilities could potentially be visible as well.

The potential visual contrast expected for this viewpoint would vary greatly depending on project locations within the SEZ, technologies, and site designs, but under the PEIS 80% development scenario, solar facilities within the SEZ would be expected to create weak to moderate visual contrasts as seen from this viewpoint. Stronger contrast levels would be expected if there were multiple power tower visible in the northern portion of the SEZ, and much lower contrast levels would be expected if only low-height solar facilities were located in the northern portion of the SEZ.

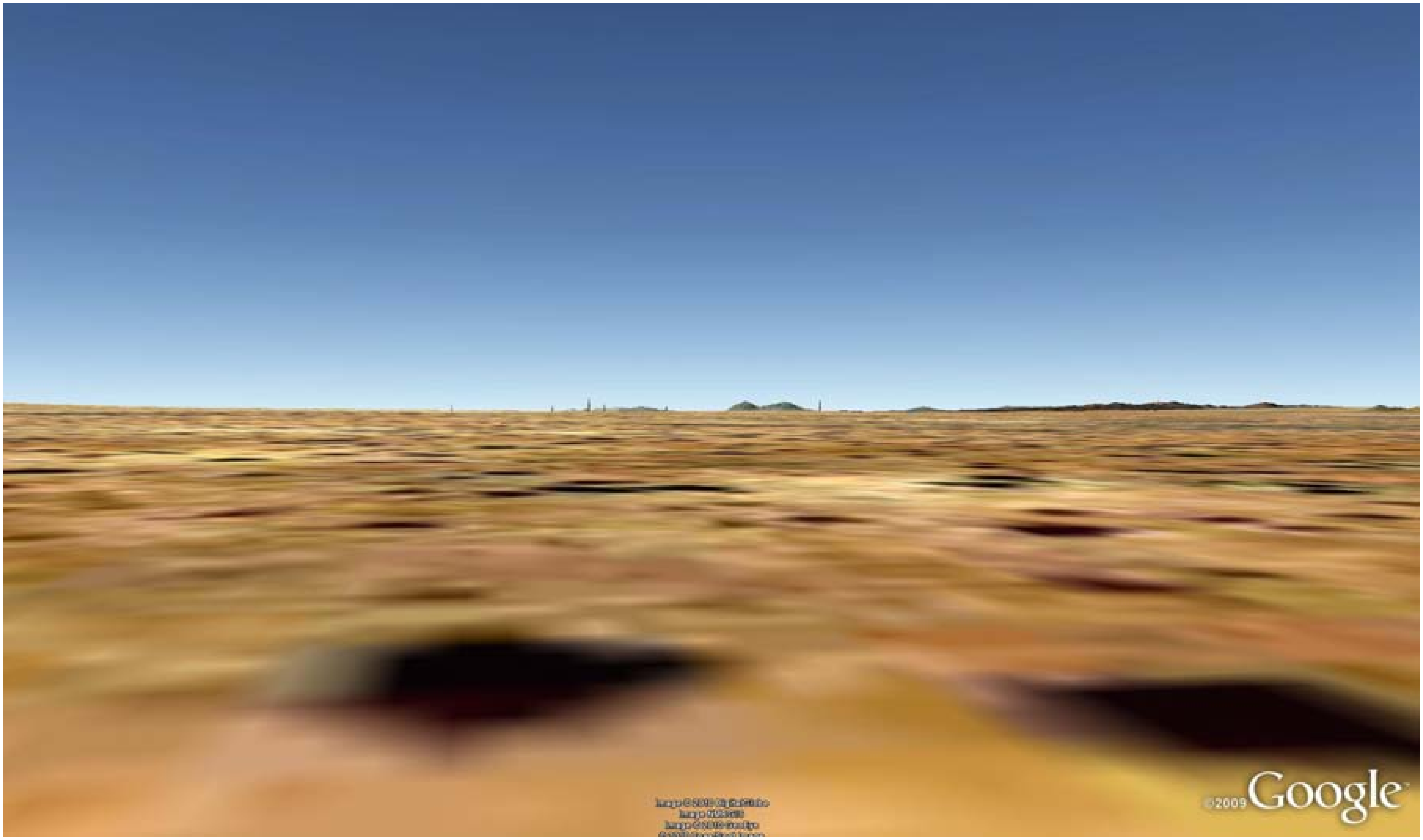

FIGURE 12.1.14.2-28 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Butterfield Trail about 6 mi (10 km) North of the SEZ

The upper portions of sufficiently tall power towers located in the Mason Draw SEZ could also be visible from this location, and if solar facilities were built in that SEZ, they could potentially contribute to visual impacts experienced at this point on the Butterfield Trail.

West of the viewpoint discussed above, the trail descends into a wash about 2.2 mi (3.5 km) west of the stagecoach stop, and because of the loss of elevation, visibility of solar facilities in the SEZ would decrease due to topographic screening. Beyond the wash, the trail gains slightly in elevation, and potential visibility of solar facilities within the SEZ would increase gradually, reaching a maximum about 5 mi (8 km) west of the stagecoach stop.

Figure 12.1.14.2-29 is a Google Earth visualization of the SEZ as seen from the Butterfield Trail near the point of maximum potential visibility of solar facilities within the proposed Afton SEZ. The viewpoint is about 5 mi (8 km) west of the stagecoach stop. The viewpoint is about 7.4 mi (11.9 km) north of the northwest corner of SEZ and about 1.5 mi (2.4 km) east of the gap between the Rough and Ready Hills and the Sleeping Lady Hills. The viewpoint is about 120 ft (37 m) higher in elevation than the nearest point in the SEZ.

The visualization shows that at this viewpoint, barring screening by the scrub vegetation common to the area or screening by small undulations in local topography, tall power towers throughout much of the SEZ would likely be in view above the southern horizon. Solar facilities in the far western portion of the SEZ would be screened by the Sleeping Lady Hills west of the viewpoint.

Lower-height facilities could be visible, but the vertical angle of view would be very low. Collector/reflector arrays would be seen edge-on, if at all, and would appear as very thin lines on the southern horizon, repeating the strong horizon line, which would reduce contrasts. Ancillary facilities, such as buildings, STGs, other power block components, cooling towers, and transmission facilities, as well as plumes (if present), could be visible above the collector/reflector arrays and could add form, color, and line contrast, especially for facilities in the far northwestern portion of the SEZ.

If operating power towers in far northern portion of the SEZ were in view, they would likely appear as bright lights atop visible tower structures and would likely attract visual attention for viewers looking south from the trail, especially if multiple towers were visible. If more than 200 ft (61 m) tall, power towers would have navigation warning lights that could be visible from this location at night. Other lighting associated with solar facilities could be visible as well.

Power towers in the far southern portion of the SEZ could still be visible, but would be less bright and very low to the horizon, thus more likely to be screened by vegetation and small undulations in local topography. Power towers on the far southeastern portion of the SEZ might be screened by topography.

The potential visual contrast expected for this viewpoint would vary greatly depending on project locations within the SEZ, technologies, and site designs, but under the PEIS 80% development scenario, solar facilities within the SEZ would be expected to create weak to

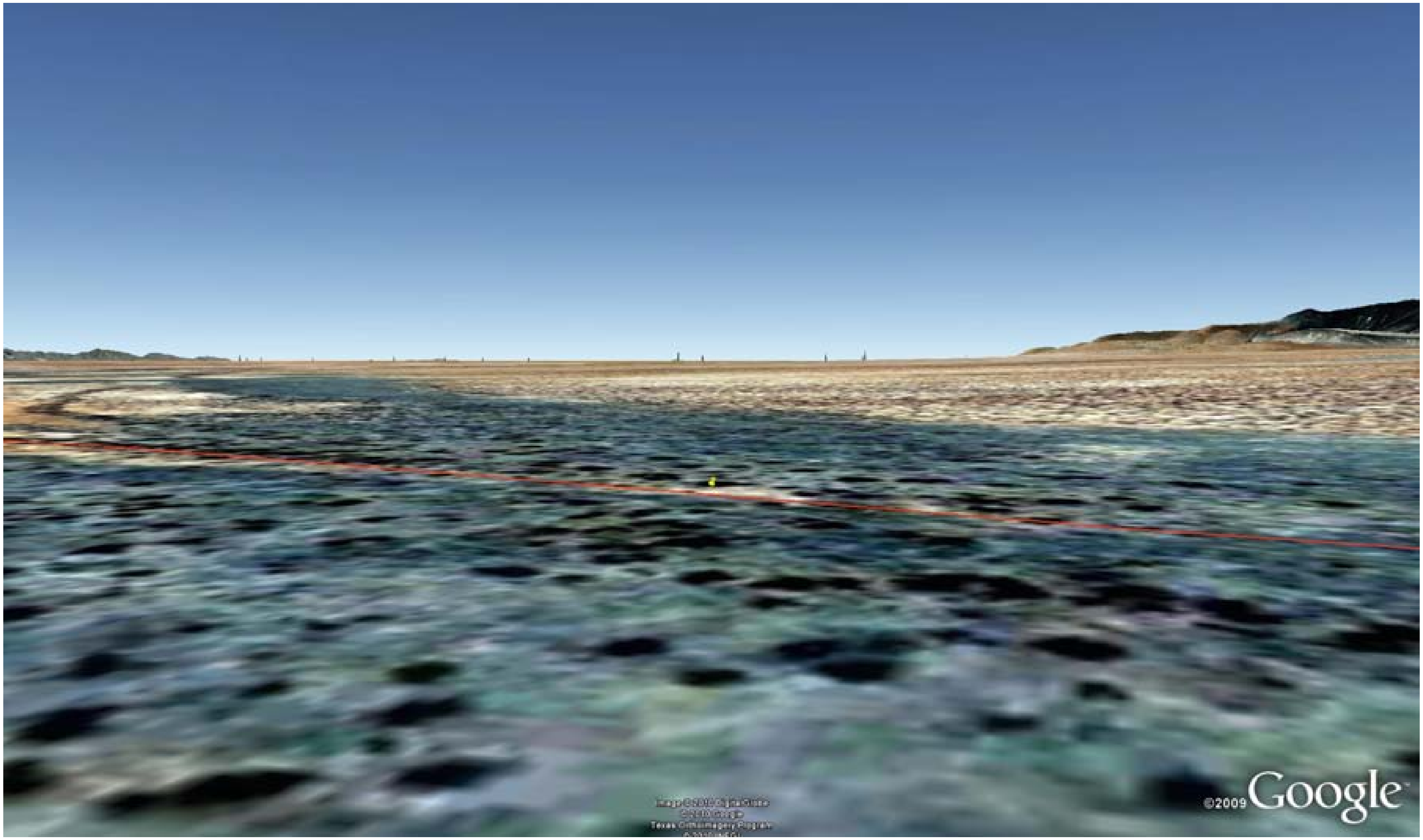

FIGURE 12.1.14.2-29 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Butterfield Trail near the Sleeping Lady Mountains

moderate visual contrasts as seen from this viewpoint. Stronger contrast levels would be expected if there were multiple power tower visible in the northern portion of the SEZ, and much lower contrast levels would be expected if only low-height solar facilities were located in the northern portion of the SEZ.

Solar facilities located in the Mason Draw SEZ would be screened from view with the possible exception of very tall power towers placed in particular locations within that SEZ. If power towers were built in those locations, they could potentially contribute to visual impacts experienced at this point on the Butterfield Trail. However, the likelihood of that occurring is low, and the expected additional visual contrasts would be weak. Section 12.2.14.2.2 of the PEIS provides discussion of potential visual impacts associated with solar development within the Mason Draw SEZ.

West of the gap between the Rough and Ready Hills and the Sleeping Lady Hills, views of solar facilities within the proposed Afton SEZ would be limited to sporadic glimpses of the receivers of tall power towers located in the western portions of the SEZ, which would be expected to create minimal contrasts. However, just west of the Sleeping Lady Hills, views of the Mason Draw SEZ would open up, and if solar facilities were present in that SEZ, they would likely contribute substantially to overall impact levels from Butterfield Trail.

Eastbound travelers on the Butterfield Trail would have similar views of solar facilities within the SEZ, but the order would be reversed, with one important potential distinction: if solar facilities were present in the Mason Draw SEZ, eastbound travelers would see the potentially strong visual contrasts associated with those facilities before seeing any substantial visual contrasts from solar facilities within the proposed Afton SEZ. The strongest contrasts from solar facilities in the proposed Afton SEZ would be seen shortly after seeing large contrasts from facilities within the Mason Draw SEZ, which could affect the perception of relative impact from the solar facilities in two SEZs.

In summary, the Butterfield Trail parallels the northern boundary of the SEZ throughout the SEZ viewshed, although in many places topographic screening and the very low angle of view would limit visual contrasts from solar facilities within the SEZ. Visual contrast levels seen from the trail would be highly dependent on the number, location, and height of power towers and other tall solar facility components in the northern portion of the SEZ. Under the 80% development scenario analyzed in the PEIS, potentially up to moderate levels of visual contrasts could be expected at points on the trail if multiple power towers or other tall solar facility components were located in the northern portions of the SEZ, with lower contrasts expected if taller facilities were not located in the northern portions of the SEZ. Regardless, in many portions of the trail within the SEZ viewshed, expected visual contrast levels from solar development in the proposed Afton SEZ would be minimal to weak, due primarily to topographic screening and the very low angle of view between the trail and the SEZ. Finally, from some locations on the Butterfield Trail, solar facilities in the Afton and Mason Draw SEZs could be visible simultaneously, potentially resulting in larger visual impacts.

Interstate 25. I-25, generally a four-lane interstate highway, extends north–south through the Mesilla Valley in the SEZ viewshed, from Las Cruces to just north of the community of Radium Springs. The AADT value for I-25 in the vicinity of the SEZ ranges from about 10,000 vehicles at the I-25–I-10 interchange in Las Cruces to 39,200 vehicles at the East Lohman Avenue interchange, and 16,300 vehicles north of the U.S. 70 interchange (NM DOT 2009).

About 23 mi (37 km) of I-25 is within the SEZ viewshed, and solar facilities within the SEZ could be in full view from some portions of I-25 as travelers approached from both directions. I-25 is within the SEZ 7.5-m (24.6-ft) viewshed for almost the entire 23 mi (37 km). This distance would equate to about 20 minutes total viewing time at highway speeds.

Southbound travelers on I-25 could first see solar facilities within the SEZ just north of the community of Radium Springs, about 16 mi (26 km) north of the I-25–U.S. 70 interchange in Las Cruces, and about 19 mi (31 km) north of the SEZ. For the first 1.7 mi (2.7 km) in the proposed Afton SEZ viewshed, I-25 is also in the viewshed of the proposed Mason Draw SEZ, but only the upper portions of sufficiently tall power towers in certain locations that SEZ could be seen.

At the northern end of the viewshed, the I-25 roadway descends into the Mesilla Valley, and solar facilities in the northeasternmost portion of the proposed Afton SEZ, close to the eastern edge of West Mesa, would be in view straight down the roadway, but at a long enough distance that with most of the SEZ screened from view by the edge of West Mesa, the SEZ would occupy a very small portion of the horizontal field of view. Thus, visual contrast levels would be expected to be weak. Sufficiently tall power towers in the northeastern corner of SEZ would likely appear as point-like light sources above the mesa's edge. At night, the towers (if sufficiently tall) would have red flashing lights, or white or red flashing strobe lights that could be visually conspicuous but would be seen above the numerous lights of the community of Las Cruces. Other lighting associated with solar facilities could be visible as well.

For the next several miles there would be relatively little change in appearance of solar facilities visible within the SEZ, until about 3 mi (5 km) south of Radium Springs, where a slight curve in the roadway would shift the SEZ away from the center of the field of view, and more of the SEZ would come into view also, so that visual contrast levels from solar facilities within the SEZ would gradually increase.

As southbound I-25 travelers approached the community of Dona Ana, most of the ground surface of the SEZ would still be screened by the edge of west Mesa; however, solar facilities (particularly power towers) near the edge of the Mesa could be visible, and if they were dispersed along the eastern edge of the SEZ, could be visible above a substantial portion of the mesa's rim.

Figure 12.1.14.2-30 is a Google Earth visualization of the SEZ as seen from I-25 at the interchange at Dona Ana. The viewpoint is about 9.3 mi (15.0 km) north of the northeast corner of the SEZ and about 50 ft (15 m) higher in elevation than the nearest point in the SEZ. The visualization shows that the far northeastern portion of the SEZ projects beyond the edge of West

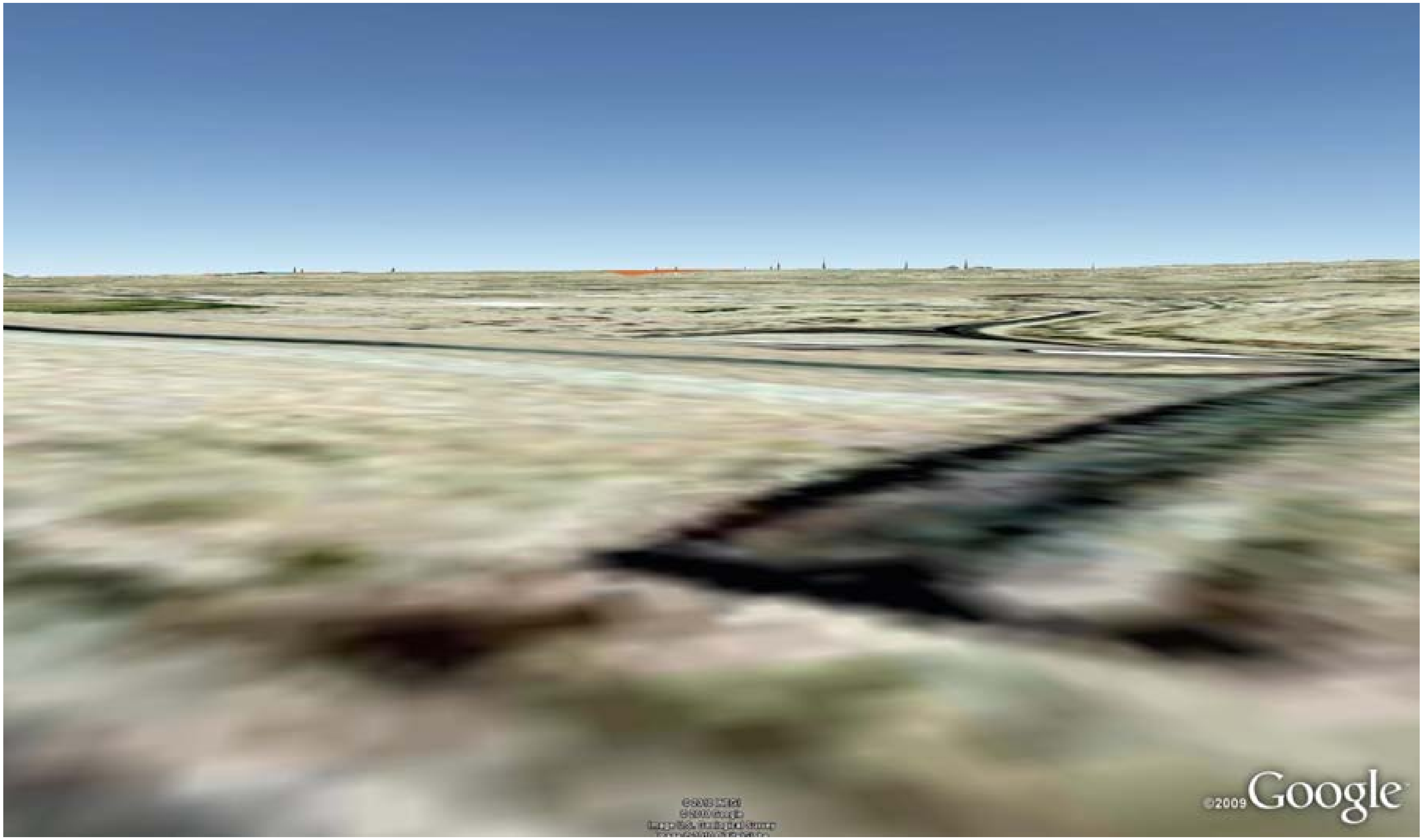

FIGURE 12.1.14.2-30 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Dona Ana Interchange on I-25

Mesa. Solar facilities in this very small portion of the SEZ would be in full view from this viewpoint on I-25. Solar facilities within the SEZ would be seen about 45 degrees to the right of the direction of travel.

Outside of this directly visible portion of the SEZ, the visibility of solar facilities from the Dona Ana interchange would depend on their proximity to the edge of West Mesa. Taller solar facilities, such as cooling towers, transmission towers, and power towers, could be seen from the interchange if they were located sufficiently close to the edge of the mesa. Because of the size of the SEZ and its close proximity to the viewpoint, if these taller facilities were very close to the eastern edge of the SEZ, they could be seen above the edge of the mesa for much of the horizontal field of view. Outside of the far northeastern portion of the SEZ, if only low-height facilities such as PV systems were located along the eastern edge of the SEZ, those facilities would be screened by the edge of the mesa and could not be seen from the interchange.

If solar facilities within the SEZ were located in the far northeastern corner of the SEZ, they would occupy a very small portion of the horizontal field of view. Because of the relatively low elevation of the viewpoint, solar facilities within the SEZ would appear in a narrow area just below the edge of the mesa. If collector/reflector arrays were located in this sloped portion of the SEZ, their strong regular geometry could be visible. At night, lighting associated with solar facilities within the SEZ could be visible from this viewpoint as well.

If power towers were located in this visible nearby portion of the SEZ, they could appear as bright non-point light sources atop visible tower structures that because of their elevation would be highly likely to command visual attention. This would be the case particularly in the morning, because the tower structures would be front-lit, thus adding short but potentially strong vertical line and color contrasts to the strongly horizontal mesa edge. Lower levels of contrast could be caused by power towers farther from the viewpoint, but close enough to the mesa edge to be visible above the valley slopes. At night, visible power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that could be conspicuous, given their prominent and elevated location, but there would be numerous lights visible throughout the valley, which could decrease the perception of visual impact created by the lights.

The potential visual contrast expected for this viewpoint would vary greatly depending on project locations (especially with respect to their proximity to the edge of West Mesa), technologies, and site designs, but because the interchange is relatively close to the SEZ, solar development within the SEZ could be prominent in the field of view and could strongly attract visual attention as seen from the interchange. Under the 80% development scenario, solar facilities within the SEZ would be expected to create weak to moderate visual contrasts as viewed from this viewpoint, with stronger contrast levels expected if multiple power tower receivers were visible above West Mesa.

Solar facilities located in the Mason Draw SEZ would be screened from view with the possible exception of very tall power towers placed in particular locations within the SEZ. If power towers were built in those locations in that SEZ, they could potentially contribute to visual impacts experienced at this point on I-25, but the likelihood of that occurring is low, and the expected additional visual contrasts would be very weak. Section 12.2.14.2.2 discusses potential visual impacts associated with solar development within the Mason Draw SEZ.

Figure 12.1.14.2-31 is a Google Earth visualization of the SEZ as seen from I-25 at its junction with I-10, the southern terminus of I-25, about 6.2 mi (10.0 km) from the SEZ. The interchange is the point of closest approach of I-25 to the SEZ.

From this location, the central portion of the SEZ would be viewed at about 90 degrees to the direction of travel; however, if sufficiently tall solar facilities were distributed along the eastern side of the SEZ, they could span an area along the edge of West Mesa too large to be encompassed in one view. Viewers would need to turn their heads to scan across the whole visible portion of the SEZ. Portions of the ground surface within the SEZ would be visible, including the far northeastern corner of the SEZ and the far southeastern portion of the SEZ, and solar facilities within these areas would be in open view from the interchange.

Outside of these directly visible portions of the SEZ, the visibility of solar facilities from the Dona Ana interchange would depend on their proximity to the edge of West Mesa. Taller solar facilities, such as cooling towers, transmission towers, and power towers, could be seen from the interchange if they were located sufficiently close to the edge of the mesa. Because of the size of the SEZ and its proximity to the viewpoint, if these taller facilities were very close to the eastern edge of the SEZ, they could occupy a substantial portion of the mesa rim visible from this location. Outside of these directly visible portions of the SEZ, if only low-height facilities such as PV systems were located along the eastern edge of the SEZ, those facilities would be screened by the edge of the mesa and could not be seen from the interchange.

If solar facilities within the SEZ were located in the directly visible portions of the SEZ, they would occupy substantial portions of the horizontal field of view. Because of the relatively low elevation of the viewpoint, solar facilities within the SEZ would appear in a narrow area on or just below the edge of the mesa. If collector/reflector arrays were located in these sloped portions of the SEZ, their strong regular geometry could be visible. At night, lighting associated with solar facilities within the SEZ could be visible from this viewpoint as well.

If power towers were located in these directly visible portions of the SEZ, they could appear as bright non-point light sources atop visible tower structures that, because of their elevation, would be highly likely to command visual attention. This would be the case particularly in the morning, when the tower structures would be frontlit, thus adding short but potentially strong vertical line and color contrasts to the strongly horizontal mesa edge. Lower levels of contrast could be caused by power towers farther from the viewpoint, but close enough to the mesa edge to be visible above the valley slopes. At night, if sufficiently tall, visible power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that could be conspicuous, given their prominent and elevated location. However, there would be numerous lights visible throughout the valley, which could decrease the perception of visual impact created by the lights.

The potential visual contrast expected for this viewpoint would vary greatly depending on project locations (especially with respect to their proximity to the edge of West Mesa),

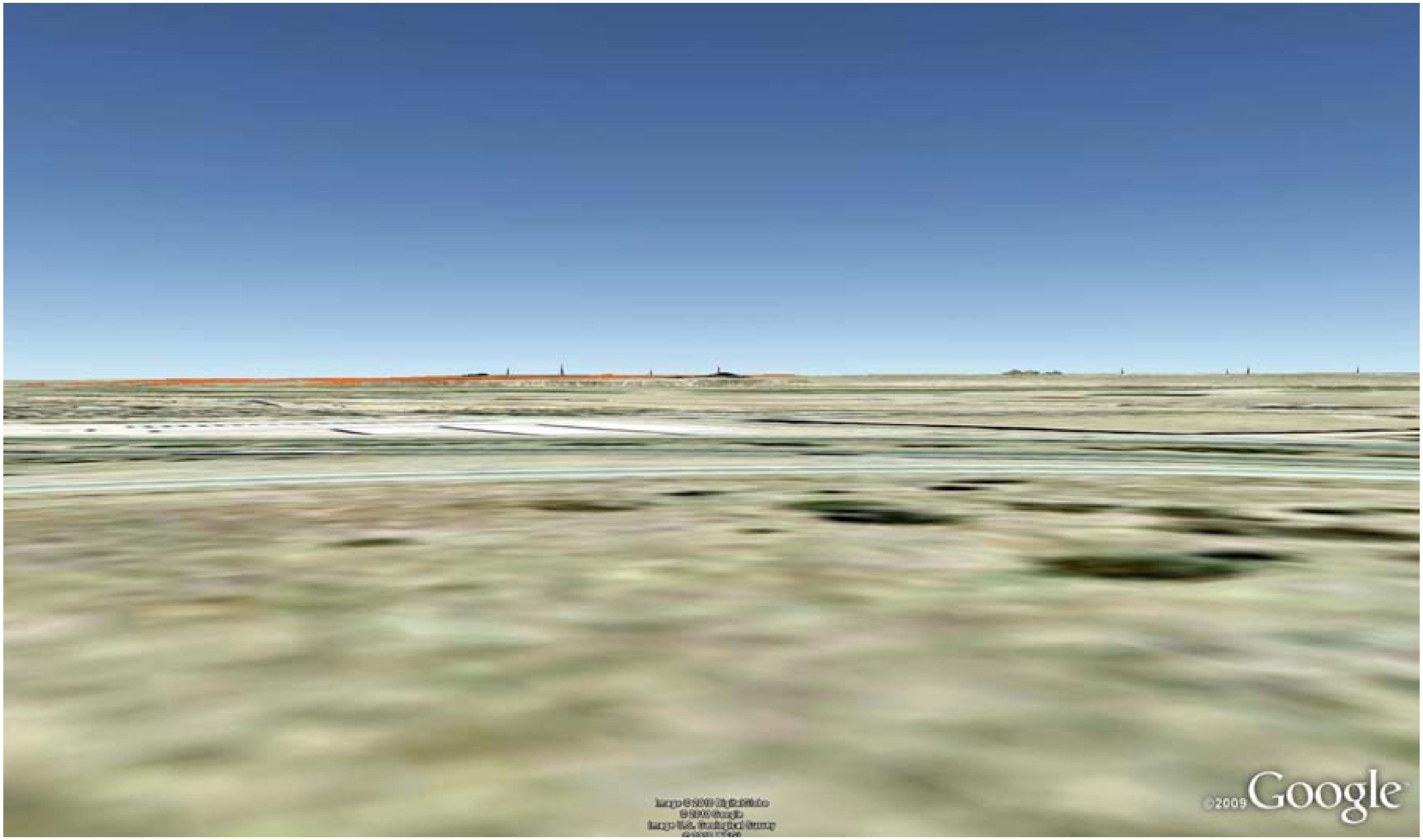

FIGURE 12.1.14.2-31 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the I-10–I-25 Interchange in Las Cruces

technologies, and site designs, but because the interchange is relatively close to the SEZ, solar development within the SEZ could be prominent in the field of view and could strongly attract visual attention as seen from the interchange, especially if multiple power towers were visible along the length of the rim of West Mesa. Under the PEIS 80% development scenario, solar facilities within the SEZ would be expected to create moderate to strong visual contrasts as viewed from this viewpoint, with stronger contrast levels expected if multiple power tower receivers were visible above West Mesa.

Solar facilities located in the Mason Draw SEZ would be screened from view except for the upper portions of tall power towers placed in particular locations within the SEZ. If power towers were built in those locations in that SEZ, they could potentially contribute to visual impacts experienced at this point on I-25. Section 12.2.14.2.2 of the PEIS discusses potential visual impacts associated with solar development within the Mason Draw SEZ.

For northbound travelers on I-25, the SEZ would be in view as they entered I-25 at its junction with I-10, the southern terminus of I-25, about 6.2 mi (10.0 km) from the SEZ, and the point of closest approach of I-25 to the SEZ. Observed contrast levels would be the same as those just described, but immediately after getting onto I-25, vehicles would pass the northern boundary of the SEZ, so that they would be traveling away from the SEZ. Travelers would need to look behind their vehicles to see solar facilities in the SEZ. While the views from a given point would be the same as for southbound travelers, the associated impact levels would be lower, because there would be far fewer viewers looking at the SEZ, and their view would generally be brief in duration.

In summary, solar facilities within the SEZ could be in view from I-25 for about 20 minutes driving time at highway speeds, but most travelers' views would be much briefer. Facilities within the SEZ could be in view from about 23 mi (37 km) of the roadway, from beyond Radium Springs to I-25's southern terminus in Las Cruces. Southbound travelers would see very little at first, but as they approached Dona Ana, potential visibility of solar facilities in the SEZ would increase, reaching maximum levels of visual contrast at the I-25–I-10 interchange, where I-25 ends. At this viewpoint, depending on the location, type, and height of solar facility components in the eastern part of the SEZ, visual contrast levels could be strong if multiple power towers were visible along the rim of West Mesa, with substantially lower levels of contrast expected if only lower-height facilities were located along the eastern side of the SEZ.

Interstate 10. I-10, generally a four-lane interstate highway, extends north-south through the Mesilla Valley in the SEZ viewshed from El Paso to Las Cruces, then turns east-west in Las Cruces to pass between the proposed Afton and Mason Draw SEZs, then heads more or less straight west across southern New Mexico. The AADT value for I-10 in the vicinity of the SEZ is about 16,000 vehicles at the Las Cruces Airport just north of the SEZ, but as high as 42,700 vehicles at the I-10–I-25 interchange in Las Cruces, east of the SEZ (NM DOT 2009).

About 81 mi (130 km) of I-10 is within the SEZ viewshed, and solar facilities within the SEZ could be in full view from some portions of I-10 as travelers approached from both directions. This distance would equate to about 65 to 70 minutes total viewing time at highway speeds. I-10 is within the SEZ 7.5-m (24.6-ft) viewshed for about 49 mi (79 km). This distance would equate to about 40 minutes total viewing time at highway speeds.

Northbound travelers on I-10 could first see solar facilities within the SEZ as far south as the outskirts of El Paso; however, because of topographic screening, views would be sporadic, distant, and partially screened. Within the first 7.5 mi (12 km) from El Paso, there would be very short periods of visibility interspersed with short periods of full screening of solar facilities in the SEZ. In general, solar development in the SEZ would be screened from view with the exception of taller solar facilities in the far eastern portion of the SEZ that might be visible above the rim of West Mesa. Expected visual contrast levels associated with solar development in the SEZ as seen from this segment of I-10 would be minimal to weak.

In the vicinity of Canutillo, Texas (about 15 mi [24 km] from the SEZ), lower-height solar facilities within a small part of the SEZ could be in view, at about 45 degrees left of the direction of travel for northbound traffic. The SEZ would occupy a small but gradually increasing portion of the horizontal field of view, but with weak levels of visual contrast expected.

In the vicinity of Anthony, New Mexico (just under 10 mi [16 km] from the SEZ), the SEZ would occupy a moderate amount of the horizontal field of view, and depending on the location, technology type, and height of facilities within the SEZ, contrasts would be expected to be at weak to moderate levels. At about 10 mi (16 km) from the SEZ, visible power tower receivers would likely appear as bright points of light atop visible tower structures. The vertical angle of view would be quite low, so that visible collector/reflector arrays would be seen edge-on. They would appear as thin lines paralleling the rim of the mesa and would repeat the line of the mesa rim, thereby reducing contrast. Ancillary facilities, such as buildings, transmission towers, and plumes, could be visible if located in the eastern portions of the SEZ. At night, if sufficiently tall, the towers would have red flashing lights, or white or red flashing strobe lights that could attract attention, but would be seen above the numerous lights of Las Cruces and the surrounding communities. Other lighting associated with solar facilities could be visible as well. Figure 12.1.14.2-32 is a Google Earth visualization of the SEZ as seen from I-10 just east of Anthony. The viewpoint is about 9 ft (3 m) lower in elevation than the closest point in the SEZ.

Just north of Anthony, I-10 turns slightly west toward the SEZ. After this point, as the distance to the SEZ decreases, more of the SEZ would come into view on West Mesa, and contrast levels associated with solar facilities in the SEZ would likely rise rapidly to strong levels in the vicinity of the Vado exit, directly east of the SEZ's southeast corner. Figure 12.1.14.2-33 is a Google Earth visualization of the SEZ as seen from the Vado interchange. The viewpoint is 5.6 mi (9 km) from the closest point in the SEZ and about 76 ft (23 m) higher in elevation than the closest point in the SEZ.

From this location, the central portion of the SEZ would be viewed at about 45 degrees to the direction of travel; however, if sufficiently tall solar facilities were distributed along the eastern side of the SEZ, they could nearly fill the horizontal field of view. Because the viewpoint is slightly elevated with respect to portions of the far eastern side of the SEZ, lower height solar

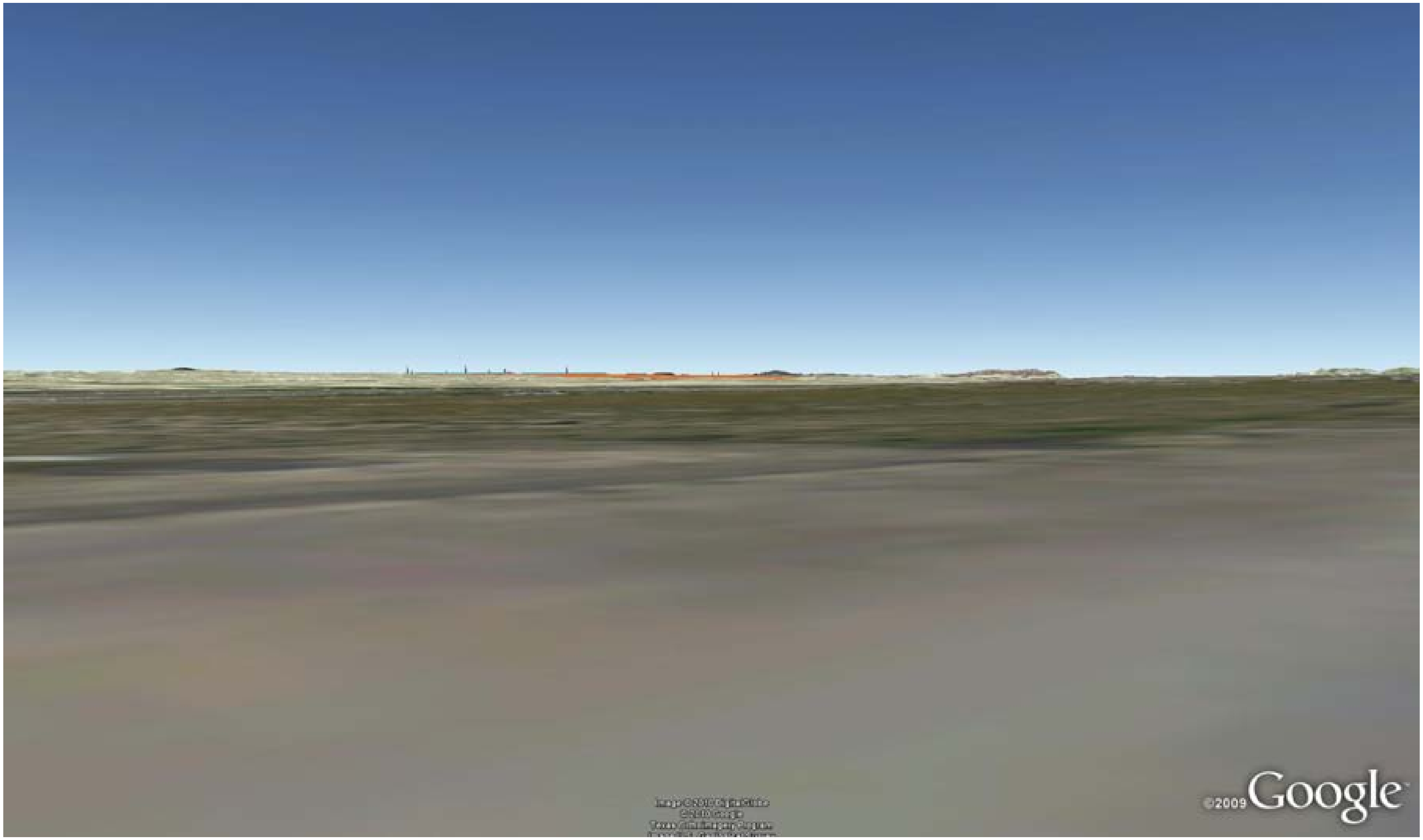

FIGURE 12.1.14.2-32 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from I-10 at Anthony, New Mexico

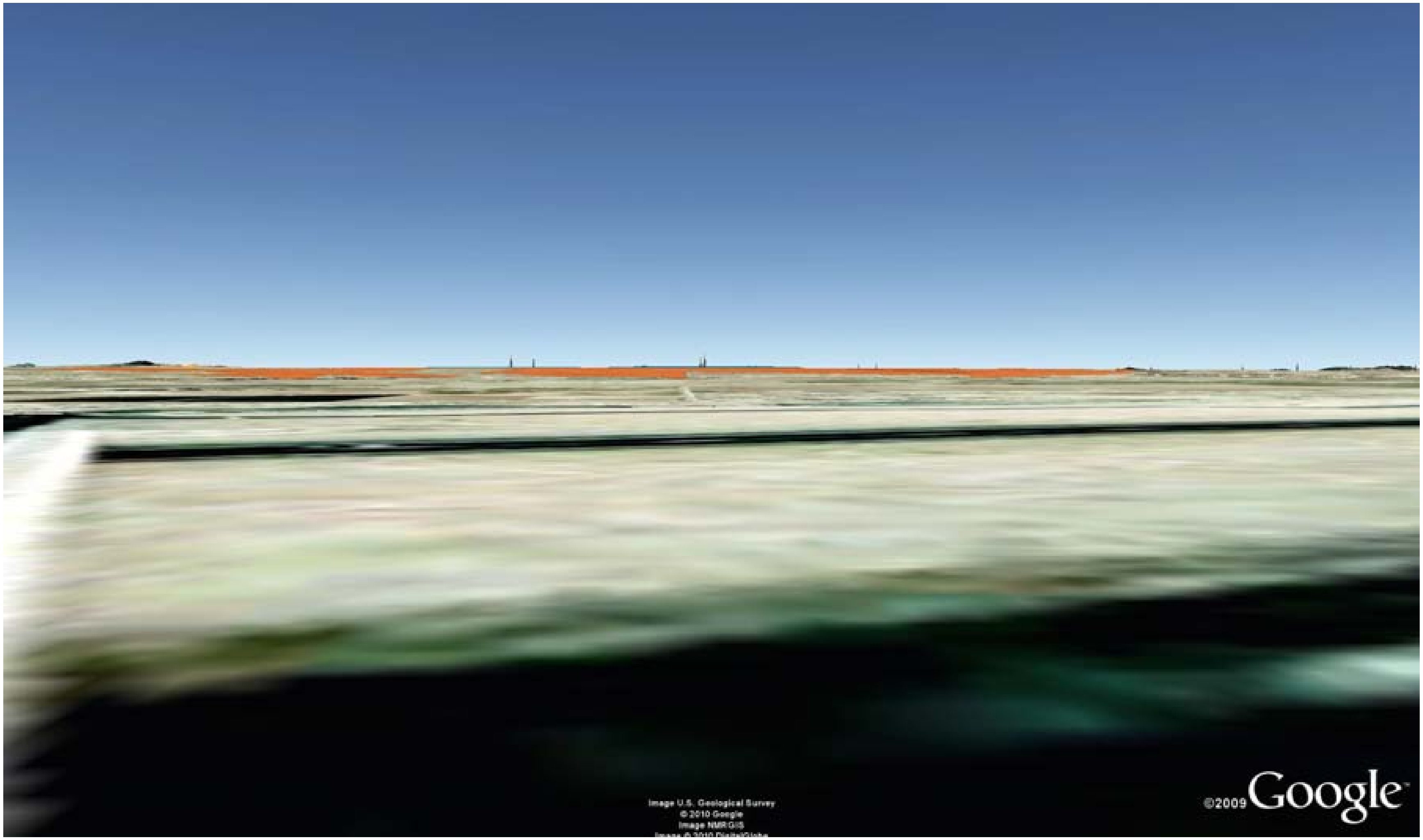

FIGURE 12.1.14.2-33 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Vado Interchange of I-10

facility components along much of the far eastern portion of the SEZ could be in view, although they would generally be seen at a low viewing angle. This would reduce associated contrast levels somewhat. Taller solar facilities, such as transmission towers and power towers, could be visible, even if they were located in the central or western portions of the SEZ, well back from the rim of West Mesa.

Ancillary facilities, such as buildings, transmission towers, and other features, as well as plumes, would likely be visible projecting above the collector/reflector arrays, and their forms, lines, and colors might contrast with the strong horizon line and the line of the collector/reflector arrays. At night, lighting associated with solar facilities within the SEZ could be visible from this viewpoint as well.

If power towers were visible within the far eastern portions of the SEZ, they could appear as very bright non-point light sources atop visible tower structures that, because of their elevation, would be highly likely to command visual attention. This would be the case particularly in the morning, when the tower structures would be frontlit, thus adding short but potentially strong vertical line and color contrasts to the strongly horizontal mesa edge. Lower levels of contrast could be caused by power towers farther from the viewpoint, but close enough to the mesa edge to be visible above the mesa rim. At night, if sufficiently tall, visible power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that could be conspicuous, given their prominent and elevated location, but there also would be numerous lights visible throughout the valley, which could decrease the perception of visual impact created by the tower lights.

The potential visual contrast expected for this viewpoint would vary greatly depending on project locations (especially with respect to their proximity to the edge of West Mesa), technologies, and site designs, but because the interchange is relatively close to the SEZ, solar development within the SEZ could be prominent in the field of view and could strongly attract visual attention as seen from the interchange, especially if multiple power towers were visible along the length of the rim of West Mesa. Under the PEIS 80% development scenario, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this viewpoint, with stronger contrast levels expected if multiple power tower receivers were visible above West Mesa.

Solar facilities located in the Mason Draw SEZ would be screened from view except for the upper portions of tall power towers placed in particular locations within the SEZ. If power towers were built in those locations in that SEZ, they could potentially contribute to visual impacts experienced at this point on I-10.

At the I-10–I-25 interchange in Las Cruces, I-10 turns west to ascend the slope to West Mesa. Figure 12.1.14.2-31 (see under I-25 discussion above) is a Google Earth visualization of the SEZ as seen from the I-10–I-25 junction, the southern terminus of I-25, about 6.2 mi (10 km) from the SEZ. Views of solar facilities within the SEZ would be roughly at a right angle to the direction of travel, on the left for northbound travelers. Visual contrast levels at this location would be as described above, but as vehicles made the gradual turn to the west, the SEZ would be visible somewhat more in line with the direction of travel, though still to the left of westbound vehicles.

As vehicles ascended the slope to the top of West Mesa, visibility of solar facilities in the SEZ would actually decrease somewhat because of partial screening by intervening topography. On top of the mesa, however, screening would diminish quickly, as the difference in elevation between the highway and the SEZ essentially would be eliminated in the vicinity of the U.S. 70 interchange 1.75 mi (2.8 km) north of the SEZ. Visual contrast levels would be expected to be strong in this area.

Under the 80% development scenario analyzed in the PEIS, visual contrast levels would be expected to peak for westbound I-10 travelers in the vicinity of the Las Cruces Municipal Airport and the Robert Larson Boulevard interchange about 5.4 mi (8.8 km) west of the airport. The distance to the northern boundary of the SEZ ranges from 1.2 mi (1.9 km) south of the airport to 0.4 mi (0.6 km) at the Robert Larson Boulevard interchange. Some structures along I-10 would provide some partial screening of views of the SEZ, but views are generally open.

Figure 12.1.14.2-34 is a Google Earth perspective visualization of the SEZ as seen from I-10 about 0.7 mi (1.1 km) east of the Crawford Boulevard interchange at the airport, facing south toward a cluster of four power tower models south of I-10. (Note that airport restrictions could preclude placing power towers in these locations, or could place height restrictions on them; however, the discussion here is illustrative in nature). The center of the cluster is about 3.2 mi (5 km) from the viewpoint, with the closest tower about 1.6 mi (2.5 km) from the viewpoint. The visualization suggests that from this location, solar facilities within the SEZ would be in full view. The SEZ would occupy more than the entire field of view south of I-10, so travelers would have to turn their heads to scan across the full SEZ. Facilities located within the northern portion of the SEZ would strongly attract the eye and would likely dominate views from I-10. Structural details of some facility components for nearby facilities would likely be visible. Steam plumes, transmission towers, and other tall facility components would be seen against a sky backdrop, or could project above the mountains south of the SEZ. From this viewpoint, solar collector/reflector arrays would be seen nearly edge on and would repeat the horizontal line of the plain in which the SEZ is situated, which would tend to reduce visual line contrast. However, as the viewer approached the SEZ, the collector/reflector arrays could increase in apparent size until their form was visible, and they no longer appeared as horizontal lines.

If power towers were located within the SEZ close to this viewpoint, the receivers would likely appear as brilliant white non-point light sources atop towers with structural details clearly visible. In addition, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the towers. The towers and receivers would strongly attract visual attention, and would likely dominate views from I-10 in this vicinity.

At night, if sufficiently tall, visible power towers in the SEZ would have red flashing lights, or white or red flashing strobe lights that could be very conspicuous from this viewpoint, but there would be other lights visible in the area, which could decrease the perception of visual impact created by the lights.

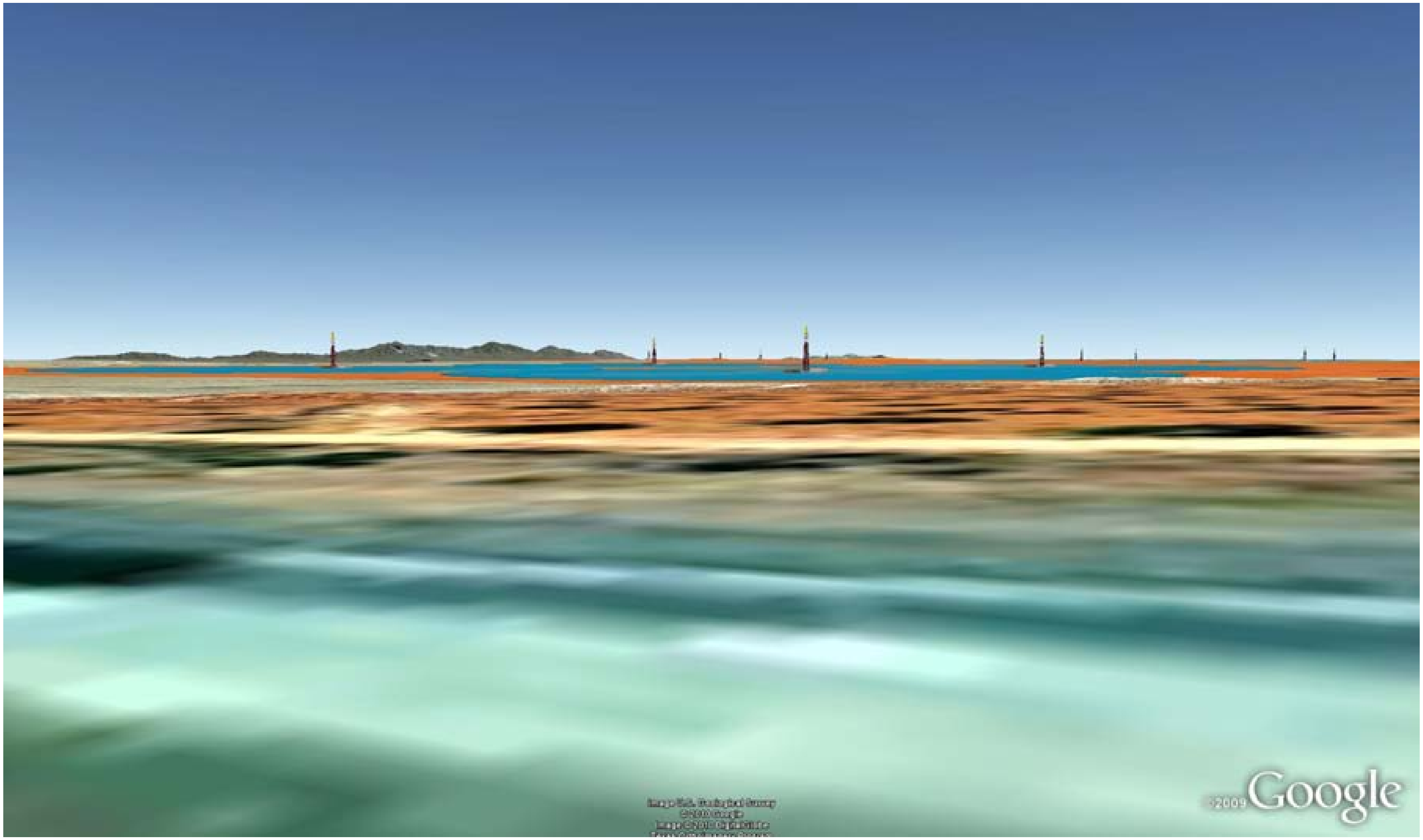

FIGURE 12.1.14.2-34 Google Earth Visualization of the Proposed Afton SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from I-10 near Crawford Boulevard Interchange at Las Cruces Municipal Airport

Under the 80% development scenario, the SEZ could contain numerous solar facilities utilizing differing solar technologies as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would exceed the visual absorption capability of the flat mesa in which the SEZ is located, leading to a perception of visual "clutter" that would likely be perceived negatively by many viewers. Because the SEZ occupies so much of the horizontal field of view, although contrast levels would depend on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, strong visual contrasts from solar energy development within the SEZ would be expected at this viewpoint under favorable viewing conditions.

Shortly after passing the Robert Larson Boulevard interchange, westbound vehicles would pass the western end of the SEZ, and impacts from solar development would decrease rapidly, since the SEZ would then be behind the vehicles. Note, however, that just as impacts from solar development within the proposed Afton SEZ would be decreasing, the nearby proposed Mason Draw SEZ would come into view, and if solar facilities were located in that SEZ, they could add substantially to visual contrasts seen in this area.

Eastbound travelers on I-10 would see the same sorts and levels of visual contrasts from solar development within the proposed Afton SEZ as westbound travelers, but they would see them after having seen any visible facilities in the Mason Draw SEZ first. However, while taller solar facilities within certain parts of the SEZ could come into view at distances greater than 25 mi (40 km) from the SEZ, because of topographic screening lower-height facilities would not come into view until travelers were within about 1.5 mi (2.4 km) of the SEZ. After passing into the 7.5-m (24.6-ft) viewshed, visual contrast levels would very quickly reach strong levels, which could result in higher perceived levels of visual impact than if the bulk of the facilities had been in view longer.

Beyond the airport, visual contrasts would diminish substantially, but as vehicles turned south, solar facilities within the SEZ would be in view on the right side as they traveled down the Mesilla Valley, with expected contrast levels as described above. While strong contrasts could be observed while I-10 paralleled the eastern side of the SEZ, perceived impact levels would drop off sharply after the vehicle passed the Vado interchange, and thereby passed the southern boundary of the SEZ.

In summary, solar facilities within the SEZ could be in view from I-10 for about 65 to 70 minutes driving time at highway speeds, but most travelers' views would be much briefer. Facilities within the SEZ could be in view from about 81 mi (130 km) of the roadway, from more than 25 mi (40 km) west of the SEZ to El Paso. Northbound travelers could first see solar facilities within the SEZ outside of El Paso, with a gradual increase in contrast levels as I-10 passes north up the Mesilla Valley, and reaching maximum levels of visual contrast near the Las Cruces Municipal Airport. At this viewpoint, depending on the location, type, and height of solar facility components in the SEZ, visual contrast levels could be strong.

U.S. 70. U.S. 70, generally a four-lane highway, extends northeast-southwest across the Organ Mountains and into the Mesilla Valley, where it joins I-10 near the Las Cruces Municipal

Airport. Westbound travelers on U.S. 70 could have views of solar facilities within the SEZ from almost any point on the road west of the Organ Mountains, except for a short stretch where the highway climbs the slope of West Mesa near the SEZ. The AADT value for U.S. 70 in the vicinity of the SEZ is between 10,200 and 12,600 vehicles (NM DOT 2009).

About 22 mi (35 km) of U.S. 70 (east of its junction with I-10) are within the SEZ viewshed. As westbound travelers on U.S. 70 past the crest of the Organ Mountains, solar facilities within the SEZ could come into view east of the community of Organ, about 19 mi (31 km) from the SEZ. The angle of view would be very low, and although the SEZ would occupy a moderate amount of the horizontal field of view, expected visual contrast levels would be weak because much of the SEZ would be screened by the lower slopes of the Organ Mountains. As U.S. 70 descended to the valley bottom, it would get closer to the SEZ, but the angle of view would constantly decrease, such that overall contrast levels would rise only very gradually.

At the Dunn Drive interchange at Spaceport City, power towers throughout the SEZ could be visible as points of light just above the mountains south and southwest of the SEZ, but much of the SEZ would be screened by intervening terrain, such that expected contrast levels would still be weak. In the vicinity of the I-25 interchange, however, enough of the SEZ would be in view that expected contrast levels would rise to moderate. Contrast levels would continue to slowly increase but would likely remain at moderate levels until U.S. 70 began to climb the western slope of West Mesa. At that point, the slope in front of the vehicle would cut off views of solar facilities within the SEZ. Solar facilities would come back into view as U.S. 70 crested the slope of West Mesa, very near to the junction of U.S. 70 and I-10. At this location, with open and near-level views of the SEZ less than 2 mi (3 km) away, expected visual contrasts would be moderate to strong. For discussion of impacts on viewers along U.S. 70 after it joins I-10, see the I-10 impacts discussion above.

Communities of Las Cruces, University Park, Mesilla, Dona Ana, Radium Springs, Organ, Spaceport City, San Miguel, La Mesa, La Union, Mesquite, Vado, Chamberino, Berino, Anthony, and El Paso (Texas). The viewshed analyses indicate potential visibility of solar facilities within the SEZ from the communities of Las Cruces, University Park, Mesilla, and other communities surrounding Las Cruces; Dona Ana; Organ; Spaceport City; San Miguel; La Mesa; Mesquite; Chamberino; Berino; Anthony; and El Paso (Texas).

Screening by small undulations in topography, vegetation, buildings or other features would likely restrict or eliminate visibility of the SEZ and associated solar facilities from many locations within these communities, but a detailed future site-specific NEPA analysis is required to determine visibility precisely. However, note that even with existing screening, solar power towers, cooling towers, plumes, transmission lines and towers, or other tall structures associated with the development could potentially be tall enough to exceed the height of screening in some areas and cause visual impacts on these communities.

Las Cruces, University Park, Mesilla and the other communities immediately surrounding Las Cruces are located in the Mesilla Valley, and all are within 7 mi (11 km) of the nearest point in the SEZ. Although contrast levels would depend on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, under the 80% development scenario analyzed in the PEIS, moderate to strong visual contrast levels could be experienced in University Park and some portions of Las Cruces. Strong visual contrast levels could be experienced in Mesilla and nearby areas. Figures 12.1.14.2-31 and 12.1.14.2-24 are visualizations of solar facilities within the SEZ as seen from Las Cruces and Mesilla, respectively.

Potential levels of visual impact in other communities in New Mexico in the vicinity of the proposed Afton SEZ are as follows:

- Dona Ana is about 9.2 mi (14.8 km) from the nearest point in the SEZ. Weak to moderate visual contrast levels could be experienced in Dona Ana and nearby areas. Figure 12.1.14.2-30 is a visualization of solar facilities within the SEZ as seen from Dona Ana.

- Radium Springs is located about 16 mi (26 km) from the nearest point in the SEZ. Because of extensive screening of views of the SEZ by topography, minimal visual contrast levels could be experienced in Radium Springs and nearby areas.

- Spaceport City is about 13 mi (21 km) from the nearest point in the SEZ. Weak visual contrast levels could be experienced in Spaceport City and nearby areas.

- Organ is about 18 mi (29 km) from the nearest point in the SEZ. Weak visual contrast levels could be experienced in Organ and nearby areas.

- San Miguel is about 0.8 mi (1.3 km) from the nearest point in the SEZ. Strong visual contrast levels could be experienced in San Miguel and nearby areas.

- La Mesa is about 1.2 mi (1.9 km) from the nearest point in the SEZ. Strong visual contrast levels could be experienced in La Mesa and nearby areas.

- La Union is about 10 mi (16 km) from the nearest point in the SEZ. Because of extensive screening of views of the SEZ by topography, minimal visual contrast levels could be experienced in La Union and nearby areas.

- Mesquite is about 3.1 mi (5.0 km) from the nearest point in the SEZ. Strong visual contrast levels could be experienced in Mesquite and nearby areas. Figure 12.1.14.2-27 is a visualization of solar facilities within the SEZ as seen from Mesquite.

- Vado is about 3.4 mi (5.5 km) from the nearest point in the SEZ. Strong visual contrast levels could be experienced in Vado and nearby areas.

- Chamberino is about 4.1 mi (6.6 km) from the nearest point in the SEZ. Because of extensive screening of views of the SEZ by topography, minimal visual contrast levels could be experienced in Chamberino and nearby areas.

- Berino is about 6.0 mi (9.7 km) from the nearest point in the SEZ. Moderate to strong visual contrast levels could be experienced in Berino and nearby areas.

- Anthony is about 9.2 mi (15 km) from the nearest point in the SEZ. Weak to moderate visual contrast levels could be experienced in Anthony and nearby areas. Figure 12.1.14.2-32 is a visualization of solar facilities within the SEZ as seen from Anthony.

In addition to these New Mexico communities that could be affected, the northwestern outskirts of El Paso, Texas, are about 25 mi (40 km) from the nearest point in the SEZ. Minimal to very weak visual contrast levels could be experienced in El Paso and nearby areas.

Other impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads, including but not limited to I-10, I-25, and U.S. 70, as noted above. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

12.1.14.2.3 Summary of Visual Resource Impacts for the Proposed Afton SEZ

Under the 80% development scenario analyzed in the PEIS, the SEZ would contain multiple solar facilities utilizing differing solar technologies and requiring a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal, relatively uncluttered, and generally natural-appearing landscape of the flat mesa on which the SEZ would be located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development within the proposed Afton SEZ because of major modification of the character of the existing landscape.

The SEZ is in an area of low scenic quality; however, it is within the viewshed of a number of sensitive visual resource areas, including several wilderness study areas, two national historic trails, a national scenic byway, a national historic landmark, a national natural landmark, and several BLM-designated ACECs and SRMAs. In general, these areas are insufficiently elevated with respect to the SEZ to afford commanding views of solar facilities within the SEZ; however, a number of the sensitive areas are close enough to the nearly 78,000-acre (320-km^2) SEZ that solar facilities could stretch across much of the field of view from many viewpoints within these areas, potentially creating panoramic views of solar facilities across the landscape.

As a result, a number of these sensitive resource areas could be subjected to moderate to strong visual contrasts from solar facilities within the SEZ. In addition, a number of them could be further impacted by solar facilities that could be built in the proposed Mason Draw SEZ.

Furthermore, because the eastern side of the SEZ is immediately adjacent to, and elevated above the Mesilla Valley, solar facilities in that portion of the SEZ would be in full or partial view of many communities and the heavily traveled highways within the Mesilla Valley and the uplands to the east of the valley. Solar development within the SEZ could be visible as far south as El Paso and northern Mexico, and as far north as Radium Springs, New Mexico. Several communities and major roads within the valley could be subjected to moderate or strong visual contrasts from solar development within the SEZ.

Under the 80% development scenario analyzed in this PEIS, the following sensitive visual resource areas would be expected to be subjected to moderate to strong visual contrast levels from solar facilities within the proposed Afton SEZ:

- Prehistoric Trackways NM (strong);

- Aden Lava Flow WSA (strong), Organ Mountains WSA (moderate to strong), Organ Needles WSA (moderate to strong), Pena Blanca WSA (moderate to strong), Robledo Mountains WSA (strong), West Potrillo Mountains/Mt. Riley WSA (moderate to strong);

- Aden Hills SRMA (strong), Organ/Franklin Mountains SRMA (moderate to strong), Dona Ana Mountains SRMA (moderate to strong);

- Dona Ana Mountains ACEC (moderate to strong), Organ/Franklin Mountains ACEC (moderate to strong), Robledo Mountains ACEC (strong);

- Mesilla Plaza National Historic Landmark (moderate to strong);

- Kilbourne Hole National Natural Landmark (moderate to strong);

- El Camino Real de Tierra Adentro National Historic Trail (strong); and

- El Camino Real National Scenic Byway (strong).

The following selected visually sensitive non-Federal lands and resources could be subjected to moderate to strong contrast levels from solar facilities within the proposed Afton SEZ:

- Butterfield Trail (moderate);

- I-25 (strong);

- I-10 (strong); and

- U.S. 70 (moderate to strong).

The following selected communities in the Mesilla Valley could be subjected to moderate to strong contrast levels from solar facilities within the proposed Afton SEZ:

- San Miguel, La Mesa, Mesquite, Vado (strong);

- Las Cruces, University Park, Mesilla and immediately surrounding communities; Berino (moderate to strong); and

- Dona Ana, Anthony (weak to moderate).

In addition, visitors to the area, workers, and residents may be subjected to minimal to strong visual contrasts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads.

12.1.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

The presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into nonindustrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the magnitude of visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

While the applicability and appropriateness of some design features would depend on site- and project-specific information that would be available only after a specific solar energy project had been proposed, some SEZ-specific design features can be identified for the proposed Afton SEZ at this time, as follows:

- Within the SEZ, in areas east of a line between the northwest corner of Section 5 of Township 024S Range 001E extending through and beyond the southeast corner of Section 24 of Township 025S Range 001E, visual impacts associated with solar energy development in the SEZ should be consistent with VRM Class II management objectives (see Table 12.1.14.3-1), as determined from key observation points to be selected by the BLM within the Mesilla Valley west of a line 0.25 mi (0.4 km) east of I-10 (for key observation points south of the I-10–I-25 interchange) or I-25 (for key observation points north of the I-10–I-25 interchange), and east of the toe of the slope of West Mesa. The VRM Class II impact level consistency mitigation would affect about 12,528 acres (50.699 km^2) within the

TABLE 12.1.14.3-1 VRM Class Objectives

Class I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should both dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM (1986b).

northeastern portion of the SEZ. The affected area includes about 16% of the total area of the proposed SEZ. The area subject to the SEZ-specific design feature requiring consistency with VRM Class II management objectives is shown in Figure 12.1.14.3-1.

Within the SEZ, in areas visible from and within 3 mi (5 km) of the Aden Lava Flow WSA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives (see Table 8.1.14.3.-1), as determined from KOPs to be selected by the BLM within the WSA, and in areas visible from between 3 and 5 mi (5 and 8 km), visual impacts should be consistent with VRM Class III management objectives. The VRM Class II impact level consistency mitigation would affect approximately 3,042 acres (12.31 km^2) within the southwestern portion of the SEZ. The VRM Class III impact level consistency mitigation would affect approximately 9,539 additional acres (38.60 km^2). The area affected by the VRM Class II and Class III impact level consistency mitigation includes about 16% of the total area of the proposed SEZ.

Within the SEZ, the height of power towers should be restricted such that the receiver and any navigation hazard lighting will not be directly visible from points within the Mesilla Valley west of a line 0.25 mi (0.4 km) east of I-10 (for points south of the I-10–I-25 interchange) or I-25 (for points north of the I-10–I-25 interchange), and east of the toe of the slope of West Mesa.

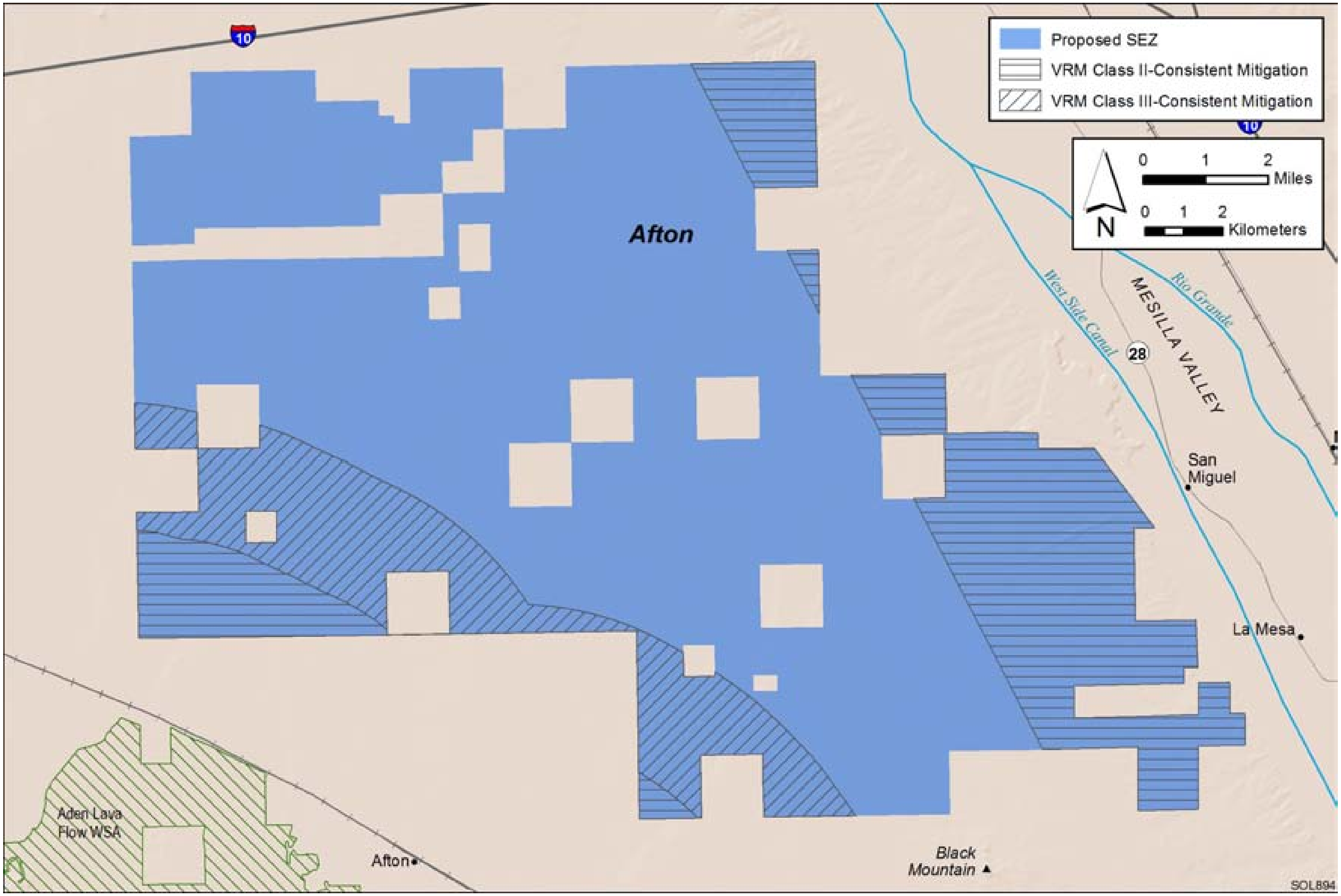

FIGURE 12.1.14.3-1 Areas within and around the Proposed Afton SEZ Affected by SEZ-Specific Distance-Based Visual Impact Design Features

Application of these SEZ-specific design features would substantially reduce visual impacts associated with solar energy development within the SEZ and also would substantially reduce potential visual impacts on the Aden Lava Flow WSA and also the communities within the Mesilla Valley where potential visual impacts would be greatest because of the number of viewers and duration of views.

These design features would also reduce impacts on the following sensitive visual resource areas:

- Organ Mountains WSA, Organ Needles WSA, Pena Blanca WSA, West Potrillo Mountains WSA;
- Organ/Franklin Mountains SRMA, Dona Ana Mountains SRMA;
- Dona Ana Mountains ACEC, Organ/Franklin Mountains ACEC;
- Mesilla Plaza National Historic Landmark;
- Kilbourne Hole National Natural Landmark
- El Camino Real de Tierra Adentro National Historic Trail;
- El Camino Real National Scenic Byway;
- I-25;
- I-10; and
- U.S. 70.

12.1.15 Acoustic Environment

12.1.15.1 Affected Environment

The proposed Afton SEZ is located in the southwestern portion of Dona Ana County in south-central New Mexico. Neither the State of New Mexico nor Dona Ana County has established quantitative noise-limit regulations applicable to solar energy development.

I-10 runs east–west as close as about 0.4 mi (0.6 km) to the north and runs north-south as close as 5 mi (8 km) to the east. Many State Routes exist in the Mesilla Valley, to the east of the SEZ. There are good access roads to the site from all directions and many internal roads exist within the SEZ. The nearest railroads run as close as about 1 mi (1.6 km) to the southwest and as close as about 3 mi (5 km) to the east of the SEZ. Nearby airports include Las Cruces International Airport and Stahmann Farms Airfield (listed as an abandoned field but used by crop dusters on occasion), about 2 mi (3 km) north and 0.25 mi (0.4 km) east of the SEZ, respectively. Substantial commercial/industrial/government uses exist on northern boundary along I-10, while a major multi-modal transmission corridor with a large power line and numerous gas pipelines runs through the southern portion of the SEZ. Natural gas–fired Afton Generating Station and Afton Compressor Station are located in the southern part of the SEZ. To the east in the fertile Mesilla Valley are situated large-scale irrigated agricultural lands. Some livestock grazing occurs on the south side of the SEZ. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist very close to the proposed Afton SEZ. However, several residences exist adjacent to the northeastern SEZ boundary and as close as 200 ft (61 m) from the southeastern SEZ boundary. To the east in the Mesilla Valley, many large and small population centers have developed, including Las Cruces, Mesilla, Mesquite, University Park, and Vado, within a 5-mi (8-km) radius of the SEZ. Accordingly, noise sources around the SEZ include road traffic, railroad traffic, aircraft flyover, commercial/industrial/agricultural activities, livestock grazing, and community activities and events. Except activities mentioned above in some portions of the SEZ, the proposed Afton SEZ is mostly undeveloped, and its overall character is considered rural to industrial. Background noise levels in most areas of the SEZ would be lower, except areas to the north, northeast, southeast, and south of the SEZ, where I-10 runs and/or industrial/commercial/agricultural activities occur. To date, no environmental noise survey has been conducted around the proposed Afton SEZ. On the basis of the population density, the day-night average noise level (L_{dn} or DNL) is estimated to be 39 dBA for Dona Ana County, typical of a rural area (33 to 47 dBA L_{dn}) (Eldred 1982; Miller 2002).[11]

12.1.15.2 Impacts

Potential noise impacts associated with solar projects in the Afton SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts on the

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

nearest residences (just next to the northeastern SEZ boundary) associated with operation of heavy equipment and vehicular traffic would be anticipated, albeit of short duration. During the operations phase, potential impacts on nearby residences would be anticipated, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the proposed Afton 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 12.1.15.3). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

12.1.15.2.1 Construction

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

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area, where key components (e.g., steam turbine/generator) needed to generate electricity are located; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background level. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment and by temperature lapse conditions typical of daytime hours; thus noise attenuation to a 40-dBA level would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur 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 closest residences adjacent to the northeastern SEZ boundary, estimated noise levels at the nearest residences would be about 74 dBA,[12] which is well above the typical daytime mean rural background level of 40 dBA. In addition, an estimated 70-dBA L_{dn}[13] at these residences is well above the EPA guidance of 55 dBA L_{dn} for residential areas.

[12] Typically, the heavy equipment operators would not allow public access any closer than 330 ft (100 m) for safety reasons. In other words, neither construction nor solar facilities would occur within this distance from the nearest residences.

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

For SEZs greater than 30,000 acres (121.4 km^2), such as the Afton SEZ, it is assumed that a maximum of three projects would be developed at any one time. If three projects were to be built within the SEZ near the closest residences, noise levels would be a little higher than the above-mentioned values, below a just-noticeable increase of about 3 dB over a single project.

In addition, noise levels are estimated at the specially designated areas within a 5-mi (8-km) range of the Afton SEZ, which is the farthest distance at which noise (other than extremely loud noise) would be discernable. There is only one specially designated area within the range where noise might be an issue: Aden Lava Flow WSA, which is about 1.3 mi (2.1 km) southwest of the SEZ. For construction activities occurring near the southwestern SEZ boundary, the noise level is estimated to be about 39 dBA at the boundary of the Aden Lava Flow WSA, which is below the typical daytime mean rural background level of 40 dBA. Thus, construction noise from the SEZ is not likely to adversely affect wildlife at the Aden Lava Flow WSA (Manci et al. 1988), as discussed in Section 5.10.2.

Depending on soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet, in contrast to the impulsive impact pile drivers frequently used at large-scale construction sites. Potential impacts on the nearest residences would be anticipated to be negligible, except when pile driving would occur near the residences (just next to the northeastern and southeastern SEZ boundary).

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

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

Construction of a new transmission line has not been assessed for the Afton SEZ, because connection to the existing 500-kV line was assumed to be possible; impacts on the acoustic environment would be evaluated at the project-specific level if new transmission construction or line upgrades were to occur. In addition, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

12.1.15.2.2 Operations

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

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

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the northeastern SEZ boundary, the predicted noise level would be about 51 dBA at the nearest residences, just next to the SEZ boundary, which is higher than the typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[14]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 49 dBA L_{dn} would be estimated, which is below the EPA guideline of 55 dBA L_{dn} for residential areas. As for construction, if three parabolic trough and/or power tower facilities would be operating around the nearest residences, combined noise levels would be a little higher than the above-mentioned values, below a just-noticeable increase of about 3 dBA over a single facility. However, day-night average noise levels higher than those estimated above by using simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Afton 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[15] within 1 or 2 mi (1.6 or 3 km) of the noise source in the presence of

---

[14] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

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

a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are lowest. To estimate the day-night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residences (just next to the SEZ boundary and about 0.5 mi [0.8 km] from the power block area for a solar facility) would be 61 dBA, which is well above the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 63 dBA L_{dn}, which is above the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 63 L_{dn} dBA at the nearest residences, even if TES were used at a solar facility. As for construction, if three projects were to be built within the SEZ near the closest residences, noise levels would be a little higher than the above-mentioned values, below a just-noticeable increase of about 3 dB over a single project. Consequently, operating parabolic trough or power tower facilities using TES and located near the SEZ boundary could result in adverse noise impacts on the nearby residences when a facility is located near the northeastern or southeastern SEZ boundary.

Associated with operation of solar facilities located near the southwestern SEZ boundary and using TES, the estimated daytime noise level of 39 dBA is lower than the typical daytime mean rural background level of 40 dBA, while the estimated nighttime level of 49 dBA is much higher than typical nighttime mean rural background level of 30 dBA. As discussed in Section 5.10.2, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, operation noise from the SEZ is not likely to adversely affect wildlife at the Aden Lava Flow WSA.

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 Afton SEZ, on the basis of the assumption of dish engine facilities of up to 6,900-MW total capacity (covering 80% of the total area, or 62,098 acres [251 km^2]), up to 275,990 of the 25-kW dish engines could be employed. For a large dish engine facility, several thousand step-up transformers would be embedded in the dish engine solar field, along with a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 330 ft (100 m). However, the combined noise level from hundreds of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, for example, about 52 dBA at 1.0 mi (1.6 km) and 50 dBA at 2 mi (3.2 km) from the boundary of the square-shaped dish engine solar field; both values are higher than the typical daytime mean rural background level of 40 dBA. However, these levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed dish engines were placed all over the Afton SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residences, just next to the northeastern SEZ boundary, would be about 58 dBA, which is well above the typical daytime mean rural background level of 40 dBA. On the basis of 12-hr daytime operation, the estimated 55 dBA L_{dn} at these residences is equivalent to the EPA guideline of 55 dBA L_{dn} for residential areas. On the basis of other noise attenuation mechanisms, noise levels at the nearest residences would be lower than the values estimated above. Noise from dish engines could cause adverse impacts on the nearest residences, depending on background noise levels and meteorological conditions.

For dish engines placed all over the SEZ, estimated noise levels would be about 48 dBA at the Aden Lava Flow WSA, which is higher than the typical daytime mean rural background level of 40 dBA. As discussed in Section 5.10.2, sand levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, dish engine noise from the SEZ is not likely to adversely affect wildlife at the Aden Lava Flow WSA.

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 proposed Afton SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be negligible.

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

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

12.1.15.2.3 Decommissioning/Reclamation

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

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

12.1.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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

- Dish engine facilities within the Afton SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearby residences (i.e., the facilities would be located anywhere within the SEZ, except the northeastern and southeastern portions 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.

12.1.16 Paleontological Resources

12.1.16.1 Affected Environment

The proposed Afton SEZ is composed primarily of unclassified Quaternary surface deposits (classified as QTs on geologic maps) of the Upper Santa Fe Group (74,903 acres [303 km^2] or 96% of the SEZ). The potential fossil yield classification (PFYC) (as discussed in Section 4.14) for QTs is Class 4/5 (on the basis of the PFYC GIS data from the New Mexico State BLM Office; Hester 2009). Additional diffuse portions of the Afton SEZ to the north and east are composed of volcanic basalt and andesite flows (Qb) and young (<10,000 years old) alluvial sediments (Qa and Qp) with little or no paleontological potential (2,720 acres [11 km^2] or 4% of the SEZ).

A review of known localities of paleontological resources within New Mexico from the New Mexico State BLM Office indicated no known localities within the Afton SEZ and four localities within 5 mi (8 km) of the SEZ to the southeast. These four localities, along with seven additional localities in the same vicinity just over 5 mi (8 km) from the SEZ, were found in the Camp Rice Formation of the Upper Santa Fe Group in an area classified as PFYC Class 4/5. The finds represent Pliocene horse (equus), camel, turtle, armadillo (glyptodont), elephant (proboscidean), and mammoth. Farther south (7 to 15 mi [12 to 24 km] from the SEZ), 235 similar finds have been made in the same formation and gomphothere (an extinct elephant or proboscidean), ground sloth (megalonyx), rabbit, tortoise (gopherus), mastodon, deer (cervid), xenarthran,[16] and peccary, as well as gar, bony fish, snake, and salamander, are added to the representative specimens. In addition, 44 paleontological localities have been documented within 10 mi (16 km) of the SEZ in the Robledo Mountains north of the SEZ in an area of higher elevation (see below for a discussion of the Prehistoric Trackways National Monument). These localities are in areas of PFYC Classes 2 and 3 of Hueco and Abo Formations, respectively.

Prehistoric Trackways National Monument is located within 6 and 10 mi (10 to 16 km) north of the proposed Afton SEZ. The monument was established in 2009 under the Omnibus Public Lands Act to “conserve, protect, and enhance the unique and nationally important paleontological, scientific, educational, scenic, and recreational resources and values of the Robledos Mountains.” The area contains the most “scientifically significant Early Permian Track sites in the world.” The monument includes fossilized footprints of amphibians, reptiles, and insects, as well as fossilized plants and petrified wood dating as far back as 280 million years. Trackways specimens within the monument are removed upon discovery and sent to the New Mexico Museum of Natural History and Science in Albuquerque for further analysis and preservation for future scientific study (BLM 2010a).

[16] Line of mammals with few or no teeth, such as an armadillo, sloth, or anteater, named after their distinct lower backbone.

12.1.16.2 Impacts

On the basis of the PFYC classification for this area, there could be impacts on significant paleontological resources in the proposed Afton SEZ, although the presence of such resources is currently unknown. The known distribution of paleontological finds in the area indicates that the easternmost portion of the Afton SEZ has a high potential for containing fossil remains of ancient mammals. A more detailed look at the geological deposits of the SEZ and their depth is needed, as well as a paleontological survey prior to development in PFYC Class 4/5 areas, as per BLM IM2008-009 and IM2009-011 (BLM 2007, 2008a). If significant paleontological resources are found to be present within the Afton SEZ during a paleontological survey, Section 5.14 discusses the types of impacts that could occur. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys would occur.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely because any such resources would be below the surface and not readily accessed; however, impacts are possible given the paleontological potential of the surrounding area, especially if surface outcrops are present. If resources are found to be present in the area during a paleontological survey for a particular project, a management plan should address a potential training program and a periodic monitoring schedule for the project boundaries. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new access roads or transmission line ROWs are anticipated for the proposed Afton SEZ, assuming existing corridors would be used; thus no impacts on paleontological resources are anticipated related to the creation of new access pathways. However, impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

The programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing possible excavation of the resource, if warranted. Depending on the significance of the find, it could also result in some modifications to the project footprint. Since the SEZ is located in an area classified as PFYC 4/5, a stipulation would be included in the permitting document to alert the solar energy developer that there is the possibility of a delay if paleontological resources are uncovered during surface-disturbing activities.

12.1.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations. Avoidance of the eastern edge of the SEZ may be warranted if a paleontological survey results in findings similar to those known south of the SEZ.

This page intentionally left blank.

12.1.17 Cultural Resources

12.1.17.1 Affected Environment

12.1.17.1.1 Prehistory

The proposed Afton SEZ is located in the northwestern portion of the Chihuahua Desert, within the basin and range province of south–central New Mexico. The earliest known use of the area was likely during the Paleoindian Period, sometime between 14,000 and 12,000 B.P. Usually associated with big game hunting, these people are thought to have relied on hunting large migrating mammal species, such as *Bison antiquus*, which have since become extinct. Paleoindian sites are rare in southern New Mexico and tend to be associated with dune fields or the margins of playas or *ciengas* (small, shallow wetlands). Stone tools in the possession of local private collectors indicate a full range of Paleoindian exploitation of the area. However, surveys of the area conducted by professional archaeologists have yielded few Paleoindian sites. Finds of Paleoindian projectile points, such as the fluted Folsom and Clovis points, are primarily isolated finds or are associated with multicomponent sites. Within the vicinity of the proposed Afton SEZ, Paleoindian sites have been located in the Sierra de Las Uvas, 18 mi (29 km) north of the SEZ, in the Tularosa Basin, 34 mi (54 km) east of the SEZ, as well as near the towns of Cuchillo and Truth or Consequences, about 71 mi (115 km) north of the SEZ. It is likely that during Paleoindian times, the proposed Afton SEZ supported grasslands that would have been attractive to the large migrating mammals that were hunted by the Paleoindians (Kirkpatrick et al. 2001).

The Archaic Period began around 9,000 B.P. and extended until about 1,800 B.P., and is sometimes referred to as the Cochise Culture or the Chihuahua Tradition (MacNeish and Beckett 1987). Sites dating to this period reflect a reliance on a broader subsistence base, with groups hunting a larger variety of small game and utilizing a broader range of plant resources. A pattern of base camps and widely scattered special-use sites for gathering, hunting, processing, and tool manufacture emerges, indicative of a highly mobile lifeway. The number of recorded Archaic sites increased over time as settlements became more permanent and populations aggregated in villages during the Late Archaic. Also during the Late Archaic, as groups became more sedentary, evidence of agriculture and pottery become prevalent in the archaeological record. Sites in the Archaic Period are often associated with sand dunes, stands of mesquite, shallow playas, and rock outcrops, and features associated with Archaic Period sites include shallow pits, hearths, fire-cracked rock, and burned caliche. The Archaic archaeological assemblage also includes grinding stones, reflecting the increased use of plant resources, and stone projectile points, usually associated with *atlatl* darts. While not present at the proposed Afton SEZ, contemporary cave sites in south–central New Mexico have yielded basketry, cordage, sandals, fur, feathers, wood, stone artifacts, and early maize (BLM 1993). The area in and around the proposed Afton SEZ was likely suitable for Archaic Period groups, and camp sites or special use sites are likely to be present here (Kirkpatrick et al. 2001).

The Mogollon Culture is characteristic of the south–central New Mexico region during the Formative Period, which lasted from 1,800 to 550 B.P. The proposed Afton SEZ lies close to the boundary between the Mimbres Mogollon variant, whose settlements were centered in the well-watered montane regions, and the Jornada Mogollon variant, people who were more adapted to the desert. Mimbres influence can be seen in the region, but the proposed Afton SEZ is probably within the western reach of the Jornada culture. The major difference between the two Mogollon variants is ceramic in nature; the Mimbres developed a distinctive black on white pottery, while the Jornada made a brown-ware pottery style. Sedentism among the Jornada developed later than among the Mimbres; however, among both groups, the aggregation of populations in villages increased throughout the Formative Period. The early or Mesilla phase of the Jornada (1,400 to 900 B.P.) continued the Archaic traditions of seed harvesting and processing, and hunting and gathering. Mesilla Phase pithouses are found in the arroyos leading to the Rio Grande. Dune sites are common in the area around the proposed Afton SEZ. Typical sites consist of lithic scatters, brown-ware ceramics, and fire-cracked rock or burned caliche. Temporary camps continue to be near playas and dune ridges. The proposed Afton SEZ is likely to have been exploited only intermittently during this time to harvest specific resources (Kirkpatrick et al. 2001).

The Dona Ana or Transitional Pueblo Phase of the Jornada Mogollon (900 to 800 B.P.) sees the shift from pithouse architecture to aboveground pueblo structures and an associated change in subsistence and settlement patterns. Distinctions between this phase and the subsequent El Paso Phase are not always evident from surface materials. Pit structures disappear by the El Paso Phase (800 to 550 B.P.) when sites include adobe pueblos and primary residences located near rivers, on valley bluffs, or on the slopes of the Potrillo Mountains, 7 mi (12 km) southwest of the proposed Afton SEZ. In general, there are fewer, but larger pueblos built with room blocks around plazas that include ceremonial structures. There are fewer procurement sites, but hunting and gathering sites continue to be located in dune locations. Mimbres characteristics disappear by this phase, and there is broad homogeneity with Arizona pueblos. It is likely that the proposed Afton SEZ was devoid of pueblos, which would have been located on arable land close to the Rio Grande, and this area continued to be used as an area for hunting and gathering. Most of the pueblos were abandoned by 1400, with complete abandonment by 1450 (Kirkpatrick et al. 2001).

The reason for abandonment of the pueblos is not known, and the larger population centers are forgone in favor of a highly mobile lifestyle based on hunting and gathering, with some limited agriculture as practiced by the southern Athabaskan-speaking Apache, who arrived in southern New Mexico by 1500. A detailed discussion of these and other ethnohistoric groups in the area is provided in Section 12.1.17.1.2.

12.1.17.1.2 Ethnohistory

The proposed Afton SEZ is located on the uplands west of the Rio Grande Valley. When Spanish explorers first entered the area in the sixteenth century, they considered the area between El Paso and Socorro unoccupied, most likely because they were unaware of Apache in the overlooking mountains (Kirkpatrick et al. 2001). However, this territory was traditionally used by the Chiricahua Apache (Opler 1983b) and historically within the range of the Manso, who appear to have been allied with the Apache (Griffen 1983). Situated on a plateau above the

Rio Grande floodplain, the proposed SEZ is likely to have been primarily used for hunting and gathering and is likely to have been known to the Tigua and Piros Pueblos located near modern El Paso, as well as the Chiricahua and Manso (Schroeder 1979; Houser 1979).

Chiricahua Apache

The Apache, one of the Southern Athapaskan- or Apachean-speaking Tribes (Opler 1983a), arrived in southern New Mexico by 1500. Divided into three regional bands, for most purposes they formed smaller kin-based matrilocal groups. They practiced a mobile lifestyle based primarily on hunting and gathering. Each group had a base camp located in the mountains, chosen for ease of defense and access to natural resources such as firewood, fodder, and a range of different ecozones that provided resources in different seasons. A nucleus of the group usually remained at the home camp, although smaller groups constantly departed to exploit plant and animal resources elsewhere as they became available throughout the year at different elevations and to engage in raiding and trading. Base camps would last for some time but were not permanent (Opler 1983b). They served as a defensible retreat for Apache raiding parties (Opler 1983b; Tweedie 1968).

The proposed Afton SEZ is in the traditional territory of the Eastern Band or "red paint people." The Eastern Band ranged throughout much of southwestern New Mexico and were reported to hunt in the Potrillo Mountains, just west and south of the SEZ and Florida Mountains, 33 mi (54 km) to the west of the SEZ. The Red Paint People differed from other Chiricahua bands in that they were more likely to practice some form of agriculture (Opler 1941) and were more apt to use tepees when in the lowlands as well as brush wickiups in the highlands (Opler 1983a,b).

The arrival of Spanish explorers and the missionaries and colonists who followed made horses available to the Chiricahua, who incorporated them into their mobile lifestyle by the 1630s. For the most part, they remained at odds with the Spanish, raiding both Spanish settlements and Native American pueblos. They joined in the Pueblo Revolt of 1680. The Spanish made little headway against the Apaches throughout the eighteenth century in spite of a military strike into the Florida Mountains (Barrett 2002). The area of the proposed Afton SEZ remained under Apache control. The Spanish traveled through Apache-controlled territory in heavily guarded parties moving hurriedly along the El Camino between El Paso del Norte and Santa Fe. In the years between Mexican independence in 1821 and the acquisition of New Mexico by the United States in 1848, there was an uneasy truce between the Chiricahua and the colonists (Opler 1983b).

The arrival of American troops during and following the Mexican War ushered in a period of renewed conflict that was to last throughout most of the nineteenth century. Euro-American mining and ranching activities were developed and expanded, thus depriving the Apache of their traditional resources. The new settlers wanted the Apache removed. The government response fluctuated between efforts to settle the Apache peacefully on reserves and to remove them by force of arms. Throughout the 1870s and 1880s, the Chiricahua resisted attempts to settle them on reservations far from their homeland, sparking vigorous military pursuit in southern New Mexico and northern Mexico. After failed attempts at establishing reservations in the Tularosa Valley, in Southeastern Arizona, and near modern Truth or Consequences, New Mexico, the Chiricahua were required to settle on the San Carlos Reservation in Arizona. Those who refused were rounded up and sent as prisoners of war to Fort Marion, Florida, and Mount Vernon Barracks, Alabama, in 1886, later to be joined by the Chiricahua who had remained at San Carlos. By 1894, their numbers greatly reduced, the Chiricahua were allowed to leave the Southeast, and lands were provided near Fort Sill, Oklahoma. In 1913, about one-third of the Fort Sill Chiricahua opted to return to the mountains of New Mexico and live on the Mescalero Apache reservation (Opler 1983b). Those retaining allotments in Oklahoma were loosely organized until they were awarded a substantial claim by the Indian Claims Commission in 1973. The Fort Sill Apache organized as a federally recognized tribe in 1976 (Coppersmith 2007).

Manso

The proposed SEZ also lies in the traditional range associated with the Manso. The Spanish first encountered the Manso, sometimes called Manso Apache, near present-day El Paso. They called them *manso*, tame or peaceful, because of their initial peaceful encounter. Little is known of their affiliation, but they may have been Apache allies (Griffen 1983; Opler 1983a). The Manso form one element of the Tigua community of Tortugas in Las Cruces, New Mexico, associated with the Pueblo of Ysleta del Sur in El Paso (Houser 1979).

Piro

The Piro are possible descendants of the Jornada Mogollon. When first encountered by Coronado in 1540, Piro pueblos stretched along the banks of the Rio Grande from Mogollon Gulch to the Rio Solado. They were farmers who employed both irrigation and rainfall agriculture. They grew the traditional maize, beans, and squash along with cotton. Bison and turkey meat supplied protein. Their numbers appear to have declined in the ensuing century, and by 1670, they were reduced to four pueblos. Left out of the conspiracy, they retreated south with the Spanish during the Pueblo Revolt of 1680. Many Piros remained in the south and have joined with Ysleta del Sur or the Tortugas community in Las Cruses (Schroeder 1979).

12.1.17.1.3 History

Spanish colonists, under the leadership of Don Juan de Oñate, arrived at the Rio Grande near El Paso de Norte in 1598, and eventually continued northward along the river to Socorro, establishing a capital at the Tewa Village of Ohke, about 275 mi (442 km) north of the SEZ. Onate, and thousands of subsequent colonists and traders, traveled El Camino Real de Tierra Adentro (the Royal Road of the Interior) from Mexico City, Mexico, to Santa Fe, New Mexico. In use from 1598 to 1885, this was the oldest and longest continuously used road in the United States. The 1,600-mi (2,575-km) El Camino Real took about 6 months to traverse, and groups were escorted by military forces to protect them from hostile groups along the route.

Traditionally, those traveling on the trail would use either *carros* (four-wheeled ox-drawn wagons) or *carretas* (two-wheeled carts). The route generally follows the Rio Grande from El Paso north, and along the trail, *paraje,* or campsites, were placed every 15 to 20 mi (24 to 32 km). Generally, these parajes did not have any permanent buildings, wells, corrals, or structures; usually the only requirement was access to a good spring or the Rio Grande. Near most established towns, pueblos or *haciendas* served as stops along the route. This congressionally designated trail passes as close as 3 mi (5 km) to the east of the proposed Afton SEZ.

Spanish settlement in New Mexico remained centered well north of the proposed Afton SEZ, where a new capital was established at Santa Fe in 1607. The region between El Paso de Norte and Socorro remained unsettled by non-Native Americans, at least partly due to Apache hostility. This situation began to change with Mexican independence from Spanish colonial rule in 1821. Thereafter, Mexican farmers began to expand along the Rio Grande from El Paso, with the towns of Las Cruces and Dona Ana founded in the 1840s. The new border drawn between Mexico and the United States, as a result of the Treaty of Guadalupe Hidalgo, which ended the Mexican–American War in 1848, left the town of Dona Ana in the United States. In an effort to allow New Mexican residents to remain a part of the country of Mexico, the Mesilla Civil Colony was established in 1848. The Mexican government issued several land grants and even offered to pay for the relocation costs for people to move to these areas. Tracts of land were set aside in the colony for a commons area, an area for pasture, and a forest area for hunting and wood gathering. Other nearby colonies were established for the same purposes, such as the Santo Tomas de Yurbide and Jose Manuel Sanchez-Baca tracts, also close to the Afton SEZ (NPS and BLM 2004).

The United States acquired most of what is now New Mexico by conquest in the Mexican–American War and established a military outpost at Fort Fillmore (near Mesilla) just 3 mi (5 km) to the east of the SEZ, in 1851 to protect both American and Mexican settlers from Apache raids. However, even after the Treaty of Guadalupe Hidalgo was signed, the boundary between Mexico and New Mexico, west of the Rio Grande, remained in dispute. The proposed Afton SEZ lies within this disputed territory. The conflict was resolved in 1853 as part of the Gadsden Purchase, when the United States purchased land from Mexico suitable for the construction of a continental railroad over a snow-free route. The proposed Afton SEZ lies within the Mesilla Valley, which was a part of the Gadsden Purchase. While the railroad did not fully materialize until the 1880s, beginning in 1858, the Butterfield Overland Mail provided stage service over a similar route to the proposed railroad, passing about 5 mi (8 km) north of the proposed Afton SEZ.

The Butterfield Overland Mail went from the Mississippi River to San Francisco, California. There were two eastern terminals, one in St. Louis, Missouri, and one in Memphis, Tennessee, as a result of a decision by the then Postmaster General, Aaron Brown of Tennessee. The U.S. Congress awarded John Butterfield the contract to carry mail along this route in 1857. The route followed a trail that was used by Native Americans and early European and American explorers. The total length of the trail was 2,795 mi (4,498 km), and, ideally, the trip would take only 25 days from start to finish. Several relay stations and forts had to be constructed along the trail. The relay stations were built every 8 to 25 mi (13 to 40 km) to provide for meals and the changing of horse teams; the stations were stocked with several hundred heads of draft animals and served as crucial waypoints along the trail. Passengers paid about $200 for a one-way trip and often were armed to deter attacks from Native Americans. The trail was an important route that connected eastern points to the western frontier. By 1860 more mail was carried by the southern overland route than by ocean steamers; however, by the spring of 1861, the company began using a more central route from Atchison, Kansas to Placerville, California. With the construction of the transcontinental railroad beginning in 1869, the need for stage routes like the Butterfield Overland Mail became obsolete (Hafen 1926; Greene 1994; TSHAOnline 2010).

The town of Mesilla, 3 mi (5 km) east of the proposed Afton SEZ, was one of the crucial overnight stage stops on the Butterfield Overland Mail route. It was established in 1848 as a place for residents of New Mexico to settle and retain their cultural ties to the "mother county" of Mexico, as described above. Mesilla is a town with a unique cultural identity; a conglomeration of Hispanic, American, and Native American ancestral components, the town is home to several historic properties that are important facets to the overall history of the region. Initially, the residents of Mesilla were under a constant threat from the Apache, and the establishment of Fort Fillmore provided the necessary protection for the residents to develop land in the vicinity of Mesilla. The military presence did not end with Fort Fillmore's construction. During the beginning of the Civil War, Confederate Soldiers entered the town and fought the Battle of Mesilla and won. The townspeople embraced the Confederate presence, and Mesilla became a central point from which the Confederate Army maintained the Arizona territory, until the Union recaptured the town later in the war. The town of Mesilla also lies along the route of the historic El Camino Real de Tierra Adentro, and the town of Mesilla became a key stopping point for weary travelers along this trail, as well as the Butterfield Trail. Initially, it was assumed that when the southern transcontinental railroad was built it would pass through Mesilla; instead, the route was constructed through Las Cruces; consequently, growth in the region became more concentrated in La Cruces (Greene 1994; TSHA Online 2010). Mesilla still retains its historical character as evidenced by La Mesilla Plaza, which is a National Historic Landmark, and La Mesilla Historic District, both of which are listed in the *National Register of Historic Places* (NRHP).

With the establishment of an American military presence, settlement in south–central New Mexico steadily increased along with ranching, homesteading, and mining. With the arrival of the railroad, which finally exploited the southern transcontinental route, and a series of wetter than normal years, significant growth in the ranching industry in the region occurred. This railroad, constructed by the Southern Pacific Company, passes just 1 mi (1.6 km) southwest of the SEZ. The Atchison, Topeka, and Santa Fe Railroad also passes close to the SEZ, 4 mi (6 km) west, and also was an important transportation route in the southwest. By the Second World War, ranching was in decline, and, consequently, the government began purchasing large tracts of land for military testing and training; the White Sands Missile Range being the closest military installation to the proposed Afton SEZ, 9 mi (14 km) to the east. With increased settlement in the region, water resources became important to control and maintain. In 1916, the Elephant Butte Dam was constructed in Sierra County, north of the proposed Afton SEZ. This dam allowed for the implementation of a large irrigation district, the Elephant Butte Irrigation District. As a part of this district, the Mesilla Dam was constructed in 1916 and diverted water into the East and West Canals; the West Canal lying just 0.5 mi (0.8 km) to the east of the SEZ (Gibbs et al. 2000). The Elephant Butte Irrigation District is listed in the NRHP.

12.1.17.1.4 Traditional Cultural Properties—Landscape

While thus far no specific features within the proposed Afton SEZ have been identified as culturally important by Native Americans, the Potrillo and Florida Mountains west of the proposed SEZ are known to have been exploited by the Chiricahua Apache and may retain cultural importance. In general, the mountains surrounding Chiricahua territory were traditionally seen as the homes of the Mountain People, beneficent supernatural beings, who shielded the Chiricahua from disease and invasion. Salinas Peak, the highest peak in the San Andres Mountains, is reported to be especially sacred to the Eastern Chiricahua (WSMR 1998). From the Chiricahua perspective, the universe is pervaded by supernatural power that individuals may acquire for healing, success in hunting, or other purposes. The power is made available through personified natural features and phenomena such as plants, animals, or celestial bodies. This power is often acquired at its sacred home, usually in or near a well-known landmark. (Opler 1941, 1947). Natural features may be of importance in the quest for this power (Opler 1983a,b; Cole 1988). Stone projectile points found in the landscape were traditionally seen as the result of arrows sent by the Lightning People during thunderstorms (Opler 1941). Plant collecting areas and traditional trails are also likely to be of importance.

12.1.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources

The proposed Afton SEZ encompasses 77,622 acres (314 km^2), only 6,096 acres (25 km^2) of which have been surveyed, covering just under 8% of the total area of the SEZ. According to the BLM New Mexico Office and New Mexico State Historic Preservation Office (SHPO) records, 113 cultural resource sites have been recorded in the proposed Afton SEZ (Hewitt 2009a; Fallis 2010). The surveys are not uniformly distributed; however, there appears to be a higher density of sites in the northern and southern sectors of the SEZ. At least 10 of these 113 sites that fall within the boundary are prehistoric in nature. Four of these sites are considered potentially eligible for inclusion in the NRHP, 2 are specified in the GIS as not evaluated, and no information on eligibility status was available in the GIS data for the remaining 107 sites. Within 5 mi (8 km) of the SEZ, about 13,841 acres (56 km^2) has been surveyed, covering about 6% of the area within 5 mi (8 km) of the SEZ boundary, resulting in the recording of 330 sites. Of these 330 sites, 147 are prehistoric in nature, 84 containing structural remains; 54 of the sites are historic, 32 with structural remains; and 6 are multicomponent sites, 4 with structural remains. The remaining 123 sites are of an unknown temporal sequence; however, it is known that 72 of them have structural remains. Seventeen of these sites are considered potentially eligible for inclusion in the NRHP, 11 are considered ineligible, and 4 are specified as unevaluated; no information on eligibility status of the remaining 300 sites was available in the GIS data.

The BLM has designated several ACECs and Special Management Areas (SMAs) in the vicinity of the proposed Afton SEZ, as these areas have been determined to be rich in cultural resources and worthy of having the resources managed and protected by the BLM. The Los Tules ACEC is located just 1 mi (1.6 km) east of the proposed Afton SEZ overlooking the Rio Grande; the ACEC was designated to protect a large pithouse village site that is the type site for the Jornada variant of the Mogollon culture. Six mi (10 km) east of the SEZ is the Organ/Franklin Mountain ACEC, a 56,480-acre (229-km^2) area that contains the NRHP-eligible sites of La Cueva and Dripping Springs. The Robledo Mountain ACEC is 9 mi (14 km) north of the SEZ and includes some of the earliest known habitation sites in New Mexico. The cultural resources in the Dona Ana Mountains ACEC are located 14 mi (23 km) northeast of the SEZ. On the north side of San Diego Mountain are several hundred of the most undisturbed petroglyphs in the Mimbres Resource Area, representing the Jornada culture; they are located within the San Diego Mountain ACEC, 24 mi (39 km) north of the SEZ.

Several additional cultural ACECs have been established in the region but are beyond the 25-mi (40-km) distance for the viewshed analysis. The Rincon ACEC is also a petroglyph site representative of the Jornada culture, 30 mi (48 km) north of the SEZ. About 39 mi (63 km) west of the proposed Afton SEZ is the Cooke's Range ACEC. Resources protected by this ACEC include Fort Cummings, a fort established in 1863 to protect travelers on the emigrant trail to California, and the Massacre Peak and Pony Hill petroglyph sites, which are representative of the Mimbres culture. The Old Town ACEC is 55 mi (89 km) west of the SEZ and contains the remains of a Mimbres village site that has been heavily looted. An estimated 1,000 whole pots have been looted from the site, and, consequently, the ACEC designation is an attempt to curb the looting practices.

The cultural SMA in the vicinity of the proposed Afton SEZ is the Butterfield Trail, 5 mi (8 km) north of the SEZ. The White Sands National Monument was designated as a national monument for its cultural resources, in addition to the unique geologic and environmental resources. The monument is located 37 mi (60 km) northeast of the SEZ (BLM 1993). Also in the vicinity of the proposed Afton SEZ is the Mesilla Plaza, a National Historic Landmark that protects the historic features of the plaza that was built in 1848. The Elephant Butte Irrigation District is a vast district that controls the water rights to 90,640 acres (367 km^2) of land and more than 100 mi (161 km) of canals in southern New Mexico. Portions of irrigation canals are within the immediate vicinity of the proposed Afton SEZ. Just 3 mi (5 km) east of the proposed Afton SEZ is the congressionally designated El Camino Real de Tierra Adentro National Historic Trail, one of the oldest and longest continually used roads in the United States.

National Register of Historic Places

There are no properties listed in the NRHP in the SEZ; however, at least four sites in the SEZ are potentially eligible for inclusion in the NRHP. In addition, several properties listed in the NRHP are located within 5 mi (8 km) of the SEZ (see Table 12.1.17-1), as well as 17 potentially eligible archaeological sites. San Jose Church is located in La Mesa, about 2 mi (3 km) east of the SEZ. In Mesilla, about 2 mi (3 km) northeast of the SEZ, three properties are listed in the NRHP—Mesilla Plaza, Barela–Reynolds House, and the La Mesilla Historic District. The Elephant Butte Irrigation District has portions that are within 5 mi (8 km) of the SEZ, notably the West Canal, 0.5 mi (0,8 km) east of the SEZ. Within the city of Las Cruces,

TABLE 12.1.17.1-1 National Register Properties within 25 mi (40 km) of the Proposed Afton SEZ in Dona Ana County

NRHP Site	Distance from SEZ
Elephant Butte Irrigation District	Variable; Mesilla Diversion Dam 2 mi (24 km) (including split of West and East Side Canals) West Side Canal 0.5 mi (0.8 km)
San Jose Church	2 mi (3 km)
Barela-Reynolds House	2 mi (3 km)
Mesilla Plaza	2 mi (3 km)
La Mesilla Historic District	2 mi (3 km)
Fort Fillmore	Address restricted
Hadley-Ludwick House	5 mi (8 km)
Air Science	5 mi (8 km)
University President's House	5 mi (8 km)
Goddard Hall	5 mi (8 km)
Foster Hall	5 mi (8 km)
Nestor Armijo House	5 mi (8 km)
Mesquite Street Original Townsite Historic District	5 mi (8 km)
Rio Grande Theatre	5 mi (8 km)
Alameda-Depot Historic District	5 mi (8 km)
Thomas Branigan Memorial Library	5 mi (8 km)
Phillips Chapel CME Church	5 mi (8 km)
Green Bridge	7 mi (11 km)
Our Lady of Purification Church	9 mi (14 km)
Dona Ana Village Historic District	9 mi (14 km)
Rio Grande Bridge at Radium Springs	16 mi (26 km)
Fort Selden	16 mi (26 km)
L.B. Bentley General Merchandise	18 mi (29 km)
Summerford Mountain Archaeological District	18 mi (29 km)
International Boundary Marker No. 1, U.S. and Mexico	24 mi (39 km)
Launch Complex 33	28 mi (45 km)[a]

[a] Although just over 25 mi (40 km) from the SEZ, this property is included in the table because it is a National Historic Landmark.

5 mi (8 km) northeast of the SEZ, and in the immediate vicinity of the city are 14 properties listed in the NRHP. The town of Dona Ana, 9 mi (14 km) northeast of the SEZ, maintains two NRHP properties, and the Radium Springs area, northeast of the SEZ, has three properties in the NRHP. There are three additional properties in Dona Ana County: L.B. Bentley General Merchandise 18 mi (29 km) in Organ; the International Boundary Marker No. 1, United States and Mexico, located near El Paso, Texas, 24 mi (39 km) southeast of the SEZ; and Launch Complex 33, on the White Sands Missile Range, 28 mi (43 km) northeast of the SEZ. Mesilla Plaza and Launch Complex 33 are also both National Historic Landmarks.

12.1.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Afton SEZ; however, further investigation is needed. A cultural resources survey of the entire area of potential effect (APE) of a proposed project, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. The proposed Afton SEZ has potential for containing significant cultural resources, especially in the dune areas in the northern and eastern portion of the SEZ, and those areas in close proximity to the Rio Grande. Section 5.15 discusses the types of effects that could occur on any significant cultural resources found to be present within the proposed Afton SEZ. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

Visual impacts on several property types are possible within this SEZ. Two important trail systems lie within 5 mi (8 km) of the SEZ, as well as several properties listed in the NRHP, and a National Historic Landmark. Additional analysis on the visual effects of solar development on these properties would be needed prior to any development. See Section 12.1.14 for an initial evaluation of visual effects.

Programmatic design features to reduce water runoff and sedimentation would prevent the likelihood of indirect impacts on cultural resources resulting from erosion outside the SEZ boundary (including along ROWs).

No needs for new transmission lines or access corridors have currently been identified, assuming existing corridors would be used. Therefore, no new areas of cultural concern would be made accessible as a result of development within the proposed Afton SEZ; thus indirect impacts resulting from vandalism or theft of cultural resources are not anticipated. However, impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

12.1.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features and cultural awareness training for the workforce on the sensitivity of certain types of cultural resources, including resources of concern to Native Americans (see also Section 12.1.18), but also possible properties of significance to the Hispanic population in this area, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the New Mexico SHPO and affected Tribes and would depend on the results of future cultural investigations.

See Section 12.1.14.3 for recommended design features for reducing visual impacts on the El Camino Real National Historic Trail, the Butterfield Trail, and Mesilla Plaza National Historic Landmark. Coordination with trails associations and historical societies regarding impacts on El Camino Real de Tierra Adentro, the Butterfield Trail, and Mesilla Plaza, as well as other NRHP-listed properties is also recommended.

12.1.18 Native American Concerns

As discussed in Section 12.1.17, Native Americans tend to view their environment holistically, and they 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 Afton SEZ, Section 12.1.17 discusses archaeological sites, structures, landscapes, and traditional cultural properties; Section 12.1.8 discusses mineral resources; Section 12.1.9.1.3 discusses water rights and water use; Section 12.1.10 discusses plant species; Section 12.1.11 discusses wildlife species, including wildlife migration patterns; Section 12.1.13 discusses air quality; Section 12.1.14 discusses visual resources; Sections 12.1.19 and 12.1.20 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.

All federally recognized Tribes with traditional ties to the proposed Afton SEZ have been contacted so that they could identify their concerns regarding solar energy development. The Tribes contacted with traditional ties to the Afton SEZ are listed in Table 12.1.18-1. Appendix K lists all federally recognized Tribes contacted for this PEIS.

12.1.18.1 Affected Environment

The traditional use areas of Native Americans varied over time, sometimes overlapping. The proposed Afton SEZ lies within the traditional range of the Eastern Band of the Chiricahua

TABLE 12.1.18-1 Federally Recognized Tribes with Traditional Ties to the Proposed Afton SEZ

Tribe	Location	State
Fort Sill Apache Tribe of Oklahoma	Apache	Oklahoma
Jicarilla Apache Nation	Dulce	New Mexico
Mescalero Apache Tribe	Mescalero	New Mexico
San Carlos Apache Tribe	San Carlos	Arizona
White Mountain Apache Tribe	Whiteriver	Arizona
Ysleta del Sur Pueblo	El Paso	Texas

Apache. While the bands of the Chiricahua Apache had a strong sense of place, the area was very likely shared with the Manso (Opler 1983b; Griffen 1983). The Indian Claims Commission included the area in the judicially established Chiricahua Apache traditional territory (Royster 2008).

12.1.18.1.1 Territorial Boundaries

Chircahua Apache

The territory of the Chiricahua Apache encompassed southwestern New Mexico, southeastern Arizona, and parts of the adjacent Mexican state of Chihuahua. In New Mexico, their range stretched westward from the Rio Grande to the modern Arizona border, and as far north as the Datil Mountains. In Arizona, it included a triangular area centered on the Chiricahua Mountains in the southeastern corner of the state. The international border is not relevant to traditional Tribal territory and the Chiricahua ranged well into adjacent areas of northern Chihuahua. The Chiricahua have been removed from their traditional range. Descendants are to be found near Fort Sill, Oklahoma, and on the Mescalero Apache Reservation in New Mexico (Opler 1983b).

Manso

The Manso were a smaller group affiliated with the Jano and Jocome. Traditionally, they inhabited a strip of land along the modern southern border of New Mexico stretching from the valley of the Rio Grande westward to the Cedar Mountains, probably including the proposed Afton SEZ (Griffen 1983). Manso descendants may be found among the members the Ysleta del Sur Pueblo and in the Tortuga Community in Las Cruces (Houser 1979).

Piro

The Piro Pueblos were originally located along the Rio Grande from Mogollon Gulch north to the Rio Solado. They moved south with the Spanish during the Pueblo Revolt of 1680 and settled near El Paso. Today, Piro descendants can be found in the Ysleta del Sur Pueblo and in the Tortuga Community (Houser 1979; Schroeder 1979).

12.1.18.1.2 Plant Resources

This section focuses on those Native American concerns that have an ecological as well as a cultural component. For many Native Americans, the taking of game or the gathering of plants or other natural resources may have been seen as both a sacred and a secular act (Stoffle et al. 1990).

The Chiricahua Apache were primarily hunters and gatherers, although the Eastern Band did practice some riverbank farming. The proposed Afton SEZ is located on relatively dry, level upland overlooking the Mesilla Valley of the Rio Grande. It does not appear to have been well suited for indigenous agriculture, and was likely used as an area for hunting and gathering. The Chiricahua had access to a variety of ecosystems and much of what they gathered is found in the mountains. Important plants found at lower elevations include agave, mesquite, yucca, cactus fruit, and seed-bearing plants such as dropseed. Agave was a principal source of wild plant food. Gathered in the spring, its crowns were roasted to form mescal, which when sun-dried was storable for long periods. There are occasional pockets of habitat suitable for agave in the proposed Afton SEZ; however, the dominant land cover is more conducive to mesquite, yucca, and dropseed. (Opler 1941, 1983b; Cole 1988). Little is known of the Manso before they joined the Ysleta. Certainly thereafter they would have engaged in irrigation agriculture supplemented by hunting and gathering, as was the case with the Piro (Houser 1979; Schroeder 1979). The proposed Afton SEZ supports plants that would have been attractive to the Apache groups in the adjacent mountains and Puebloan groups along the Rio Grande.

The plant communities observed or likely to be present at the proposed Afton SEZ are discussed in Section 12.1.10. As shown in the USGS's Southwest Regional Gap Analysis, the land cover at the proposed Afton SEZ is predominantly Chihuahuan Stabilized Dune and Sand Flat Scrub, interspersed with patches of Apacherian-Chihuahuan Mesquite Upland Scrub, Chihuahuan Mixed Salt Desert Scrub, Chihuahuan Creosotebush Mixed Desert and Thorn Scrub, and North American Warm Desert Active and Stabilized Dune (USGS 2005a). While vegetation is sparse most of the year, seasonal rains often result in a florescence of ephemeral herbaceous species.

Native American populations have traditionally made use of hundreds of native plants. Table 12.1.18.1-1 lists plants traditionally used by the Chiricahua Apache that were either observed at the proposed Afton SEZ or are probable members of the cover type plant communities identified for the SEZ. These plants are the dominant species; however, other plants important to Native Americans could occur in the SEZ, depending on local conditions and the season. Much of the proposed Afton SEZ is flat, open terrain supporting widely spaced desert scrub, mostly creosotebush. Scattered depressions, mostly located in a line cutting diagonally across the northwestern corner of the study area, support concentrations of mesquite. Creosotebush is important in traditional Native American medicine and as a food plant. Mesquite was among the most important food plants. Its long, beanlike pods were harvested in the summer, could be processed and stored, and were widely traded.

12.1.18.1.3 Other Resources

Water is an essential prerequisite for life in the arid Southwest. As long-time desert dwellers, Native Americans have a great appreciation for the importance of water in a desert environment. They have expressed concern over the use and availability of water for solar energy installations (Jackson 2009). Tribes are also sensitive about the use of scarce local water supplies for the benefit of distant communities and recommend that determination of adequate

TABLE 12.1.18.1-1 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Afton SEZ

Common Name	Scientific Name	Status
Agave	*Agave* spp.	Possible
Buckwheat	*Eriogonum* spp.	Possible
Creosotebush	*Larrea tridentata*	Observed
Honey mesquite	*Prosopis Glandolosa*	Observed
Juniper	*Juniperus* spp.	Possible
Mesa dropseed	*Sporobolus flexuosus*	Possible
Prickly pear cactus	*Opuntia* spp.	Possible
Sage	*Artemisia trifolia*	Possible
Screwbean mesquite	*Prosopis pubescens*	Possible
Sumac	*Rhus microphylla*	Possible
Wild grasses	Various species	Possible
Yucca	*Yucca* spp.	Possible

Sources: Field visit; Opler (1941, 1983b); Cole (1988); USGS (2005a).

water supplies be a primary consideration for whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

Between the mountainous terrain favored by the Apache and the river bottomland farmed by the Piro, it is likely that the uplands where the proposed Afton SEZ is situated were seasonal hunting grounds. Deer was the principal Chiricahua game animal. Deer have been an important source of food and of bone, sinew, and hide used to make a variety of implements. They were especially hunted in the fall, when meat and hides were thought to be best. The proposed SEZ is within mule deer range. Pronghorn were also important, but the SEZ does not appear to be within pronghorn range. Other prized game animals included elk (wapiti) and bighorn sheep. The proposed SEZ does not provide suitable habitat for either (USGS 2005b). While big game was highly prized, smaller animals, such as desert cottontail, woodrats, and squirrels (all potentially present in the SEZ), traditionally also added protein to their diet, as did some birds. The Chiricahua would not eat snakes, lizards, or animals, such as peccaries, thought to feed on unclean species. Animals hunted for their skins or feathers include bobcat, mountain lion, badger, beaver, otter, and eagle (Opler 1941, 1983a). Wildlife likely to be found in the proposed Afton SEZ is described in Section 12.1.11. Native American game species whose ranges include the SEZ are listed in Table 12.1.18.1-2.

In other areas, Native Americans have expressed concern over ecological segmentation, that is, development that fragments animal habitat and does not provide corridors for movement. They would prefer solar energy development take place on land that has already been disturbed, such as abandoned farmland, rather than on undisturbed ground (Jackson 2009).

TABLE 12.1.18.1-2 Animal Species Used by Native Americans Whose Range Includes the Proposed Afton SEZ

Common Name	Scientific Name	Status
Badger	*Taxidea taxus*	Possible
Bald eagle	*Haliaeetus leucocephalus*	Winter
Bobcat	*Lynx rufus*	Possible
Desert cottontail	*Silvilagus audubonii*	All year
Gambel's quail	*Callipepla gambelii*	All year
Golden eagle	*Aquila chrysaetos*	Possible
Mountain lion	*Puma concolor*	Possible
Mourning dove	*Zenaida macroura*	All year
Mule deer	*Odocoileus hemionus*	All year
Rock squirrel	*Spermophilus variegates*	All year
Woodrats	*Neotoma* spp.	All year

Sources: Opler (1983b); USGS (2005b).

12.1.18.2 Impacts

To date, no comments have been received from the Tribes specifically referencing the proposed Afton SEZ. However, the Tribal Historic Preservation Officer (THPO) for the Ysleta del Sur Pueblo stated in response to the 2008 notification of the impending PEIS that the Ysleta did not believe that the solar energy PEIS would adversely affect the traditional, religious, or culturally significant sites of Ysleta Pueblo, but did request that Ysleta Pueblo be consulted if any burials or NAGPRA artifacts were encountered during development (Loera 2010; copy of correspondence in Appendix K.1.2). Many traditional Chiricahua ritual specialists feel they derive their power from the sun (Opler 1947). They may be sensitive to deriving electric energy from the sun.

The impacts on resources important to Native Americans that would be expected from solar energy development within the proposed Afton SEZ fall into two major categories: impacts on the landscape and impacts on discrete localized resources.

Potential landscape-scale impacts are those caused by the presence of an industrial facility within a cultural landscape that includes sacred mountains and other geophysical features often tied together by a network of trails. Impacts may be visual—the intrusion of an industrial feature in sacred space; audible—noise from the construction, operation or decommissioning of a facility detracting from the traditional cultural values of the site; or demographic—the presence of a larger number of outsiders in the area that would increase the chance that the cultural importance of the area would be degraded by more foot and motorized traffic. 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 effects solar energy development could have on the landscape within the proposed SEZ; however, Salinas Peak, considered sacred by the Eastern Chiricahua, is located 74 mi (120 km) north-northeast of the SEZ and is not likely to be affected by development there.

Localized effects could occur both within the proposed SEZ and in adjacent areas. Within the SEZ, these effects would include the destruction or degradation of important plant resources, destroying the habitat of and impeding the movement of culturally important animal species, destroying archaeological sites and burials, and the degradation or destruction of trails. Plant resources are known to exist in the SEZ. Any ground-disturbing activity associated with the development within the SEZ has the potential for destruction of localized resources. However, significant areas of mesquite and associate plants important to Native Americans would remain outside the SEZ, and anticipated overall effects on these plant populations would be small. Animal species important to Native Americans are shown in Table 12.1.18.1-2. While the construction of utility-scale solar energy facilities would reduce the amount of habitat available to many of these species, similar habitat is abundant and the effect on animal populations is likewise likely to be small.

Since solar energy facilities cover large tracts of ground, even taking into account the implementation of design features, it is unlikely that avoidance of all resources would be possible. Programmatic design features (see Appendix A, Section A.2.2) assume that the necessary cultural surveys, site evaluations, and Tribal consultations will occur. 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.

12.1.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to address impacts of potential concern to Native Americans, such as avoidance of sacred sites, water 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 12.1.18-1.

Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 12.1.17.3, in addition to the design features for historic properties discussed in Section A.2.2 in Appendix A.

12.1.19 Socioeconomics

12.1.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the region of influence (ROI) surrounding the proposed Afton SEZ. The ROI is a two-county area consisting of Dona Ana County in New Mexico and El Paso County in Texas. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

12.1.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 365,658 (Table 12.1.19.1-1). Over the period 1999 to 2008, annual average employment growth rates were higher in Dona Ana County (2.7%) than in El Paso County (0.7%). At 1.1%, employment growth rates in the ROI as a whole were somewhat less than the average state rates for New Mexico (1.5%) and Texas (1.3%).

In 2006, the service sector provided the highest percentage of employment in the ROI at 53.3%, followed by wholesale and retail trade with 20.3% (Table 12.1.19.1-2). Smaller employment shares were held by manufacturing (7.9%), transportation and public utilities (5.3%), and finance, insurance and real estate (5.1%). Within the ROI counties, the distribution of employment across sectors is similar to that of the ROI as a whole, with a slightly higher percentage of employment in agriculture (9.8%) and construction (9.3%), and slightly lower percentages in manufacturing (5.0%) and wholesale and retail trade (17.3%) in Dona Ana County compared to the ROI as a whole.

TABLE 12.1.19.1-1 Employment in the ROI for the Proposed Afton SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Dona Ana County, New Mexico	65,546	85,934	2.7
El Paso County, Texas	261,213	279,724	0.7
ROI	326,759	365,658	1.1
New Mexico	793,052	919,466	1.5
Texas	9,766,299	11,126,436	1.3

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

1

TABLE 12.1.19.1-2 Employment by Sector in the ROI for the Proposed Afton SEZ, 2006[a]

Industry	Dona Ana County, New Mexico		El Paso County, Texas		ROI	
	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	5,042	9.8	1,038	0.5	6,080	2.4
Mining	175	0.3	375	0.2	550	0.2
Construction	4,798	9.3	8,856	4.4	13,654	5.4
Manufacturing	2,586	5.0	17,401	8.6	19,987	7.9
Transportation and public utilities	1,240	2.4	12,159	2.0	13,399	5.3
Wholesale and retail trade	8,957	17.3	42,676	21.1	51,633	20.3
Finance, insurance, and real estate	2,430	4.7	10,574	5.2	13,004	5.1
Services	26,497	51.3	108,952	53.8	135,449	53.3
Other	14	0.0	75	0.0	89	0.0
Total	51,658		202,368		254,026	

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

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

12.1.19.1.2 ROI Unemployment

Unemployment rates have varied across the two counties in the ROI. Over the period 1999 to 2008, the average rate in El Paso County was 7.0%, with a lower rate of 5.8% in Dona Ana County (Table 12.1.19.1-3). The average unemployment rate in the ROI as a whole over this period was 6.8%, higher than the average rates for New Mexico (5.0%) and Texas (5.3%). Unemployment rates for the first five months of 2009 contrast somewhat with rates for 2008 as a whole; in El Paso County the unemployment rate increased to 8.2%, while in Dona Ana County the rate reached 5.8%. The average rates for the ROI (7.7%), New Mexico (5.6%), and Texas (6.6%) were also higher during this period than the corresponding average rates for 2008.

12.1.19.1.3 ROI Urban Population

The population of the ROI in 2008 was 82% urban; the largest city, El Paso, had an estimated 2008 population of 609,248; populations of the next two largest cities in the ROI were Las Cruces at 90,908 and Socorro at 32,056 (Table 12.1.19.1-4). In addition, there are six smaller cities in the ROI with 2008 populations of less than 20,000.

Population growth rates in the ROI have varied over the period 2000 and 2006 to 2008 (Table 12.1.19.1-4). Horizon City grew at an annual rate of 12.1% during this period, with higher than average growth also experienced in Las Cruces (2.6%) and Socorro (2.1%). El Paso (1.0%) experienced a lower growth rate between 2000 and 2008, while Hatch (–0.2%) and Clint (–0.1%), experienced population declines during this period.

12.1.19.1.4 ROI Urban Income

Median household incomes vary across cities in the ROI. Two cities for which data are available for 2006 to 2008—Las Cruces ($37,402) and El Paso ($36,649)—had median incomes

TABLE 12.1.19.1-3 Unemployment Rates in the ROI for the Proposed Afton SEZ (%)

Location	1999–2008	2008	2009[a]
Dona Ana County, New Mexico	5.8	4.4	5.8
El Paso County, Texas	7.0	6.3	8.2
ROI	6.8	5.8	7.7
New Mexico	5.0	4.2	5.6
Texas	5.3	4.9	6.6

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

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

TABLE 12.1.19.1-4 Urban Population and Income in the ROI for the Proposed Afton 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]
Anthony	3,850	4,330	1.5	33,855	NA	NA
Clint	980	970	–0.1	43,776	NA	NA
El Paso	563,662	609,248	1.0	41,360	36,649	–1.3
Hatch	1,673	1,641	–0.2	27,360	NA	NA
Horizon City	5,233	13,019	12.1	62,559	NA	NA
Las Cruces	74,267	90,908	2.6	39,108	37,402	–0.5
Mesilla	2,180	2,196	0.1	54,430	NA	NA
Socorro	27,152	32,056	2.1	31,012	NA	NA
Sunland Park	13,309	14,436	1.0	25,961	NA	NA

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

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

in 2006 to 2008 that were lower than the average for New Mexico ($43,202) and Texas ($49,078) (Table 12.1.19.1-4).

Median household incomes declined between 1999 and 2006 to 2008 in Las Cruces (–0.5%) and El Paso (–1.3%). The average median household income growth rate for New Mexico as a whole over this period was –0.2%; in Texas the growth rate was –0.5%.

12.1.19.1.5 ROI Population

Table 12.1.19.1-5 presents recent and projected populations in the ROI and in the two states as a whole. Population in the ROI stood at 982,193 in 2008, having grown at an average annual rate of 1.8% since 2000. Growth rates for the ROI have been similar to the rates for New Mexico (1.7%) and Texas (1.6%) over the same period.

Both counties in the ROI have experienced a growth in population since 2000. Dona Ana County recorded a population growth rate of 2.1% between 2000 and 2008, while El Paso County grew by 1.7% over the same period. The ROI population is expected to increase to 1,171,031 by 2021, and to 1,194,737 by 2023.

12.1.19.1.6 ROI Income

Personal income in the ROI stood at $25.2 billion in 2007 and grew at an annual average rate of 3.0% over the period 1998 to 2007 (Table 12.1.19.1-6). ROI personal income per capita

TABLE 12.1.19.1-5 Population in the ROI for the Proposed Afton SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Dona Ana County, New Mexico	174,682	206,486	2.1	260,227	267,444
El Paso County, Texas	679,622	775,707	1.7	910,804	927,293
ROI	854,304	982,193	1.8	1,171,031	1,194,737
New Mexico	1,819,046	2,085,115	1.7	2,573,667	2,640,712
Texas	20,851,820	23,711,019	1.6	28,255,284	28,925,856

Sources: U.S. Bureau of the Census (2009e-f); Texas Comptroller's Office (2009); University of New Mexico (2009).

TABLE 12.1.19.1-6 Personal Income in the ROI for the Proposed Afton SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Dona Ana County			
Total income ($ billion 2008)	3.8	5.1	3.0
Per-capita income	22,254	25,493	1.4
El Paso County			
Total income ($ billion 2008)	15.0	20.1	3.0
Per-capita income	22,349	26,237	1.6
ROI			
Total income ($ billion 2008)	18.8	25.2	3.0
Per-capita income	22,329	26,082	1.6
New Mexico			
Total income ($ billion 2008)	48.8	62.4	2.5
Per-capita income	27,182	30,497	1.2
Texas			
Total income ($ billion 2008)	668.1	914.9	3.2
Per-capita income	25,186	37,808	1.7

[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).

also rose over the same period at a rate of 1.6%, increasing from $22,329 to $26,082. Per-capita incomes were higher in El Paso County ($26,237) in 2007 than in Dona Ana County ($25,493). Although personal income and per-capita income growth rates in the ROI have been higher than for the states as a whole, personal income per capita was slightly higher in New Mexico as a whole ($30,497) in 2007 than in Dona Ana County. In El Paso County, per-capita income growth rates and per-capita incomes were slightly lower than for Texas as a whole ($37,808).

Median household income during the period from 2006 to 2008 varied from $35,637 in El Paso County to $35,867 in Dona Ana County (U.S. Bureau of the Census 2009d).

12.1.19.1.7 ROI Housing

In 2007, nearly 330,000 housing units were located in the two counties, with more than 77% of these located in El Paso County (Table 12.1.19.1-7). Owner-occupied units comprise 65% of the occupied units in both counties, with rental housing making up 35% of the total. In 2007, vacancy rates were 11.3% in Dona Ana County, compared with 9.2% in El Paso County. With an overall vacancy rate of 9.7% in the ROI, there were 32,026 vacant housing units in the ROI in 2007, of which 10,112 (2,690 in Dona Ana County, 7,422 in El Paso County) are estimated to be rental units that would be available to construction workers. There were 1,436 seasonal, recreational, or occasional-use units vacant at the time of the 2000 Census.

Housing stock in the ROI as a whole grew at an annual rate of 1.9% over the period 2000 to 2007, with 40,188 new units added to the existing housing stock in the ROI (Table 12.1.19.1-7).

The median value of owner-occupied housing in 2006 to 2008 ranged from $97,800 in El Paso County to $133,300 in Dona Ana County (U.S. Bureau of the Census 2009g).

12.1.19.1.8 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 12.1.19.1-8. No Tribal governments are located in the ROI, but members of Tribal governments located in adjacent counties or states reside in the ROI.

12.1.19.1.9 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

Schools

In 2007 a total of 322 public and private elementary, middle, and high schools were located in the two-county ROI (NCES 2009). Table 12.1.19.1-9 provides summary statistics for

TABLE 12.1.19.1-7 Housing Characteristics in the ROI for the Proposed Afton SEZ

Parameter	2000	2007[a]
Dona Ana County		
Owner occupied	40,248	44,251
Rental	19,348	23,913
Vacant units	5,654	8,641
Seasonal and recreational use	551	NA
Total units	65,210	76,805
El Paso County		
Owner occupied	133,624	149,345
Rental	76,398	80,310
Vacant units	14,425	23,385
Seasonal and recreational use	885	NA
Total units	224,447	253,040
ROI Total		
Owner occupied	173,832	193,596
Rental	95,746	104,223
Vacant units	20,079	32,026
Seasonal and recreational use	1,436	NA
Total units	289,657	329,845

[a] NA = data not available.

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

enrollment, educational staffing, and two indices of educational quality—student-teacher ratios (number of students per teacher) and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Dona Ana County schools (15.3) is slightly higher than for schools in El Paso County (14.9), while the level of service is slightly higher in El Paso County (15.0).

Health Care

Even with a much larger number of physicians (1,557), the number of doctors per 1,000 population in El Paso County is only slightly higher than in Dona Ana County (Table 12.1.19.1-10). Although the Although the smaller number of healthcare professionals in Dona Ana County may mean that residents of these counties have poorer access to specialized healthcare, a substantial number of county residents might also travel to El Paso County for their medical care.

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI. Dona Ana County has 131 officers and would provide law enforcement services to the SEZ, while El Paso County has 251 officers (Table 12.1.19.1-11). There are currently 695 professional firefighters in El Paso County and 195 in Dona Ana County (Table 12.1.19.1-11). Levels of service in police protection in El Paso County (0.3 personnel per 1,000 population) are significantly lower than for Dona Ana County, while fire protection in both counties is similar to that for the ROI as a whole (Table 12.1.19.1-11).

TABLE 12.1.19.1-8 Local Government Organizations and Social Institutions in the ROI for the Proposed Afton SEZ

Governments	
City	
Anthony	Las Cruces
Clint	Mesilla
El Paso	Socorro
Hatch	Sunland Park
Horizon City	
County	
Dona Ana County	El Paso County
Tribal	
None	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

12.1.19.1.10 ROI Social Structure and Social Change

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

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide,

TABLE 12.1.19.1-9 School District Data for the ROI for the Proposed Afton SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Dona Ana County, New Mexico	39,320	2,578	15.3	12.8
El Paso County, Texas	170,382	11,443	14.9	15.0
ROI	209,702	14,020	15.0	14.5

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

Source: NCES (2009).

TABLE 12.1.19.1-10 Physicians in the ROI for the Proposed Afton SEZ, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Dona Ana County, New Mexico	369	1.8
El Paso County, Texas	1,557	2.0
ROI	1,926	2.0

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

Source: AMA (2009).

TABLE 12.1.19.1-11 Public Safety Employment in the ROI for the Proposed Afton SEZ

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service[b]
Dona Ana County, New Mexico	131	0.6	195	0.9
El Paso County, Texas	251	0.3	695	0.9
ROI	382	0.4	890	0.9

[a] 2007 data.

[b] Number per 1,000 population.

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

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

social conflict, divorce, and delinquency increase and levels of community satisfaction deteriorate (BLM 1980, 1983, 1996). Tables 12.1.19.1-12 and 12.1.19.1-13 present data for a number of indicators of social change in the ROI, including violent crime and property crime rates, alcoholism and illicit drug use, and mental health and divorce, that might be used to indicate social change.

Some variation exists in the level of crime across the ROI, with slightly higher property-related crime rates in Dona Ana County (29.9 crimes per 1,000 population) than in El Paso County (28.6). Violent crime rates were the same in both counties (4.2 per 1,000 population), meaning that overall crime rates in Dona Ana County (34.1) were slightly higher than for El Paso County (32.8).

TABLE 12.1.19.1-12 County and ROI Crime Rates[a] for the Proposed Afton SEZ

Location	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
Don Ana County, New Mexico	842	4.2	6,028	29.9	6,870	34.1
El Paso County, Texas	3,068	4.2	21,147	28.6	24,215	32.8
ROI	3,910	4.2	27,175	28.9	31,085	33.1

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

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

TABLE 12.1.19.1-13 Data on Alcoholism, Drug Use, Mental Health, and Divorce in the ROI for the Proposed Afton SEZ[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
New Mexico Region 5 (includes Dona Ana County)	8.3	3.0	9.9	–[d]
Texas Region 10 (includes El Paso County)	7.0	3.0	8.3	–
New Mexico				4.3
Texas				3.3

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

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

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

[d] A dash indicates data not available.

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

Data on other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the Substance Abuse and Mental Health Services Administration (SAMHSA) region in which the ROI is located. There is some variation across the two regions in which the two counties are located, with slightly higher rates for alcoholism and mental illness in the region in which Dona Ana County is located and the same rates of illicit drug use in both regions (Table 12.1.19.1-13).

12.1.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These activities are discussed in Section 12.1.5.

Because data on 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 assessment method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar facilities, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 39,933 people were employed in the ROI in the various sectors identified as recreation-related, constituting 11.1% of total ROI employment (Table 12.1.19.1-14). Recreation spending also produced almost $822 million in income in the ROI in 2007. The primary sources of recreation-related employment were eating and drinking places.

TABLE 12.1.19.1-14 Recreation Sector Activity in the ROI for the Proposed Afton SEZ, 2007

Recreation Component	Employment	Income ($ million)
Amusement and recreation services	695	14.5
Automotive rental	2,427	190.8
Eating and drinking places	31,003	440.4
Hotels and lodging places	1,951	39.3
Museums and historic sites	40	3.7
Recreational vehicle parks and campsites	93	2.1
Scenic tours	2,044	103.3
Sporting goods retailers	1,680	27.8
Total ROI	39,933	821.8

Source: MIG, Inc. (2010).

12.1.19.2 Impacts

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

12.1.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulated through the economy, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy developments are discussed in detail in Section 5.17. Those impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Appendix M). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar development in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodation otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy developments in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be impacted, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 0.2% in ROI population during construction of the trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, because of the lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families and the insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI. This situation would reduce the potential impact of solar developments on social change. Regardless of the pace of population growth associated with the commercial development of solar resources, and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the region of influence is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar developments are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

Livestock Grazing Impacts

Cattle ranching and farming supported 421 jobs and $4.4 million in income in the ROI in 2007 (MIG, Inc. 2010). The construction and operation of solar facilities in the proposed 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 102 jobs and $1.9 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 $6,615 annually on land dedicated to solar developments in the SEZ.

12.1.19.2.2 Technology-Specific Impacts

The socioeconomic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), BLM acreage-related fees and capacity fees, population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are presented in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming land requirements of 9 acres/MW (0.04 km^2/MW) for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of three projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 9,000 acres (36 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for each technology. 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 technology would be up to 16,022 jobs (Table 12.1.19.2-1). Construction activities would constitute 3.5% of total ROI employment. A solar development would also produce $883.4 million in income. Direct sales taxes would be $41.2 million; direct income taxes, $18.9 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 2,229 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 1,114 rental units expected to be occupied in the ROI. This occupancy rate would represent 7.9% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration also would affect community services (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 34 new teachers, 5 physicians, and 3 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.2% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) from a build-out using solar trough technologies would be 4,513 jobs (Table 12.1.19.2-1). Such a solar development would also produce $155.2 million in income.

TABLE 12.1.19.2-1 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Afton SEZ with Trough Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	5,232	2,705
Total	16,022	4,513
Income[c]		
Total	883.4	155.2
Direct state taxes[c]		
Sales	41.2	0.6
Income	18.9	4.3
BLM payments[c]		
Acreage-related fee	NA	7.3
Capacity fee[d]	NA	81.6
In-migrants (no.)	2,229	345
Vacant housing[e] (no.)	1,114	310
Local community service employment		
Teachers (no.)	34	5
Physicians (no.)	5	1
Public safety (no.)	3	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,800 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 12,420 MW.

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

[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.

Direct sales taxes would be $0.6 million; direct income taxes, $4.3 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage–related fees would be $7.3 million, and solar generating capacity fees would total at least $81.6 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 345 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 310 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community services (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, 5 new teachers and 1 physician 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 technology would be up to 6,382 jobs (Table 12.1.19.2-2). Construction activities would constitute 1.4% of total ROI employment. Such a solar development would also produce $351.9 million in income. Direct sales taxes would be $16.4 million; direct income taxes, $7.5 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 888 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 444 rental units expected to be occupied in the ROI. This occupancy rate would represent 3.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community services (education, health, and public safety) employment. An increase in such employment would be required to maintain existing levels of service in the ROI. Accordingly, 13 new teachers, 2 physicians, and 1 public safety employee would be required in the ROI. These increases would represent 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) from a build-out using power tower technologies would be 1,981 jobs

(Table 12.1.19.2-2). Such a solar development would also produce $63.6 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $2.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage-related fees would be $7.3 million, and solar generating capacity fees would total at least $45.3 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a power tower facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 178 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 160 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community services (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 3 new teachers 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 technology would be up to 2,594 jobs (Table 12.1.19.2-3). Construction activities would constitute 0.6 % of total ROI employment. Such a solar development would also produce $143.1 million in income. Direct sales taxes would be $6.7 million; direct income taxes, $3.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a dish engine facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 361 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 180 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community services (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 5 new teachers and 1 physician would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in these occupations.

TABLE 12.1.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Afton SEZ with Power Tower Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	2,084	1,397
Total	6,382	1,981
Income[c]		
Total	351.9	63.6
Direct state taxes[c]		
Sales		
Income	16.4	0.1
	7.5	2.2
BLM payments[c]		
Acreage-related fee	NA	7.3
Capacity fee[d]	NA	45.3
In-migrants (no.)	888	178
Vacant housing[e] (no.)	444	160
Local community service employment		
Teachers (no.)	13	3
Physicians (no.)	2	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 6,900 MW.

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

[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.

TABLE 12.1.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Afton SEZ with Dish Engine Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	847	1,358
Total	2,594	1,925
Income[c]		
Total	143.1	61.8
Direct state taxes[c]		
Sales	6.7	0.1
Income	3.1	2.1
BLM payments[c]		
Acreage-related fee	NA	7.3
Capacity fee[d]	NA	45.3
In-migrants (no.)	361	173
Vacant housing[e] (no.)	180	156
Local community service employment		
Teachers (no.)	5	3
Physicians (no.)	1	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 6,900 MW.

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

[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.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) from a build-out using dish engine technology would be 1,925 jobs (Table 12.1.19.2-3). Such a solar development would also produce $61.8 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $2.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage-related fees would be $7.3 million, and solar generating capacity fees would total at least $45.3 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 173 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 156 owner-occupied units expected to be required in the ROI.

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

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technology would be up to 1,210 jobs (Table 12.1.19.2-4). Construction activities would constitute 0.3% of total ROI employment. Such a solar development would also produce $66.7 million in income. Direct sales taxes would be $3.1 million; direct income taxes, $1.4 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 168 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 84 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.6% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community services (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 3 new

TABLE 12.1.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Afton SEZ with PV Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	395	135
Total	1,210	192
Income[c]		
Total	66.7	6.2
Direct state taxes[c]		
Sales	3.1	<0.1
Income	1.4	0.2
BLM payments[c]		
Acreage-related fee	NA	7.3
Capacity fee[d]	NA	36.3
In-migrants (no.)	168	17
Vacant housing[e] (no.)	84	16
Local community service employment		
Teachers (no.)	3	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 6,900 MW.

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

[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 build-out of the site.

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

teachers would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) from a build-out using PV technologies would be 192 jobs (Table 12.1.19.2-4). Such a solar development would also produce $6.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes $0.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage-related fees would be $7.3 million, and solar generating capacity fees would total at least $36.3 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a PV solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 17 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of 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 16 owner-occupied units expected to be required in the ROI.

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

12.1.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

12.1.20 Environmental Justice

12.1.20.1 Affected Environment

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

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the Council on Environmental Quality's (CEQ's) *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts would disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and in an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons are included in the minority category if they identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origins. In addition, persons who classify themselves as being of multiple racial origin may choose up to six racial groups as the basis of their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or “Other Race” (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census Bureau data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state as a whole (the reference geographic unit).

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

The data in Table 12.1.20.1-1 show the minority and low-income composition of the total population located within 50 mi (80 km) of the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in New Mexico, 65.8% of the population is classified as minority, while 25.9% is classified as low-income. The number of minority individuals exceeds 50% of the total population in the area, and the number of minority individuals exceeds the state average by 20 percentage points or more; thus, there is a minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, there are no low-income populations in New Mexico in the 50-mi (80-km) area around the boundary of the SEZ.

Within the 50-mi (80-km) radius in Texas, 82.8% of the population is classified as minority, while 23.2% is classified as low income. The number of minority individuals exceeds 50% of the total population in the area, and the number of minority individuals exceeds the state average by 20 percentage points or more; thus, there is a minority population in the SEZ area in Texas based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of

TABLE 12.1.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Afton SEZ

Parameter	New Mexico	Texas
Total population	211,443	670,757
White, non-Hispanic	72,247	115,378
Hispanic or Latino	130,947	147,791
Non-Hispanic or Latino minorities	8,249	32,413
One race	6,066	27,808
Black or African American	2,481	18,665
American Indian or Alaskan Native	1,525	2,057
Asian	1,337	6,149
Native Hawaiian or Other Pacific Islander	77	440
Some other race	646	497
Two or more races	2,183	4,605
Total minority	139,196	555,379
Low income	54,664	155,380
Percentage minority	65.8	82.8
State percentage minority	33.2	29.0
Percentage low-income	25.9	23.2
State percentage low-income	18.4	15.4

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

the total population in the area; thus, there are no low-income populations in Texas in the 50-mi (80-km) area around the boundary of the SEZ.

Figures 12.1.20.1-1 and 12.1.20.1-2 show the locations of the minority and low-income population groups within the 50-mi (80-km) area around the boundary of the SEZ.

12.1.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy developments are described in detail in Section 5.18. These impacts will 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 developments within the

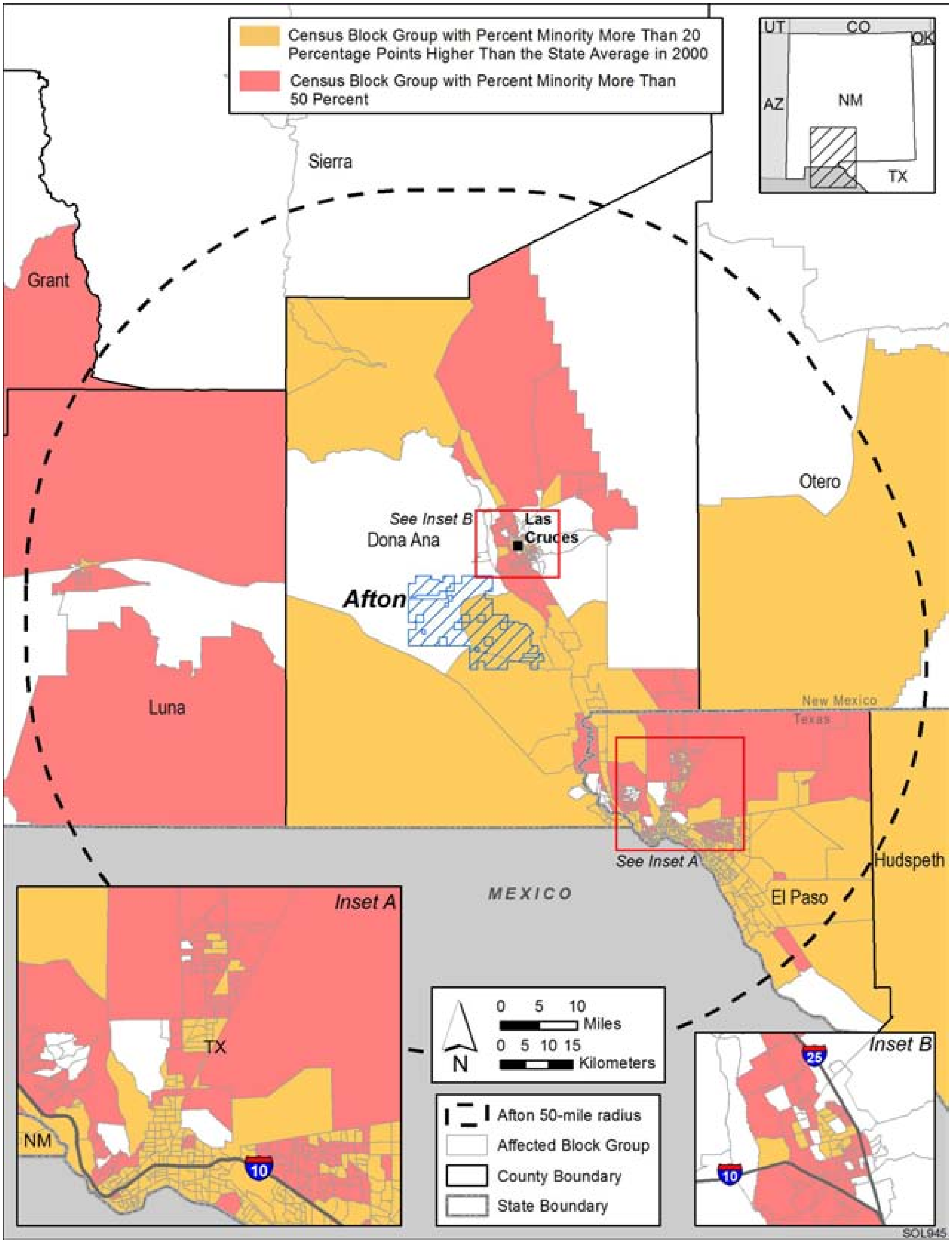

FIGURE 12.1.20.1-1 Minority Population Groups within the 50-mi (80-km) Area Surrounding the Proposed Afton SEZ

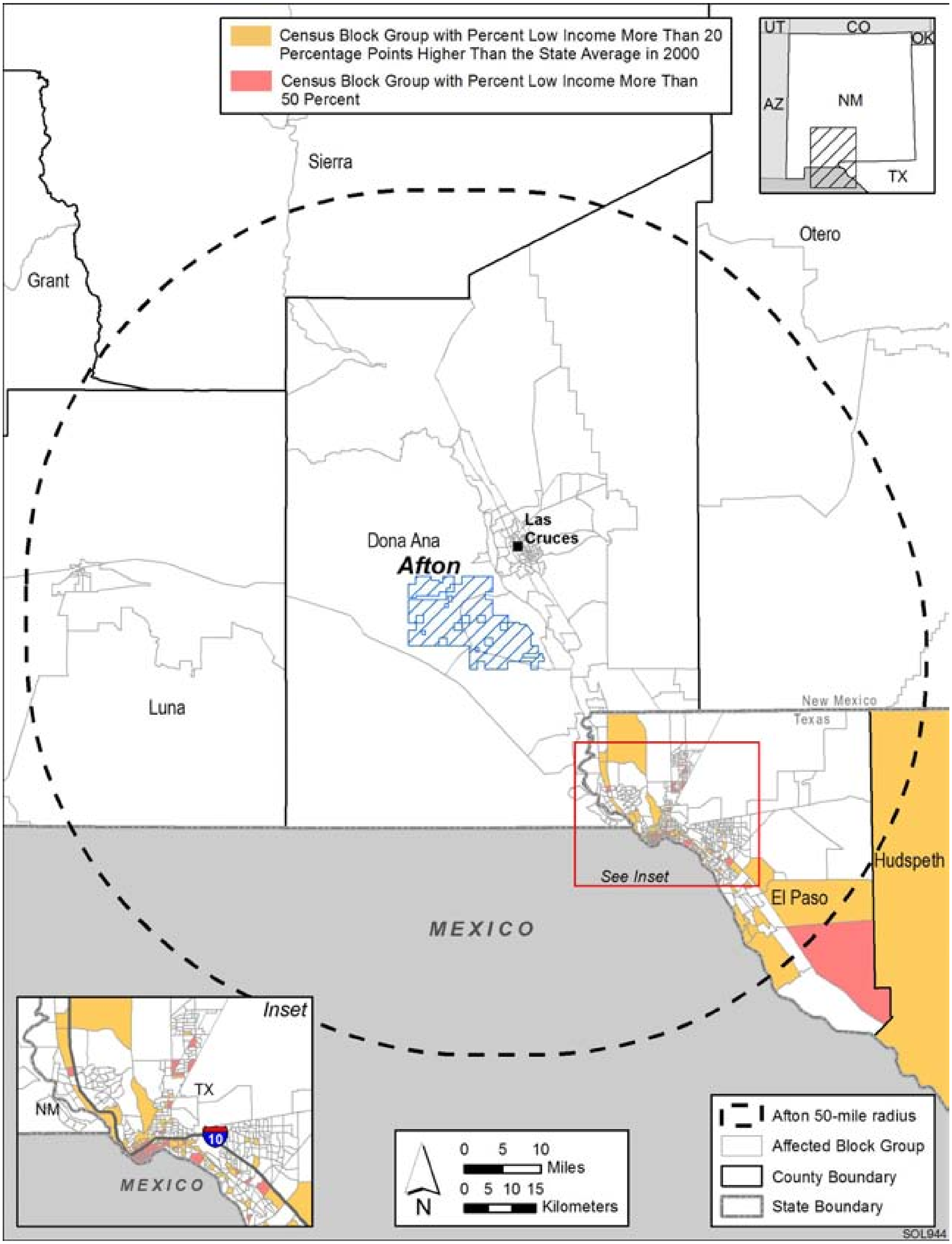

FIGURE 12.1.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Afton SEZ

proposed SEZ include noise and dust during the construction of solar facilities; noise and electromagnetic field (EMF) effects associated with solar project operations; the visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values. These are areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar development involving each of the four technologies. Although impacts are likely to be small, there are minority populations, as defined by CEQ guidelines (Section 12.1.20.1), within the 50-mi (80-km) radius around the boundary of the SEZ; thus any adverse impacts of solar projects could disproportionately affect minority populations. Because there are low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there would also be impacts on low-income populations.

12.1.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

12.1.21 Transportation

The proposed Afton SEZ is accessible by road, rail, and air networks. Two interstate highways, two major railroads, and a small regional airport serve the area. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

12.1.21.1 Affected Environment

The Afton SEZ is southwest of Las Cruces, New Mexico, and adjacent to the Interstate-10 (I-10) corridor, as shown in Figure 12.1.21.1-1. The Interstates I-10 and I-25 connect in Las Cruces. Albuquerque is 220 mi (354 km) north of Las Cruces along I-25. Tucson and El Paso lie along I-10, 275 mi (442 km) to the west and 45 mi (72 km) to the south–southeast, respectively. The distance to the northern edge of the SEZ on the west and east borders is approximately 0.5 and 2.0 mi (0.8 and 3 km) south of I-10, respectively. Dona Ana County dirt roads B006, B007, B008, and B009 cross the SEZ, with B008 and B009 providing access to the southern portion of the SEZ from the south, east, and west. In the Mimbres RMP (BLM 1993), the area included in the SEZ is in the group of lands designated for OHV and vehicle uses as "Limited, existing roads and trails." After I-10 joins I-25 in Las Cruces, it travels southward past the southeastern portion of the SEZ at a distance of approximately 5 mi (8 km). As seen in Figure 12.1.21.1-1, State Routes 28 and 478 pass through several small communities as they parallel I-10 to the east of the SEZ. Annual average daily traffic (AADT) volumes for the major roads are provided in Table 12.1.21.1-1.

The Union Pacific (UP) and Burlington Northern Santa Fe (BNSF) railroads serve the area. The UP Railroad runs almost within 1.0 mi (1.6 km) of the southwest portion of the SEZ going to El Paso to the southeast and Tucson to the west. The nearest stops to the SEZ are in Deming, about 50 mi (80 km) to the west, and in El Paso, 60 mi (97 km) to the south-southeast (UP Railroad 2009). The BNSF Railroad parallels State Route 478 and runs east of the SEZ with stops in Las Cruces, Mesilla Park, Mesquite, Vado, and Berino (BNSF Railroad 2010), all within about 1 to 5 mi (1.6 to 8 km) of the SEZ.

Four small airports and one larger airport that are open to the public are within a driving distance of approximately 58 mi (93 km) of the proposed Afton SEZ, as listed in Table 12.1.21.1-2. None of the small airports has regularly scheduled passenger service. The nearest public airport is Las Cruces International Airport, directly north of the SEZ on the north side of I-10. The nearest larger airport is in El Paso, approximately a 58 mi (93 km) drive to the southeast of the SEZ. The El Paso International Airport is served by a number of major United States airlines, with 1.90 million passengers departing from and 1.88 million passengers arriving at the airport in 2008 (BTS 2009). For the same year, 60.8 million lbs (27.6 million kg) of freight were shipped from El Paso International Airport and 80.7 million lbs (36.6 million kg) of freight were received.

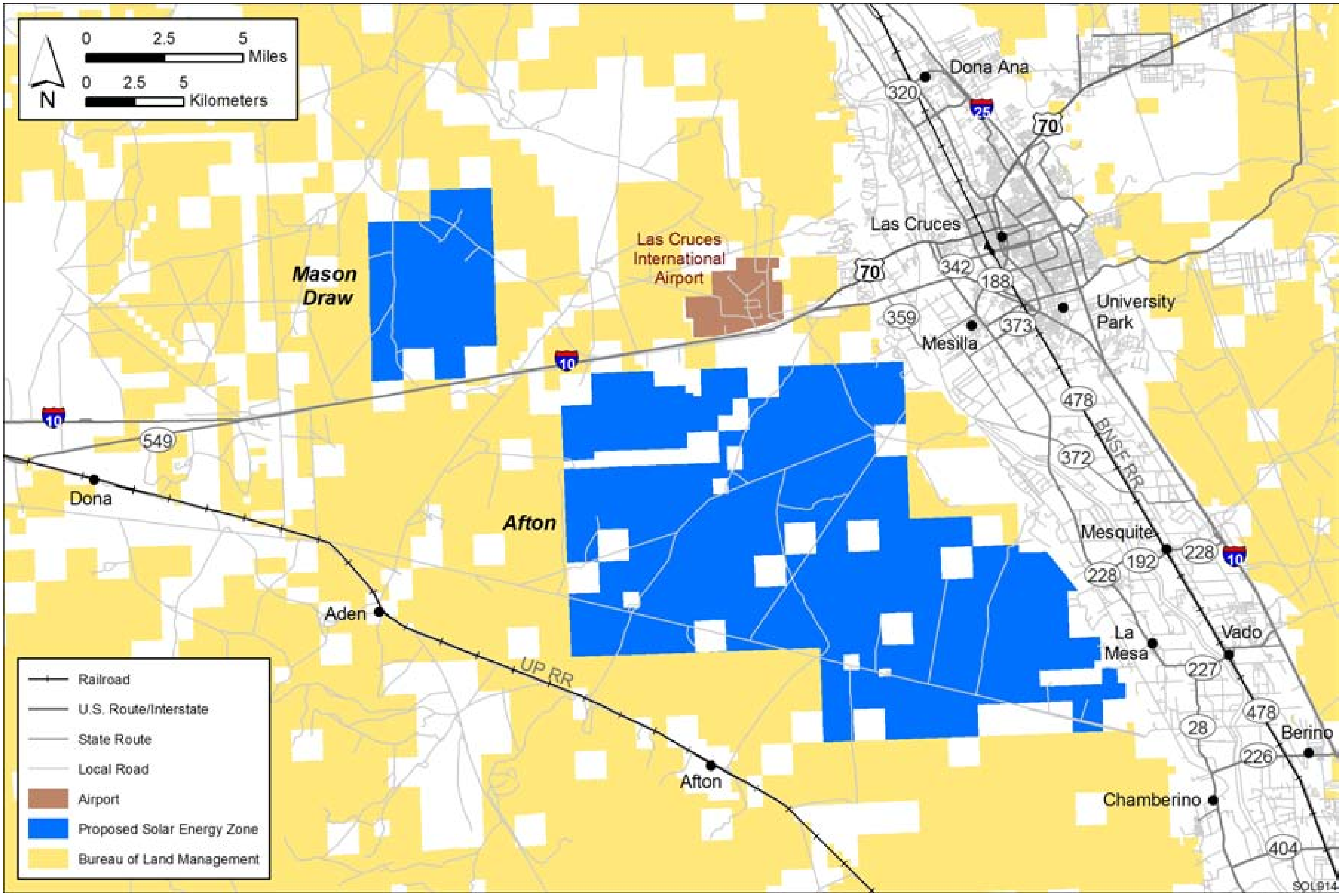

FIGURE 12.1.21.1-1 Local Transportation Network Serving the Proposed Afton SEZ

TABLE 12.1.21.1-1 AADT on Major Roads near the Proposed Afton SEZ for 2008

Road	General Direction	Location	AADT (Vehicles)
I-10	East–west	East of exit 132 (Las Cruces Airport)	16,700
		West of exit 132	16,000
		East of junction U.S. 70	20,100
	North–south	South of I-25 interchange	42,700
		South of Mesquite (exit 151)	30,800
		South of Vado (exit 155)	33,900
		Junction State Route 404	34,000
I-25	North–south	North of University Park (exit 1)	36,800
		North of East Lohman Ave. (exit 3)	39,200
		North of junction U.S. 70	16,300
		North of State Route 320 (exit 9)	8,500
U.S. 70		Junction I-10	10,200
		West of Las Cruces	12,600
State Route 28	North–south	South of Union Ave. in Las Cruces	3,430
		South of San Miguel	1,890
		North of State Route 226	1,720
		South of State Route 226	2,590
State Route 478	North–south	South of Las Cruces	4,390
		South of Mesquite/North of Vado	3,260
		South of Vado	3,370
		North of State Route 404	10,700

Source: NM DOT (2010).

12.1.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. I-10 provides a regional traffic corridor that would experience small impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Such an increase is approximately 10% of the current traffic on I-10 as it passes the northern section of the SEZ, as summarized in Table 12.1.21.1-1, which provides the available AADT values for routes in the vicinity of the SEZ. However, the exits on I-10 might experience moderate impacts with some congestion. Local road improvements would be necessary in any portion of the SEZ near I-10 that might be developed so as not to overwhelm the local roads near any site access point(s). Similarly, any access to portions of the SEZ using State Route 28 may require road improvements on State Route 28 or other local access roads.

TABLE 12.1.21.1-2 Airports Open to the Public in the Vicinity of the Proposed Afton SEZ

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Las Cruces International	Directly north of the SEZ on the opposite side of I-10.	City of Las Cruces	6,069 (1,850)	Asphalt	Good	7,499 (2,286)	Concrete/ Grooved	Excellent
			7,499 (2,286)	Asphalt	Fair	NA[b]	NA	NA
Dona Ana County Airport at Santa Teresa	About 46 mi (74 km) south-southeast of the SEZ near I-10 in Santa Teresa.	Dona Ana County	8,500 (2,591)	Asphalt	Good	NA	NA	NA
Deming Municipal	In Deming, approximately 54 mi (87 km) to the west of the SEZ along I-10.	City of Deming	5,675 (1,730)	Asphalt	Fair	6,627 (2,020)	Asphalt	Good
El Paso International	Southeast of the SEZ in El Paso near I-10, about a 58 mi (93 km) drive.	City of El Paso	5,499 (1,676)	Asphalt	Fair	9,025 (2,751)	Asphalt/ Grooved	Excellent
			12,020 (3,664)	Asphalt/Grooved	Good	NA	NA	NA
Hatch Municipal	About 58 mi (93 km) to the northwest of the SEZ. Near I-25 in Hatch.	Village of Hatch	4,110 (1,253)	Asphalt	Good	NA	NA	NA

a Source: FAA (2010).

b NA = not applicable.

Should up to three large projects with approximately 1,000 daily workers each be under development simultaneously, an additional 6,000 vehicle trips per day could be added to I-10 in the vicinity of the SEZ, assuming ride-sharing was not implemented and all access to the SEZ funneled through I-10 bordering the northern section of the SEZ (i.e., no workers commuted to work through local roads via State Routes 28 or 478 to the east). This would be about a 35% increase in the current average daily traffic level on most segments of I-10 near the northern portion of the SEZ, and could have moderate impacts on traffic flow during peak commute times. The extent of the problem would depend on the relative locations of the projects within the SEZ, where the worker populations originate, and work schedules. The affected exits on I-10 would experience moderate impacts with some congestion. Local road improvements would be necessary in any portion of the SEZ near I-10 that might be developed so as not to overwhelm the local roads near any site access point(s). Similarly, any access to portions of the SEZ from the east using I-10 or State Routes 28 or 478 may also require road improvements on these roads and local access roads, dependent on the percentage of worker commuter traffic using those routes.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any routes designated as open within the proposed SEZ, these routes crossing areas 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).

12.1.21.3 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 Afton SEZ. The programmatic design features 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.

This page intentionally left blank.

12.1.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Afton SEZ in Dona Ana County, New Mexico. The CEQ guidelines for implementing NEPA define cumulative impacts as environment impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The Afton SEZ is located between two populated areas, the city of Las Cruces, New Mexico, and El Paso, Texas. The nearest towns are San Miguel (unincorporated), located about 5 mi (8 km) to the east, and Afton (unincorporated), located about 5 mi (8 km) to the south. The border with Mexico is approximately 20 mi (32 km) to the south of the proposed SEZ. Within 50 mi (80 km) of the SEZ, there are about nine Wilderness Study Areas. The Agricultural Research Service (ARS) Jornada Experimental Range is located 20 mi (32 km) northeast of the SEZ, the San Andres National Wildlife Refuge is located about 30 mi (48 km) northeast of the SEZ, and the White Sands National Monument is located about 36 mi (58 km) northeast of the SEZ. The White Sands Missile Range is located 10 mi (16 km) east of the SEZ, and the Fort Bliss McGregor Range is located 26 mi (42 km) east of the SEZ. In addition, the Afton SEZ is located close to the Mason Draw SEZ, and in some areas, impacts from the two SEZs overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the proposed Afton SEZ is identified in Section 12.1.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 12.1.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 12.1.22.3. Cumulative impacts for each resource area are discussed in Section 12.1.22.4.

12.1.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the proposed Afton SEZ is provided in Table 12.1.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than visual resources). The BLM, the DoD, and the USDA administer most of the land around the SEZ. The BLM administers approximately 32% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 12.1.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Afton SEZ

Resource Area	Geographic Extent
Land Use	Dona Ana, Luna, Sierra, Otero Counties in New Mexico, and El Paso County in Texas
Specially Designated Areas and Lands with Wilderness Characteristics	Within a 25-mi (40-km) radius of the Afton SEZ
Rangeland Resources	
Grazing	Grazing allotments within 5 mi (8km) of the Afton SEZ
Wild Horses and Burros	A 50-mi (80-km) radius from the center of the Afton SEZ
Recreation	Dona Ana, Luna, Sierra, Otero Counties in New Mexico, and El Paso County in Texas
Military and Civilian Aviation	Dona Ana, Luna, Sierra, Otero Counties in New Mexico, and El Paso County in Texas
Soil Resources	Areas within and adjacent to the Afton SEZ
Minerals	Dona Ana, Luna, Sierra, Otero Counties in New Mexico, and El Paso County in Texas
Water resources	
Surface Water	Rio Grande River, West Side Canal
Groundwater	Mesilla groundwater basin
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Afton SEZ
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Afton SEZ, including portions of Dona Ana, Luna, Sierra, Otero Counties in New Mexico, and El Paso County in Texas
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Afton SEZ
Acoustic Environment (noise)	Areas adjacent to the Afton SEZ
Paleontological Resources	Areas within and adjacent to the Afton SEZ
Cultural Resources	Areas within and adjacent to the Afton SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Afton SEZ for other properties, such as traditional cultural properties
Native American Concerns	Areas within and adjacent to the Afton SEZ; viewshed within a 25-mi (40-km) radius of the Afton SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the Afton SEZ
Environmental Justice	A 50-mi (80-km) radius from the center of the Afton SEZ
Transportation	I-10 and I-25; U.S. Highways 54 and 70; several State Routes including these nearby highways 28, 185, 273, 292, and 478

12.1.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

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

- Proposals for which NEPA documents are in preparation or finalized;
- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the Federal Register or state publications;
- Proposals for which enabling legislation has been passed; and
- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 12.1.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 12.1.22.2.2). Together, these actions and trends have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

12.1.22.2.1 Energy Production and Distribution

In March 2007, New Mexico passed Senate Bill 418, which expands the state’s Renewable Energy Standard to 20% by 2020, with interim standards of 10% by 2011 and 15% by 2015. The bill also establishes a standard for rural electric cooperatives of 10% by 2020. Furthermore, utilities are to set a goal of at least 5% reduction in total retail sales to New Mexico customers, adjusted for load growth, by January 1, 2020 (DSIRE 2010).

Reasonably foreseeable future actions related to renewable energy production and energy distribution within 50 mi (80 km) of the proposed Afton SEZ are identified in Table 12.1.22.2-1 and are described. However, no fast-track solar energy, wind, or geothermal projects have been identified within this distance.

TABLE 12.1.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Afton SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Fast-Track Solar Energy Projects on BLM-Administered Land			
None			
Transmission and Distribution Systems			
SunZia Southwest Transmission Project (two 500-kV lines)	NOI May 29, 2009; Draft EIS is expected to be available for review and comment by late 2010	Land use, terrestrial habitats, visual	Project Study Area includes the proposed Afton SEZ, most of central New Mexico, and a corridor through southwest New Mexico that connects to Arizona
High Plains Express Transmission Project (two 500-kV lines)	Feasibility Study Report June 2008	Land use, terrestrial habitats, visual	Conceptual route from northeast to southwest New Mexico via Luna, New Mexico, to Arizona

Renewable Energy Development

Renewable energy ROW applications are considered in two categories, fast-track and regular-track applications. Fast-track applications, which apply principally to solar energy facilities, are those applications on public lands for which the environmental review and public participation process is underway and the applications could be approved by December 2010. A fast-track project would be considered foreseeable because the permitting and environmental review processes would be underway. There are no solar fast-track project applications within the ROI of the proposed Afton SEZ. Regular-track proposals are considered potential future projects, but not necessarily foreseeable projects, since not all applications would be expected to be carried to completion. These proposals are considered together as a general level of interest in development of renewable energy in the region and are discussed in the following section. The locations of these projects are shown in Figure 12.1.22.2-1.

Pending Renewable Energy ROW Applications on BLM-Administered Lands. One regular-track solar project ROW application has been submitted to the BLM that would be located within 50 mi (80 km) of the SEZ. Table 12.1.22.2-2 provides information on the solar project that had a pending application submitted to BLM as of March 2010 (BLM and USFS 2010a). Figure 12.1.22.2-1 shows the location of this application. In addition, there is one pending wind testing ROW application within 50 mi (80 km) of the SEZ. The likelihood of any

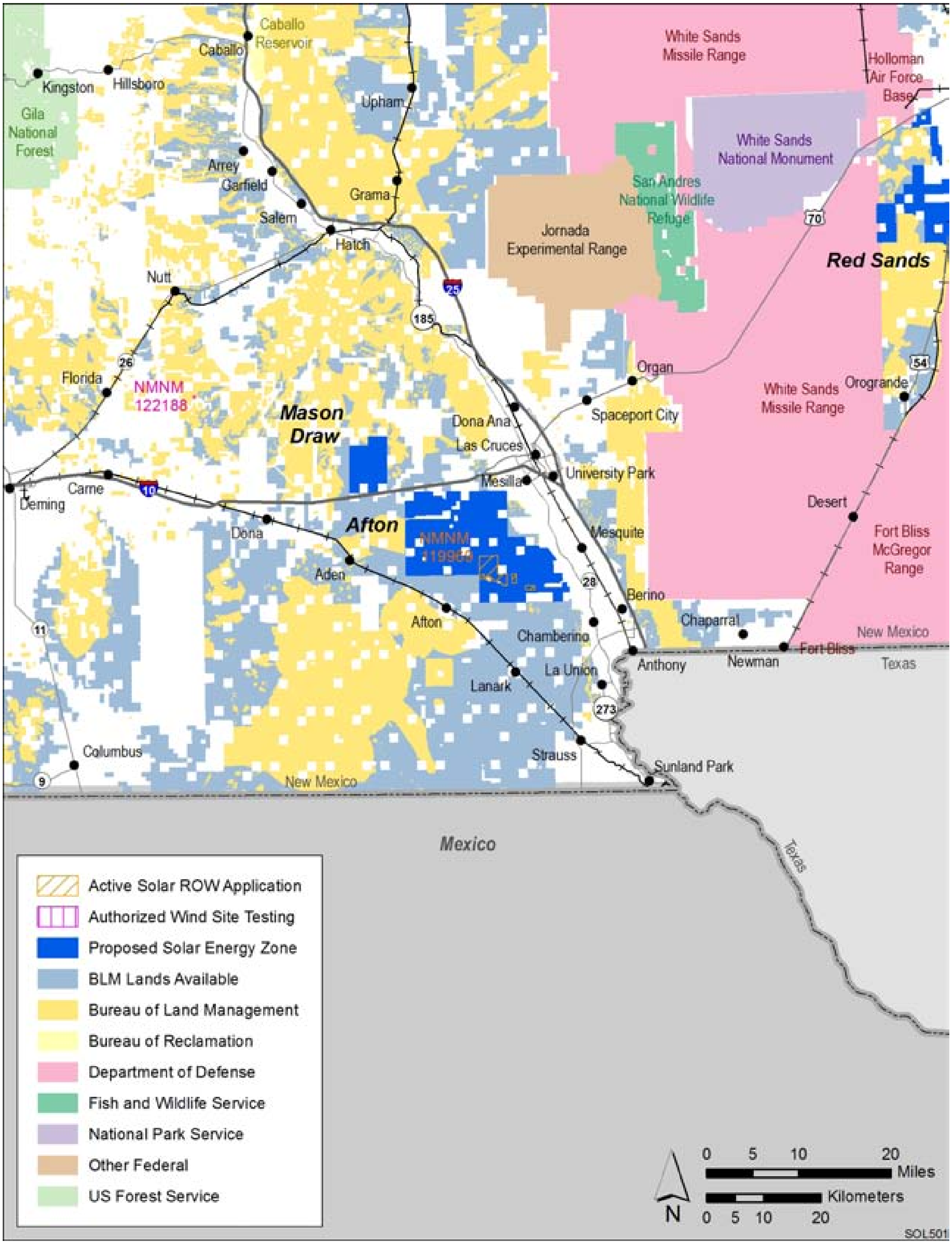

FIGURE 12.1.22.2-1 Locations of Renewable Energy Project ROW Applications within a 50-mi (80-km) Radius of the Proposed Afton SEZ

TABLE 12.1.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi of the Proposed Afton SEZ

Serial No.	Project Name	Application Received	Size (acres[a])	MW	Technology	Status	Field Office
Solar Applications							
NMNM 119969	enXco Development Corp.	Feb. 6, 2008	3,000	600	CSP/Trough	Pending	Las Cruces
Wind Applications							
NMNM 122188	Uriel Wind, Inc.	Oct. 16, 2008	3,200	–	Wind	Authorized for Wind Site Testing	Las Cruces

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

of the regular-track application projects actually being developed is uncertain but is generally assumed to be less than that for fast-track applications.

Transmission and Distribution

SunZia Southwest Transmission Project. This proposed project would be for two 500-kV transmission lines with an estimated total capacity of 3,000 MW. The proposed transmission line would originate at a new substation in either Socorro County or Lincoln County in the vicinity of Bingham or Ancho, New Mexico, and terminate at the Pinal Central Substation in Pinal County near Coolidge, Arizona. A new substation is also proposed east of Deming, New Mexico, about 35 mi (56 km) west of the proposed Afton SEZ. The transmission line route would be approximately 460 mi (736 km) in length. The route and alternatives would cross approximately 170 mi (272 km) of BLM lands in New Mexico and 45 mi (72 km) in Arizona, along with state and private lands (BLM 2010e). The project's study area includes the Afton SEZ, most of central New Mexico, and a corridor through southwest New Mexico that connects to Arizona. The project would transport electricity generated by power generation resources, including primarily renewable resources, to western power markets and load centers (BLM 2010e). A Draft EIS is expected to be available for public review and comment by late 2010. Other federal, state, and county permitting efforts are also under way. SunZia is anticipated to be in service and delivering renewable energy by early 2014 (SunZia 2010).

High Plains Express Transmission Project. Two 500-kV transmission lines are proposed that would carry up to 4,000 MW of bulk power and traverse 1,300 mi (2,092 km) from east-central Wyoming, through eastern Colorado, across New Mexico, to Arizona. The conceptual route for one 500-kV line would connect to a substation located about 35 mi (56 km) west of the Afton SEZ or interconnect with the proposed SunZia project for a portion of the route near the SEZ. The project would strengthen the eastern portion of the western grid, increase markets for renewable energy, increase system reliability, and allow economic transfers of energy. The project is projected to cost over $5 billion (HPX 2008). Construction would begin in 2015 and operation in 2018. A project feasibility study was completed in 2008, and more detailed project studies are under way.

12.1.22.2.2 Other Actions

Other major ongoing and foreseeable actions identified within 50 mi (80 km) of the proposed Afton SEZ are listed in Table 12.1.22.2-3 and are described in the following subsections.

Other Ongoing Actions

Afton Generating Station. PNM operates the Afton Generating Station, located 12.5 mi (20 km) southwest of Las Cruces, New Mexico, and within the SEZ. The 135-MW plant consists of a simple-cycle, natural gas–fired facility (PNM 2002).

TABLE 12.1.22.2-3 Other Major Actions near the Proposed Afton SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Afton Generating Station	Operating since 2002	Land use, terrestrial habitats, air quality, visual	Within the SEZ
Rio Grande Power Station	Operating since 1929	Land use, terrestrial habitats, water, air quality, visual	22 mi (35 km) southeast of the SEZ
Newman Power Station	Last unit began operating in 2009	Land use, terrestrial habitats, water, air quality, visual	20 mi (32 km) southeast of the SEZ
Fort Bliss	Established in 1854	Land use, terrestrial habitats, air quality, visual	25 mi (40 km) southeast of the SEZ
Fort Bliss McGregor Range	Operating since the 1940s	Land use, terrestrial habitats, air quality, visual	30 mi (48 km) east of the SEZ
Fort Bliss Dona Ana Range		Land use, terrestrial habitats, air quality, visual	13 mi (21 km) east of the SEZ
White Sands Missile Range	Operating since 1945	Land use, terrestrial habitats, air quality, visual	Boundary about 23 mi (37 km) northeast of the SEZ
Jornada Experimental Range	Operating since 1912	Land use	Boundary 16 mi (26 km) north northeast of the SEZ
Opening of Hunting on the San Andres National Wildlife Refuge (NWR)	EA issued Feb. 2007	Terrestrial habitat, wildlife	Boundary 27 mi (43 km) northeast of the SEZ
Mountain Lion Management on the San Andres NWR	EA issued Sept. 2002	Terrestrial habitat, wildlife	Boundary 27 mi (43 km) northeast of the SEZ

[a] Projects ongoing or in later stages of agency environmental review and project development.

Rio Grande Power Station. El Paso Electric operates the Rio Grande Power Station, located on the banks of the Rio Grande River, about 22 mi (35 km) southeast of the SEZ. The plant consists of three steam-electric generating units with a total capacity of 246 MW. The units operate primarily on natural gas, but can also operate on fuel oil (El Paso Electric 2010).

Newman Power Station. El Paso Electric operates the Newman Power Station, located in El Paso, Texas, about 20 mi (32 km) southeast of the SEZ. The plant consists of three steam-electric and two combined cycle generating units with a total capacity of 614 MW. The units operate primarily on natural gas but can also operate on fuel oil (Reuters 2010).

Fort Bliss. The main cantonment area of Fort Bliss is located adjacent to El Paso, Texas, approximately 25 mi (40 km) southeast of the SEZ. The installation, which also includes the McGregor Range, the Dona Ana Range, the North Training Area in New Mexico, and the South Training Area in Texas, occupies a total of 1.12 million acres (4,530 km^2). Fort Bliss is comprised of a complex of facilities, and areas for training, and test activities. The original Army Post was established in 1854 (GlobalSecurity.org 2010a).

Fort Bliss McGregor Range. Fort Bliss McGregor Range, 30 mi (48 km) east of the SEZ, encompasses 608,335 acres (2,461 km^2) of withdrawn public land, 71,083 acres (288 km^2) of Army fee-owned land, and 18,004 acres (73 km^2) of U.S. Forest Service land. Mission activities include training to maintain the operational readiness of active duty, reserve, and National Guard units through training, operations and field exercises. Field exercises include field operations, communications, command and control, simulated enemy contact, smoke generation, and missile and weapons firing. Participation in joint training involves 10,000 to 20,000 personnel per year (GlobalSecurity.org 2010b).

Fort Bliss Dona Ana Range. Fort Bliss Dona Ana Range is located 13 mi (21 km) east of the SEZ. The Multi-Purpose Range Complex consists of target lanes with armor stationary pits, moving and stationary targets, small arms ranges for mechanized infantry and aerial gunnery, and smoke generators for training to screen friendly actions against aggressor positions. Participation in joint training has involved more than 20,000 personnel per year (GlobalSecurity.org 2010c).

White Sands Missile Range (WSMR). The White Sands Missile Range, the Department of the Army's largest installation, covers approximately 2.2 million acres (8900 km^2). The closest boundary is 23 mi (37 km) northeast of the SEZ. The facility began operating in 1945 and employs approximately 2,700 military personnel and contractors. The primary mission is to support missile development and test programs for the U.S. Army, Navy, Air Force, and NASA. WSMR supports approximately 3,200 to 4,300 test events annually (GlobalSecurity.org 2010d; WSMR 2009).

Jornada Experimental Range. The Department of Agriculture's Jornada Experimental Range encompasses 193,000 acres (780 km^2). The closest boundary is 16 mi (26 km) north northeast of the SEZ. The mission of the facility, which began operation in 1912, is to develop new knowledge of ecosystem processes as a basis for management and remediation of desert rangelands (USDA 2008).

Other Foreseeable Actions

Opening of Hunting on the San Andres National Wildlife Refuge (NWR). The U.S. Fish and Wildlife Service (USFWS) intends to remove exotic antelope oryx on the San Andres NWR through a limited hunting program. The closest boundary of the NWR is 27 mi (43 km) northeast of the SEZ. The NWR encompasses 57,215 acres (232 km^2). Oryx, a large African antelope that was introduced in the early 1970s, has caused habitat damage and presents potential disease impacts for desert mule deer and desert bighorn sheep (USFWS 2007).

Mountain Lion Management on the San Andres NWR. The USFWS intends to protect desert bighorn sheep from predation by mountain lions during restoration efforts of desert bighorn sheep in the San Andres Mountains. The closest boundary of the NWR is 27 mi (43 km) northeast of the SEZ. The NWR encompasses 57,215 acres (232 km^2). Control of mountain lions would be concentrated in a limited area around the desert bighorn sheep release sites. Any mature mountain lion perceived to be a threat would be killed (USFWS 2002).

Grazing Allotments

Seven grazing allotments overlap the Afton SEZ. Within 50 mi (80 km) of the SEZ, most of the land is covered with grazing allotments with the exception of the land to the east.

Mining

Within 50 mi (80 km) of the Afton SEZ, the BLM GeoCommunicator database (BLM and USFS 2010b) shows several active mining claims on file with the BLM. The highest density (51 to 100 claims per township) is located about 47 mi (75 km) northwest of the SEZ.

12.1.22.3 General Trends

12.1.22.3.1 Population Growth

Over the period 2000 to 2008, the counties in the ROI experienced growth in population. The population in Dona Ana County in New Mexico grew at an annual rate of 2.1% between

2000 and 2008, and El Paso County in Texas grew by 1.7% over the same period. The population of the ROI in 2008 was 982,193, having grown at an average annual rate of 1.8% since 2000. The growth rate for the state of New Mexico as a whole was 1.7% (Section 12.1.10.1).

12.1.22.3.2 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 Dona Ana and El Paso Counties between 2006 and 2016, an increase in energy demand is also expected. However, the Energy Information Administration (EIA) projects a decline in per-capita energy use through 2030, mainly because of the high cost of oil and improvements in energy efficiency throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year; the fastest growth is projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5%, 0.4%, and 0.1% each year, respectively (EIA 2009).

12.1.22.3.3 Water Availability

As described in Section 12.1.9.1, the Afton SEZ is located within the northwestern part of the Mesilla Groundwater Basin, an area known as the West Mesa. In the vicinity of the SEZ, depth to groundwater is approximately 300 ft (91 m). Measured water levels in the West Mesa area have remained relatively stable over the last 10 years, while groundwater levels in the Mesilla Basin east of the Rio Grande decreased by 10 to 40 ft (3 to 12 m) between 1978 and 2000.

In 2005, water withdrawals from surface waters and groundwater in Dona Ana County were 521,000 ac-ft/yr (642 million m^3/yr), of which 61% came from surface waters and 39% came from groundwater. Agricultural was the largest use, at 470,000 ac-ft/yr (580 million m^3/yr), while public supply water use was 42,000 ac-ft/yr (52 million m^3/yr). Current total water withdrawals in the West Mesa portion of the Mesilla Basin near the SEZ are not known. The City of Las Cruces has obtained rights to 13,000 ac-ft/yr (16 million m^3/yr) from a planned well field in the West Mesa.

The Santa Fe Group basin fill is the main aquifer beneath the West Mesa. Recharge to the aquifer occurs mostly near the mountain margins of the basin and is very low, estimated to be less than 10,000 ac-ft/yr (12.3 million m^3/yr). The upper to middle hydrostratigraphic units are the major sources of fresh to moderately saline groundwater, with the upper unit containing most of the fresh water. Both groundwater and surface water are fully appropriated within the Lower Rio Grande water management region, which includes the proposed SEZ.

12.1.22.3.4 Climate Change

A report on global climate change in the United States prepared by the U.S. Global Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from this report indicate the following for the Southwest region of the U.S., which includes western and central New Mexico:

- Decreased precipitation, with a greater percentage of that precipitation coming from rain, will result in a greater likelihood of winter and spring flooding and decreased stream flow in the summer.

- Increased frequency and altered timing of flooding will increase risks to people, ecosystems, and infrastructure.

- The average temperature in the southwest has already increased by about 1.5ºF (0.8ºC) compared to a 1960 to 1979 baseline, and by the end of the century, the average annual temperature is projected to rise 4ºF to 10ºF (2ºC to 6ºC).

- A warming climate and the related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires.

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end.

- Much of the Southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region.

- As temperatures rise, the landscape will be altered as species shift their ranges northward and upward to cooler climates.

- Temperature increases, when combined with urban heat island effects for major cities such as Albuquerque, present significant stress to health and electricity and water supplies.

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

12.1.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Afton SEZ on the basis of the following assumptions: (1) because of the relatively large size of the proposed

SEZ (<30,000 acres [<121 km^2]), up to three projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 62,098 acres (251 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 up to 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. Since a 345-kV line runs through the southern portion of the SEZ, no analysis of impacts has been conducted for the construction of a new transmission line outside of the SEZ that might be needed to connect solar facilities to the regional grid (see Section 8.3.1.2). Regarding site access, the nearest major road is I-10, which runs adjacent to the northern boundary of the SEZ. It is assumed that no new access road would need to be constructed to reach this road and to support solar development in the SEZ.

Cumulative impacts that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section in each resource area are discussed below. At this stage of development, because of the uncertain nature of future projects in terms of size, number, and location within the proposed SEZ, and the types of technology that would be employed, the impacts are discussed qualitatively or semiquantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic area.

12.1.22.4.1 Lands and Realty

The area covered by the proposed Afton SEZ is largely rural and undeveloped. The areas surrounding the SEZ are both rural and industrial in nature, with several large electric power plants nearby. I-10, which runs within 0.5 mi (0.8 km) north of the SEZ, would provide access to the SEZ, while the interior of the SEZ is accessible via several dirt/gravel roads and four county roads. There are two roads associated with natural gas pipelines that cross the SEZ in a northeasterly direction (Section 12.1.2.1).

Development of the SEZ for utility-scale solar energy production would establish a new industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. There are several natural gas pipelines, electric transmission lines, and a flood control project on public lands within the SEZ, while several industrial facilities and a municipal airport lie along the I-10 corridor to the north. Thus, utility-scale solar energy development within the SEZ would not be a new land use in the area, but would convert additional rural land to such use. Access to portions of the SEZ holding solar facilities by both the general public and much wildlife for current uses would be eliminated.

As shown in Table 12.1.22.2-2 and Figure 12.1.22.2-1, there is one solar application on the SEZ and one wind testing application and no geothermal applications on public land within a 50-mi (80-km) radius of the proposed SEZ. Other foreseeable projects identified in Section 12.1.22.2.2 are mainly transmission projects located more than 30 mi (48 km) from the SEZ (Section 12.1.22.2.2) and would have minimal impacts on land use near the SEZ. The proposed Mason Draw SEZ is located 3 mi (5 km) to the northwest.

The development of utility-scale solar projects in the proposed Afton SEZ in combination with other ongoing and foreseeable actions within the 50-mi (80-km) geographic extent of effects could have small cumulative effects on land use through impacts on land access and use for other purposes, and through impacts on groundwater availability and on visual resources, especially if the Afton and Mason Draw SEZs are fully developed with solar facilities. It is not anticipated that approval of solar energy development within the SEZ would have a significant impact on the amount of public lands available for future ROWs outside the SEZ (Section 12.1.2.2.1), except lands developed with solar facilities in the nearby Afton SEZ.

12.1.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

There are 19 specially designated areas within 25 mi (40 km) of the proposed Afton SEZ in New Mexico that potentially could be affected by solar energy development within the SEZ from impacts on scenic and wilderness characteristics (Section 12.1.3.1). Potential exists for cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and other development outside the SEZ within the geographic extent of effects, including solar facilities in the proposed Mason Draw SEZ. The magnitude of cumulative effects from foreseeable development, however, would be low due to the small number of projects identified. Existing urban, agricultural, and commercial development in the Mesilla Valley along the Rio Grande would contribute to cumulative impacts on sensitive areas.

12.1.22.4.3 Rangeland Resources

The proposed Afton SEZ includes portions of seven grazing allotments, six with significant acreage within the SEZ held by six permittees (Section 12.1.4.1.1). If utility-scale solar facilities were constructed on the SEZ, those areas occupied by the solar projects would be excluded from grazing. In addition, the nearby Mason Draw SEZ also includes portions of one of the allotments which could be affected by Afton. Other foreseeable development within 50 mi (80 km) of the SEZ, including renewable energy development, is not expected to result in cumulative impacts on grazing due to the nature and small number of the proposed projects, which would have minor impact on grazing.

The proposed Afton SEZ is about 125 mi (201 km) from the nearest wild horse and burro HMA managed by BLM and more than 240 mi (386 km) from any wild horse and burro territories administered by the USFS; thus solar energy development within the SEZ would not directly or indirectly affect wild horses and burros (Section 12.1.4.2.2). The SEZ would not, therefore, contribute to cumulative effects on wild horses and burros.

12.1.22.4.4 Recreation

The large size of the proposed SEZ and easy access to nearby population centers invites some types of outdoor recreation, including back country driving, hiking/walking, bird-watching, and small game hunting. Four county roads and other roads and trails provide ready access into and through the area (Section 12.1.5.1). Construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects, while access restrictions within the SEZ could affect access to recreational areas within and outside the SEZ. The nearby Mason Draw SEZ would have similar effects from solar facilities built there. Such effects within either SEZ are expected to be small due to low current use and alternate recreational areas, while the cumulative effect of two would be small as well. Effects on wilderness characteristics in surrounding specially designated areas from visual impacts of solar facilities are more difficult to assess, but small cumulative impacts on these areas from solar development in both SEZs could accrue. Other foreseeable actions within the geographic extent of effects, mainly transmission projects located more than 30 mi (48 km) from the SEZ, would not contribute significantly to cumulative impacts on recreation.

12.1.22.4.5 Military and Civilian Aviation

There are no military training routes or special use airspace over the proposed Afton SEZ, while the northern boundary of the SEZ is within 3 mi (5 km) of the Las Cruces International Airport (Section 12.1.6.1). Thus, solar facilities in the SEZ would not affect military aviation. FAA regulations, including height restrictions on solar facilities and transmission lines, would prevent conflicts with civilian airport operation. Likewise, foreseeable development within 50 mi (80 km) of the SEZ, including potential solar facilities within the nearby Mason Draw SEZ would not appreciably affect military or civilian aviation and there would be no cumulative impacts.

12.1.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from ongoing activities outside of the proposed SEZ, including military training operations and agriculture. Cumulative impacts on soil resources from other ongoing and foreseeable projects within the region are unlikely as these projects are few in number, are mostly more than 20 mi (32 km) from SEZ, and generally do not produce significant soil disturbance (Section 12.1.22.2). Cumulative impacts from solar facilities in both the Afton and nearby Mason Draw SEZs would depend on the number and size of facilities ultimately built, but are expected to remain small with mitigations in place.

Landscaping of solar energy facility areas in the SEZ could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that from other activities outside the SEZ. However, with the expected required design features in place, cumulative impacts would likewise be small.

12.1.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 12.1.8, there are currently no active oil and gas leases or mining claims within the proposed Afton SEZ, and there are no proposals for geothermal energy development pending. Because of the generally low level of mineral production in the proposed SEZ and surrounding area and the expected low impact on mineral accessibility of other foreseeable actions within the geographic extent of effects, including potential solar facilities within the nearby proposed Mason Draw SEZ no cumulative impacts on mineral resources are expected.

12.1.22.4.8 Water Resources

Section 12.1.9.2 describes the water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities. The amount of water needed during the peak construction year for evaluated solar technologies would be up to about 5,300 ac-ft/yr (6.5 million m^3/yr). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for evaluated solar technologies would range from 353 to 186,469 ac-ft/yr (436 thousand to 230 million m^3/yr). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. In 2005, water withdrawals from surface waters and groundwater in Dona Ana County were 521,000 ac-ft/yr (642 million m^3/yr), of which 61% came from surface waters and 39% came from groundwater. The largest water use was for agricultural irrigation, at 470,000 ac-ft/yr (580 million m^3/yr) (Section 12.1.9.1.3). Therefore, cumulatively the additional water resources needed for solar facilities in the SEZ during operations would constitute from a very small (0.07%) to a very large (36%) increment (the ratio of the annual water requirement for operations to the annual amount withdrawn in Dona Ana County), depending on the solar technology used (PV technology at the low end and the wet-cooled parabolic trough technology at the high end). As discussed in Section 12.1.9.1.2, the proposed Afton SEZ is located within the West Mesa portion of the Mesilla Groundwater Basin. With an estimated recharge of less than 10,000 ac-ft/yr (12.3 million m^3/yr), West Mesa groundwater would not be able to support wet cooling for a full build-out of the Afton SEZ. Even dry-cooling technologies could use between 50 and 100% of the estimated recharge of the basin (Section 12.1.9.2.4),

While solar development of the proposed SEZ with water-intensive technologies that would use groundwater would likely be judged infeasible due to concerns for groundwater supplies, if employed, intensive groundwater withdrawals could cause drawdown of groundwater and disturbance of regional groundwater flow patterns and recharge patterns, potentially affecting ecological habitats (Section 12.1.9.2). Cumulative impacts on groundwater could occur when combined with other current and future developments in the region. The City of

Las Cruces has rights to 13,000 ac-ft/yr (16 million m^3/yr) from a planned well field in the West Mesa (Section 12.1.9.2.4). Should Las Cruces exercise its withdrawal right, water use would exceed the estimated recharge of the basin. Water use by solar energy facilities in the proposed Afton SEZ would contribute additional impacts on the West Mesa groundwater. The proposed nearby Mason Draw SEZ could potentially add further groundwater impacts from any solar facilities built there.

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 28 to 222 ac-ft/yr (35 to 274 thousand m^3/yr) during the peak construction year and would range from 7.7 to 174 ac-ft/yr (up to 215,000 m^3/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to put undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet-cooling systems, there would also be 1,960 to 3,528 ac-ft/yr (2.4 to 4.4 million m^3/yr) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

12.1.22.4.9 Vegetation

The proposed Afton SEZ is located primarily within the Chihuahuan Basins and Playas ecoregion, which supports communities of desert shrubs and grasses. The dominant species is creosotebush. Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub is the predominant cover type within the proposed SEZ. Dominant species are creosotebush, honey mesquite, and snakeweed. Soaptree yucca is abundant in some areas of the SEZ. Sensitive habitats on the SEZ include desert dry washes and sand dunes. In addition, 20 NWI-mapped wetlands covering about 38.5 acres (0.2 km^2) occur on the SEZ, while many more occur east of the SEZ near the Rio Grande River. Cover types associated with wetlands include North American Warm Desert Riparian Woodland and Shrubland, Open Water, North American Warm Desert Playa, North American Arid West Emergent Marsh, and North American Warm Desert Wash. In the 5-mi (8-km) area of indirect effects, the predominant cover types are Apacherian-Chihuahuan Mesquite Upland Scrub, Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub, Agriculture, and Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub (Section 12.1.10.1). If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the SEZ over 80% of its area would result in small to moderate impacts on the various cover types (Section 12.1.10.2.1).

Intermittently flooded areas downgradient from solar projects could be affected by ground-disturbing activities. Alteration of surface drainage patterns or hydrology, and sedimentation and siltation could adversely affect on-site and downstream wetland communities, including wetland habitats along the Rio Grande River. Wetlands could be impacted by lower groundwater levels if solar projects were to draw heavily on this resource. Additional impacts from the Mason Draw SEZ to the northwest could affect hydraulically shared areas near Mason Draw. Wetland habitats along the Rio Grande River are likely too far away to be affected by actions on the Mason Draw SEZ.

The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, in combination with that from other construction, mining, agriculture, recreation, and transportation activities. The cumulative dust loading could result in reduced productivity or changes in plant community composition. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

While most of the cover types within the SEZ are relatively common in the SEZ region, a number of species are relatively uncommon, representing less than 1% of the land area within the region. In addition, sensitive areas are present within the SEZ, including dune communities and shrubland communities with cryptogamic soil crusts. Thus, future solar facilities and other ongoing and reasonably foreseeable future actions, including facilities within the nearby proposed Mason Draw SEZ, could have a cumulative effect on sensitive and rare cover types, as well as on more abundant species. Such effects would likely be small for foreseeable development due to the abundance of the primary species and the small number of foreseeable actions within the geographic extent of effects. Cumulative impacts would increase if both the Afton and Mason Draw SEZs were fully developed with solar facilities.

12.1.22.4.10 Wildlife and Aquatic Biota

Wildlife species that could potentially be affected by the development of utility-scale solar energy facilities in the proposed Afton SEZ include amphibians, reptiles, birds, and mammals. The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, loss of connectivity between natural areas, and wildlife injury or mortality. In general, species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These design features may include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats.

Impacts from full build-out over 80% of the proposed SEZ would result in small impacts on amphibian and reptile species and small to moderate impacts on bird and mammal species (Section 12.1.11). Impacts from ongoing and foreseeable development within the 50-mi (80-km) geographic extent of effects, including solar development in the nearby proposed Mason Draw SEZ, would add to those of the SEZ. Because few foreseeable projects have been identified, mainly transmission projects more than 30 mi (48 km) from the SEZ, cumulative effects in the region would be small for most species. Cumulative impacts would increase if both the Afton and Mason Draw SEZs were fully developed with solar facilities. Two future actions have been identified that would benefit wildlife in the region: removing introduced exotic antelope oryx on the San Andres NWR and protecting desert bighorn sheep from predation by mountain lions in the San Andres Mountains.

There are no surface water bodies, or perennial or intermittent streams, present within the proposed Afton SEZ. However, there are 15 mi (24 km) of canals and 23 mi (37 km) of the Rio Grande River, but no perennial or intermittent streams, located within the 5-mi (8-km) area of indirect effects. Twenty wetlands mapped by the NWI occur in the Afton SEZ, and many wetlands occur along the Rio Grande River just east of the proposed SEZ (Section 12.1.11.2). Disturbance of land areas within the SEZ for solar energy facilities could result in waterborne and airborne sediment deposition into the Rio Grande River and associated wetlands, mainly from airborne dust during construction of solar facilities. Such impacts would be mitigated and only small contributions to cumulative impacts on aquatic biota and habitats in the Rio Grande River would be expected in addition to those from construction of solar facilities in the Mason Draw SEZ to the northwest, for example, or from other foreseeable actions in the region. Such impacts would be in addition to ongoing impacts from agriculture and urban sources along the river. Groundwater drawdown from solar facilities that use wet cooling could also contribute small cumulative impacts on these habitats through reduction of source water, in addition to similar impacts from agricultural and municipal uses of groundwater.

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

On the basis of recorded occurrences or suitable habitat, as many as 35 special status species could occur within the Afton SEZ. Of these species, 6 are known or are likely to occur within the affected area of the SEZ (including the SEZ, the 5-mi [8-km] area of indirect effects, and road and transmission ROWs): sand prickly-pear cactus, smallmouth buffalo, Texas horned lizard, eastern bluebird, fringed myotis, and Townsend's big-eared bat. In addition, the ESA-listed northern aplomado falcon and Sneed's pincushion cactus may occur within the same area. Section 12.1.12.1 discusses the nature of the special status listing of these species within state and federal agencies. Numerous additional species that may occur on or in the vicinity of the SEZ are listed as threatened or endangered by the State of New Mexico or listed as a sensitive species by the BLM. Potential programmatic design features 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 facilities in the SEZ and related facilities (e.g., access roads and transmission line connections) outside the SEZ include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. Ongoing effects on special status species within the 50-mi (80-km) geographic extent of effects include those from roads, transmission lines, agriculture, and urban development in the area, particularly along the Rio Grande River. Special status species are also likely present in areas outside the SEZ within the 50-mi (80-km) geographic extent of effects that would be affected by future development, including possible solar development in the proposed Mason Draw SEZ located 3 mi (5 km) to the northwest. However, cumulative impacts on protected species are expected to be low for foreseeable development, since few projects have been identified (Section 12.1.22.2). Projects would employ mitigation measures to limit effects.

12.1.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would be responsible for some amount of air pollutants. Most of the emissions would be particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other nearby activities outside the proposed Afton SEZ, including from solar facilities within the proposed Mason Draw SEZ located 3 mi (5 km) to the northwest, 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, during construction of solar facilities the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. Dust generation from construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment.

Ozone, PM_{10}, and $PM_{2.5}$ are of regional concern in the area, because of high temperatures, abundant sunshine, and windblown dust from occasional high winds and dry soil conditions. Construction of solar facilities in the SEZ in addition to ongoing and potential future sources in the geographic extent of effects could contribute cumulatively to short-term ozone and PM increases. Cumulative air quality effects due to dust emissions are expected to be small and short-term.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values by offsetting the need for energy production that results in higher levels of emissions, such as coal, oil, and natural gas. As discussed in Section 12.1.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the Afton SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 64% of all emissions from the current electric power systems in New Mexico.

12.1.22.4.13 Visual Resources

The proposed Afton SEZ is located is located in Dona Ana County, in southern New Mexico on West Mesa, immediately west of the Mesilla Valley and the Rio Grande. The SEZ lies within a flat, treeless mesa, with the strong horizon line and surrounding mountain ranges being the dominant visual features (Section 12.1.14.1). Cultural modifications in and around the SEZ include dirt and gravel roads, transmission towers, a pipeline, cleared ROWs, a cheese factory, an electric power plant, a natural gas peaker plant, and mining activity. The VRI values for the SEZ and immediate surroundings are mostly VRI Class IV, but with some areas of Class III and Class II values, indicating low, moderate, and high visual values, respectively. The inventory indicates low scenic quality for the SEZ and its immediate surroundings; however, the inventory indicates high sensitivity for portions of the SEZ and its immediate surroundings because of the SEZ's proximity to the I-10 corridor, and the El Camino Real Scenic Byway, a scenic, high-use travel corridor with high levels of public interest.

Construction of utility-scale solar facilities on the SEZ would alter the natural scenic quality of the immediate area, although the broader area is already affected by urban, industrial, and agricultural development. Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. 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 other solar facilities on private lands, transmission lines, and other renewable energy facilities, such as wind mills. The presence of new facilities would normally be accompanied by increased numbers of workers in the area, traffic on local roadways, and support facilities, all of which would add to cumulative visual impacts.

There is currently only one pending solar application on the SEZ and one wind testing application, but no other renewable energy applications exist on public lands within 50 mi (80 km) of the SEZ (Figure 12.1.22.2-1). While the number of foreseeable and potential projects within the geographic extent of visual effects is low, it may be concluded that the general visual character of the landscape on and within the immediate vicinity of the SEZ could be cumulatively impacted by the presence of solar facilities on the SEZ in combination with solar facilities built on the nearby proposed Mason Draw SEZ and existing impacts and any other new infrastructure within the viewshed. The degree of cumulative visual impacts would depend in large part on the number and location of solar facilities built in the two proposed SEZs. Because of the topography of the region, SEZ facilities, located on mesa flats, would be visible at great distances from surrounding mountains, which include sensitive viewsheds. In addition, facilities would be located near major roads and thus would be viewable by motorists, who would also be viewing transmission lines, towns, and other infrastructure, as well as the road system itself.

As additional facilities are added, several projects might become visible from one location, or in succession as viewers move through the landscape, as by driving on local roads. In general, the new facilities would be expected to vary in appearance; depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Considering the low level of currently foreseeable development in the region, however, small to moderate cumulative visual impacts could occur within the geographic extent of effects from future solar and other existing and future development.

12.1.22.4.14 Acoustic Environment

The areas around the proposed Afton SEZ range from rural to industrial. Existing noise sources around the SEZ include road traffic, railroad traffic, aircraft flyover, commercial/industrial/agricultural activities, livestock grazing, and community activities and events. The construction of solar energy facilities could increase the noise levels periodically for up to

3 years per facility, but there would be little or minor noise impacts during operation of solar facilities, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES, which could affect nearby residences.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZ are described in Section 12.1.22.2. Because few proposed projects lie nearby outside the SEZ and noise from facilities built within the SEZ would be short range, cumulative noise effects during the construction or operation of solar facilities are unlikely. The 3-mi (5-km) distance between the Afton and Mason Draw SEZs is occupied by the I-10 corridor where few residents live and where noise from solar facilities would be largely masked by highway noise.

12.1.22.4.15 Paleontological Resources

The proposed Afton SEZ has a high potential to contain paleontological resources, especially along the eastern edge of the SEZ, although no known localities have been identified within the SEZ to date. There are four known localities within 5 mi (8 km) to the southeast and up to 235 additional localities out to 15 mi (24 km) to the south. The Prehistoric Trackways National Monument, located within 6 to 10 mi (10 to 16 km) north of the SEZ, includes fossilized footprints of amphibians, reptiles, and insects, as well as fossilized plants and petrified wood dating back 280 million years. Given the high occurrence of significant fossil material in the region, the SEZ would require further geological review and a paleontological survey prior to project approval (Section 12.1.16.2). Any resources encountered during a paleontological survey would be mitigated to the extent possible by collecting detailed information and allowing possible excavation and relocation of the resource. Cumulative impacts on paleontological resources would be dependent on whether significant resources are found within the SEZ and in additional project areas in the region, including in the proposed Mason Draw SEZ located 3 mi (5 km) to the northwest, and the extent to which these resources would be collectively impacted and/or removed.

12.1.22.4.16 Cultural Resources

The proposed Afton SEZ is rich in cultural history, with settlements dating as far back as 12,000 years, and has the potential to contain significant cultural resources. Approximately 8% of the area of the SEZ has been surveyed for cultural resources, and 113 cultural resource sites have been recorded. About 6% of the area within 5 mi (8 km) of the SEZ has been surveyed, resulting in the recording of 330 sites within this range (Section 12.1.17.1.5). Areas with potential for significant archaeological sites within the proposed SEZ include the dune areas in the northern and eastern portions of the SEZ, and areas close to the Rio Grande (Section 12.1.17.2). It is possible that the development of utility-scale solar energy projects in the SEZ, when added to other potential projects likely to occur in the area, including solar facilities in the proposed Mason Draw SEZ 3 mi (5 km) to the northwest, would contribute cumulatively to impacts on archaeological sites occurring in the region. Little foreseeable development has been identified within the 25-mi (40-km) geographic extent of effects (Section 12.1.22.2). While any future solar projects would disturb large areas, the specific sites selected for future projects would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. However, visual impacts on the Butterfield Trail, El Camino Real de Tierra Adentro, and Mesilla Plaza, as well as potentially other NRHP-listed properties in Mesilla and Las Cruces, from multiple development projects in the area would have a cumulative effect on these properties. Through ongoing consultation with the New Mexico 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, but this would depend on the results of the future surveys and evaluations. Avoidance of all NRHP-eligible sites and mitigation of all impacts may not be possible.

12.1.22.4.17 Native American Concerns

Government-to-government consultation is under way with federally recognized Native American Tribes with possible traditional ties to the Afton area. All such Tribes have been contacted and provided an opportunity to comment or consult regarding this PEIS. To date, no specific concerns have been raised to the BLM regarding the proposed Afton SEZ. However, the Pueblo of Ysleta del Sur has requested that they be consulted if human remains or other NAGPRA materials are encountered during development, implying concern for human burials and objects of cultural patrimony. Impacts of solar development in the SEZ and in the surrounding area on water resources is likely to be of major concern to affected Tribes, as are intrusions on the landscape and impacts on plants and game and on traditional resources at specific locations (Section 12.1.18). The development of solar energy facilities in combination with the development of other foreseeable projects in the area could reduce the traditionally important plant and animal resources available to the Tribes. Such effects would be small for foreseeable development due to the abundance of the most culturally important plant species and the small number and minor effects of foreseeable actions within the geographic extent of effects. Effects would increase if both the Afton and nearby Mason Draw SEZs were fully developed with solar facilities. Continued discussions with area Tribes through government-to-government consultation is necessary to effectively consider and address the Tribes' concerns tied to solar energy development in the Afton SEZ.

12.1.22.4.18 Socioeconomics

Solar energy development projects in the proposed Afton SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZ 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 any other new development in the area, including other renewable energy projects. The number of workers involved in the construction of solar projects in the peak construction year could range from about 400 to 5,200, 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 1,200 (solar PV) to as high as 16,000 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-year or more solar development period, including in the proposed nearby Mason Draw SEZ.

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. Additional employment could occur at other new, but not yet foreseen, facilities within 50 mi (80 km) of the proposed SEZ. Based on the assumption of full build-out of the SEZ (Section 12.1.19.2.2), the number of workers needed at the solar facilities in the SEZ would range from 135 to 2,700, with approximately 190 to 4,500 total jobs created in the region. Population increases would contribute to general upward trends in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

12.1.22.4.19 Environmental Justice

Any impacts from solar development could have cumulative impacts on minority and low-income populations within 50 mi (80 km) of the proposed SEZ in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual impacts, noise, and exposure to fugitive dust (Section 12.1.20.2). Actual impacts would depend on where low-income populations are located relative to solar and other proposed facilities, including in the proposed nearby Mason Draw SEZ, and on the geographic range of effects. Overall, effects from facilities within the SEZ are expected to be small, while those from other foreseeable actions would be minor and would not likely combine with negative effects from the SEZ on minority or low-income populations, with the possible exception of dust impacts from concurrent development of solar facilities within the proposed Mason Draw SEZ. It is not expected, however, that the proposed Afton SEZ would contribute to cumulative impacts on minority and low-income populations.

12.1.22.4.20 Transportation

I-10 lies within 0.5 mi (0.8 km) of the northern border of the proposed Afton SEZ. The nearest public airport is Las Cruces International Airport, located directly north of I-10 and the SEZ. The nearest railroad stops lie within 1 to 5 mi (1.6 to 8 km) of the SEZ. During construction of utility-scale solar energy facilities, up to 1,000 workers could be commuting to the construction site at the SEZ at a given time, which could increase the AADT on these roads by 2,000 vehicle trips for each facility under construction. Traffic on I-10 could experience small slowdowns and exits on I-10 might experience moderate impacts with some congestion during construction (Section 12.1.21.2). This increase in highway traffic from construction workers could likewise have small cumulative impacts in combination with existing traffic levels and increases from any additional future development in the area, including during construction of solar facilities in the nearby proposed Mason Draw SEZ, should construction schedules overlap. Local road improvements might be necessary on affected portions of I-10 and on any other affected roads. Any impacts during construction activities would be temporary. The impacts can also be mitigated to some degree by staggered work schedules and ride-sharing programs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate the solar facilities and would have little contribution to cumulative impacts.

This page intentionally left blank.

12.1.23 References

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

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.

Bailie, A., et al., 2006, *Appendix D: New Mexico Greenhouse Gas Inventory and Reference Case Projections, 1990–2020*, prepared by the Center for Climate Strategies, for the New Mexico Environment Department, Nov. Available at http://www.nmenv.state.nm.us/cc/documents/CCAGFinalReport-AppendixD-EmissionsInventory.pdf. Accessed Aug. 22, 2010.

Balch, R.S., et al., 2010, *The Socorro Midcrustal Magma Body*, New Mexico Tech: New Mexico Earthquakes. Available at http://www.ees.nmt.edu/Geop/magma.html. Accessed Aug. 24, 2010.

Barrett, E.M., 2002, "The Geography of the Rio Grande Pueblos in the Seventeenth Century," *Ethnohistory* 49(1):123–169.

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.

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

BISON-M, 2010, *Biota Information System of New Mexico.* Available at http://www.bison-m.org. Accessed Aug. 17, 2010.

BLM (Bureau of Land Management), 1980, *Green River—Hams Fork Draft Environmental Impact Statement: Coal*, U.S. Department of the Interior.

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

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, Washington, D.C., Jan.

BLM, 1993, *Mimbres Resource Management Plan*, U.S. Department of the Interior, Bureau of Land Management, Las Cruces District Office, Las Cruces, N.M., Dec.

BLM, 1996, *White River Resource Area: Proposed Resource Management Plan and Final Environmental Impacts Statement*, White River Resource Area.

BLM, 2001, *New Mexico Water Rights Fact Sheet*. Available at http://www.blm.gov/nstc/WaterLaws/pdf/Utah.pdf. Accessed June 16, 2010.

BLM, 2007, *Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands*, Instruction Memorandum No. 2008-009, with attachments, Washington, D.C., Oct. 15.

BLM, 2008a, *Assessment and Mitigation of Potential Impacts to Paleontological Resources*, Instruction Memorandum No. 2009-011, with attachments, Washington, D.C., Oct. 10.

BLM, 2008b, *Dona Ana County Proposed Mimbres Resource Management Plan Amendment/ Environmental Assessment and FONSI*, NM-030-2008-025, Report No. BLM/NM/PL-08-09-1610, Sept.

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

BLM, 2008d, *Rangeland Administration System*. Available at http://www.blm.gov/ras/index.htm, last updated March 16, 2010. Accessed Nov. 24, 2009.

BLM, 2009a, *Las Cruces District Office Mule Deer Range*, U.S. Bureau of Land Management, New Mexico State Office, Sante Fe, N.M., May 13.

BLM, 2009b, *Las Cruces Office Pronghorn Range*, U.S. Bureau of Land Management, New Mexico State Office, Sante Fe, N.M., May 13.

BLM, 2010a, *Prehistoric Trackways National Monument*. Available at http://www.blm.gov/nm/st/en/prog/rrecreation/las_cruces/trackways.html. Accessed Aug. 18, 2010.

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, *Draft Visual Resource Inventory*, U.S. Department of the Interior, BLM Las Cruces District Office, Las Cruces, N.M., May.

BLM, 2010d, *Wild Horse and Burro Statistics and Maps*, U.S. Bureau of Land Management, Washington, D.C. Available at http://www.blm.gov/wo/st/en/prog/wild_horse_and_burro/wh_b_information_center/statistics_and_maps/ha_and_hma_data.html. Accessed June 25, 2010.

BLM, 2010e, *SunZia Transmission Line Project*. Available at http://www.blm.gov/nm/st/en/prog/more/lands_realty/sunzia_southwest_transmission.html. Accessed Aug. 19, 2010.

BLM and USFS, 2010a, *GeoCommunicator: Energy Map Viewer*. Available at http://www.geocommunicator.gov/GeoComm/index.shtm. Accessed March 26, 2010.

BLM and USFS, 2010b, *GeoCommunicator: Mining Claim Map*. Available at http://www.geocommunicator.gov/GeoComm/index.shtm. Accessed Aug. 5, 2010.

BNSF (Burlington Northern and Santa Fe) Railroad, 2010, *BNSF Railway Company, Southwest Operating Division, System Maintenance and Planning, Current May 2010*. Available at http://www.bnsf.com/customers/pdf/maps/div_sw.pdf. Accessed Aug. 16, 2010.

Bolluch, E.H., Jr., and R.E. Neher, 1980, *Soil Survey of Dona Ana County Area New Mexico*, U.S. Department of Agriculture, Soil Conservation Service.

Brown, D., 1994, "Chihuahuan Desertscrub," in *Biotic Communities, Southwestern United States and Northwestern Mexico*, D. Brown (editor), University of Utah Press, Salt Lake City, Utah.

BTS (Bureau of Transportation Statistics), 2009, *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 March 5, 2010.

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.

CDFG (California Department of Fish and Game), 2008, *Life History Accounts and Range Maps—California Wildlife Habitat Relationships System*, Sacramento, Calif. Available at http://dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx. Accessed Feb. 19, 2010.

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.

CH2M HILL, 2002, *Final Report: Groundwater Modeling of the Canutillo Wellfield*, prepared for the El Paso Water Utilities Public Service Board, April.

Chapin, C.E., 1988, “Axial Basins of the Northern and Central Rio Grande Rifts,” in *Sedimentary Cover—North American Craton (U.S.)*, Geological Society of America, Geology of North America, L.L. Sloss (editor), D-2, 165–170.

City of Las Cruces, 2008, *Water and Wastewater System Master Plan Update, Final*, City of Las Cruces Utilities Department, Sept.

Cole, D.C., 1988, *The Chiricahua Apache: 1846–1876 from War to Reservation*, University of New Mexico Press, Albuquerque, N.M.

Contaldo, G.J., and J.E. Mueller, 1991, “Earth Fissures and Land Subsidence of the Mimbres Basin, Southwestern New Mexico, USA,” in *Land Subsidence*, proceedings of the Fourth International Symposium on Land Subsidence, May.

Coppersmith, C.P., 2007, “Apache, Fort Sill,” *Encyclopedia of Oklahoma History and Culture,* Oklahoma Historical Society, Oklahoma City, Okla. Available at http://digital.library.okstate.edu/encyclopedia/entries/A/AP003.html.

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.

Crawford, C.S., et al., 1993, *Middle Rio Grande Ecosystem: Bosque Biological Management Plan*, U.S. Fish and Wildlife Service, Albuquerque, N.M.

Creel, B.J., et al., 1998, *Ground-water Aquifer Sensitivity Assessment and Management Practices Evaluation for Pesticides in the Mesilla Valley of New Mexico*, New Mexico Water Resources Research Institute (WRRI) Technical Completion Report No. 305. Available at http://wrri.nmsu.edu/publish/techrpt/tr305/downl.html. Accessed June 2010.

CSC (Coastal Services Center), 2010, *Historical Hurricane Tracks*, National Oceanic and Atmospheric Administration. Available at http//csc-s-maps-q.csc.noaa.gov/hurricanes. Accessed Aug. 13, 2010.

DOE (U.S. Department of Energy), 2009a, *Concentrating Solar Power Commercial Application Study: Reducing Water Consumption of Concentrating Solar Power Electricity Generation*, Report to Congress, Jan. 13. Available at http://www1.eere.energy.gov/solar/pdfs/csp_water_study.pdf.

DSIRE (Database of State Incentives for Renewables and Efficiency), 2010, *New Mexico Incentives/Policies for Renewables & Efficiency*. Available at http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NM05R&re=1&ee=1. Accessed Aug. 17, 2010.

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.

El Paso Electric, 2010, *Power Plant Tours*. Available at http://www.epelectric.com/__8725712E0054BD02.nsf/0/232434BD7CD17B3D8725712E0055D6C5?Open. Accessed Aug. 9, 2010.

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, 2007, *Level III Ecoregions*, Western Ecology Division, Corvalis, Ore. Available at http://www.epa.gov/wed/pages/ecoregions/level_iii.htm. Accessed Oct. 2, 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 June 23, 2009.

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

EPA, 2009c, *eGRID*. Available at http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html, last updated Oct. 16, 2008. Accessed Jan. 12, 2009.

EPA, 2009d, *National Primary Drinking Water Regulations and National Secondary Drinking Water Regulation*. Available at http://www.epa.gov/safewater/standard/index.html.

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

EPA, 2010b, *AirData: Access to Air Pollution Data*. Available at http://www.epa.gov/oar/data. Accessed Aug. 13, 2010.

EPA, 2010c, *Primary Distinguishing Characteristics of Level III Ecoregions of the Continental United States*, July. Available at ftp://ftp.epa.gov/wed/ecoregions/us/Eco_Level_III_descriptions.doc.

FAA (Federal Aviation Administration), 2010, *Airport Data (5010) & Contact Information, Information Current as of 06/03/2010*. Available at http://www.faa.gov/airports/airport_safety/airportdata_5010. Accessed July 19, 2010.

Fallis, T., 2010, "Archaeological Site and Survey Data for New Mexico," personal communication from Fallis (New Mexico State Historic Preservation Division, Albuquerque, N.M.) to B. Cantwell (Argonne National Laboratory, Argonne, Ill.), Jan 12.

FEMA (Federal Emergency Management Agency), 2009, *FEMA Map Service Center*. Available at http://www.fema.gov. Accessed Nov. 20, 2009.

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

Frenzel, P.F., et al., 1992, *Geohydrology and Simulation of Ground Water Flow in the Mesilla Basin, Dona Ana County, New Mexico, and El Paso County, Texas*, U.S. Geological Survey Professional Paper 1407-C.

GCRP (U.S. Global Change Research Program), 2009, *Global Climate Change Impacts in the United States: A State of Knowledge Report from the U.S. Global Change Research Program*, Cambridge University Press, Cambridge, Mass. Available at http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf. Accessed Jan. 25, 2010.

Gibbs, V., et al., 2000, *Cultural Resource Survey and Planning Report; El Paso–Las Cruces Regional Sustainable Water Project*, prepared for CH2M HILL and the New Mexico–Texas Water Commission. Available at http://www.nm-xwatercomm.org/library/TechReports/Cultural/CulturalResources.pdf.

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

GlobalSecurity.org, 2010a, *Fort Bliss*. Available at http://www.globalsecurity.org/military/facility/fort-bliss.htm. Accessed Aug. 18, 2010.

GlobalSecurity.org, 2010b, *Fort Bliss McGregor Range*. Available at http://www.globalsecurity.org/military/facility/mcgregor.htm. Accessed Aug. 17, 2010.

GlobalSecurity.org, 2010c*, Fort Bliss Dona Ana Range*. Available at http://www.globalsecurity.org/military/facility/dona-ana.htm. Accessed Aug. 17, 2010.

GlobalSecurity.org, 2010d, *White Sands Missile Range*. Available at http://www.globalsecurity.org/space/facility/wsmr.htm. Accessed Aug. 17, 2010.

Graham, T.B., 2001, *Survey of Ephemeral Pool Invertebrates at Wupatki NM: An Evaluation of the Significance of Constructed Impoundments as Habitat*, WUPA-310, final report for Wupatki National Monument and Southwest Parks and Monuments Association, Sept.

Greene, A.C., 1994, *900 Miles on the Butterfield Trail*, University of North Texas Press, Denton, Tex.

Griffen, W.B., 1983, "Southern Periphery: East," pp. 329–342 in *Handbook of North American Indians, Vol. 10, Southwest*, A. Ortiz (editor), Smithsonian Institution, Washington, D.C.

Griffith, G., et al., 2006, *Ecoregions of New Mexico* (color poster with map, descriptive text, summary tables, and photographs) (map scale 1:1,400,000), Reston, Va., U.S. Geological Survey.

Hafen, Le Roy R., 1926, *The Overland Mail 1849-1869; Promoter of Settlement, Precursor of Railroads*, Arthur H. Clark Company, Cleveland, Ohio.

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.

Hawley, J.W., and A. Granados-Olivas, 2008, *Progress Report on Development of an Annotated Bibliography for Transboundary Aquifer Systems of the Mesilla Basin–Paso Del Norte Area, New Mexico, Texas (USA) and Chihuahua (Mex)*. Available at http://wrri.nmsu.edu/publish/ympabs/posters2008.pdf. Accessed July 2010.

Hawley, J.W., and R.P. Lozinsky, 1992, *Hydrogeologic Framework of the Mesilla Basin in New Mexico and Western Texas*, New Mexico Bureau of Mines and Mineral Resources and the New Mexico Institute for Mining and Technology, Open File Report 323.

Hawley, J.W., et al., 2001, "The Mesilla Basin Aquifer System of New Mexico, West Texas, and Chihuahua—An Overview of Its Hydrogeologic Framework and Related Aspects of Groundwater Flow and Chemistry," in *Aquifers of West Texas*, R.E. Mace et al. (editors), Texas Water Development Board Report 356, Dec.

Hester, P., 2009, "GIS Data," personal communication with attachment from Hester (BLM, New Mexico State Office, N.M.) to K. Wescott (Argonne National Laboratory, Argonne, Ill.), June 12.

Hewitt, R., 2009a, "Archaeological Sites for Las Cruces District Office," personal communication from Hewitt (GIS Specialist, BLM, Las Cruces District Office, Las Cruces, N.M.) to B. Cantwell (Argonne National Laboratory, Argonne, Ill.), May 13.

Hewitt, R., 2009b, "GIS Data for the Las Cruces District Office," personal communication with attachment from Hewitt (GIS Specialist, BLM, Las Cruces District Office, Las Cruces, N.M.) to Karen Smith (Argonne National Laboratory, Argonne, Ill.), May 13.

Houser, N.P., 1979, "Tigua Pueblo," pp. 336–342 in *Handbook of North American Indians, Vol. 9, Southwest*, A. Ortiz (editor), Smithsonian Institution, Washington, D.C.

HPX (High Plains Express), 2008, *High Plains Express Transmission Project Feasibility Study Report*, final report, June.

Jackson, M., Sr., 2009, "Quechan Indian Tribe's Comments on Programmatic Environmental Impact Statement for Solar Energy Development," letter from Jackson (President, Quechan Indian Tribe, Fort Yuma, Ariz.) to Argonne National Laboratory (Argonne, Ill.), Sept. 3.

Kenny, J.F, et al., 2009, *Estimated Use of Water in the United States in 2005*, Circular 1344, U.S. Geological Survey. Available at http://pubs.usgs.gov/circ/1344. County data accessed Jan. 4, 2010.

King, P.J., 2007, *Regional Water Planning in the Lower Rio Grande Basin*, New Mexico State University. Available at http://www.las-cruces.org/utilities/Regional%20Water%20Plan%20 compressed.pdf. Accessed June 17, 2010.

Kirkpatrick, D.T., et al., 2001, "Basin and Range Archaeology: An Overview of Prehistory in South–Central New Mexico," in *The Archaeological Record of Southern New Mexico*, S.R. Katz and P. Katz (editors), manuscript prepared for the Historic Preservation Division, State of New Mexico, Albuquerque, N.M.

Lee, J.M., et al., 1996, *Electrical and Biological Effects of Transmission Lines: A Review*, Bonneville Power Administration, Portland, Ore., Dec.

Loera, J., 2010, letter from Loera (Ysleta del Sur Pueblo, El Paso, Texas) to S.J. Borchard (California Desert District, Bureau of Land Management, Riverside, Calif.), Feb. 23.

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.

LRGWUO (Lower Rio Grande Water Users Organization), 1999, *New Mexico Lower Rio Grande Regional Water Plan*. Accessed June 29, 2010.

LRGWUO, 2004, *The New Mexico Lower Rio Grande Regional Water Plan*. Available at http://wrri.nmsu.edu/lrgwuo/rwp.html.

Machete, M.N. (compiler), 1996a, *Fault Number 2063, East Robledo Fault (Class A)*, in Quaternary Fault and Fold Database of the United States: U.S. Geological Survey Web site. Available at http://earthquakes.usgs.gov/regional/qfaults. Accessed Aug. 20, 2010.

Machete, M.N. (compiler), 1996b, *Fault Number 2065, Fitzgerald Fault (Class A)*, in Quaternary Fault and Fold Database of the United States: U.S. Geological Survey Web site. Available at http://earthquakes.usgs.gov/regional/qfaults. Accessed Aug. 20, 2010.

Machete, M.N. (compiler), 1996c, *Fault Number 2078, Ward Tank Fault (Class A)*, in Quaternary Fault and Fold Database of the United States: U.S. Geological Survey Web site. Available at http://earthquakes.usgs.gov/regional/qfaults. Accessed Aug. 20, 2010.

Machete, M.N. (compiler), 1996d, *Fault Number 2064, West Robledo Fault (Class A)*, in Quaternary Fault and Fold Database of the United States: U.S. Geological Survey Web site. Available at http://earthquakes.usgs.gov/regional/qfaults. Accessed Aug. 18, 2010.

Machete, M.N. (compiler), 1996e, *Fault Number 2077, Unnamed Faults and Folds on La Mesa (Class A)*, in Quaternary Fault and Fold Database of the United States: U.S. Geological Survey Web site. Available at http://earthquakes.usgs.gov/regional/qfaults. Accessed Aug. 18, 2010.

Machete, M.N. (compiler), 1996f, *Fault Number 2066, East Potrillo Fault (Class A)*, in Quaternary Fault and Fold Database of the United States: U.S. Geological Survey Web site. Available at http://earthquakes.usgs.gov/regional/qfaults. Accessed Aug. 18, 2010.

MacNeish, R.S., and P.H. Beckett, 1987, *The Archaic Chihuahua Tradition of South–Central New Mexico and Chihuahua, Mexico,* Monograph No. 7, COAS Publishing and Research, Las Cruces, N.M.

Manci, K.M., et al., 1988, *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*, NERC-88/29, U.S. Fish and Wildlife Service National Ecology Research Center, Ft. Collins, Colo.

McCollough, R., 2009, "New Mexico TES Data Request," personal communication with attachment from McCollough (Data Services Manager, Natural Heritage New Mexico, Albuquerque, N.M.) to L. Walston (Argonne National Laboratory, Argonne, Ill.), Sept. 17.

MIG (Minnesota IMPLAN Group), Inc., 2010, *State Data Files*, Stillwater, Minn.

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/N011.pdf. Accessed Aug. 30, 2007.

Montoya, J., 2010, personal communication from Montoya (BLM, Las Cruces District Office, Planning and Environmental Coordinator, Las Cruces, N.M.) to J. May (Argonne National Laboratory, Lakewood, Colo.), Aug.

Moose, V., 2009, "Comments on Solar Energy Development Programmatic EIS," letter from Moose (Tribal Chairperson, Big Pine Paiute Tribe of the Owens Valley, Big Pine, Calif.) to Argonne National Laboratory (Argonne, Ill.), Sept. 14.

Myers, R.G., and B.R. Orr, 1985, *Geohydrology of the Aquifer in the Santa Fe Group, Northern West Mesa of the Mesilla Basin near Las Cruces, New Mexico*, Water Resources Investigations Report 84-4190, U.S. Geological Survey.

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), 2010a, *Climates of the States (CLIM60): Climate of New Mexico*, National Oceanic and Atmospheric Administration, Satellite and Information Service. Available at http://cdo.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl. Accessed Aug. 13, 2010.

NCDC, 2010b, *Integrated Surface Data (ISD), DS3505 Format*, database, Asheville, N.C. Available at ftp://ftp3.ncdc.noaa.gov/pub/data/noaa. Accessed Aug. 13, 2010.

NCDC, 2010c, *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 Aug. 13, 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.

New Mexico Rare Plant Technical Council, 1999, *New Mexico Rare Plants*, Albuquerque, N.M. Available at http://www.nmrareplants.unm.edu, last updated July 22, 2010. Accessed Aug. 17, 2010.

Nickerson, E., 1987, *Monitoring Network of the Ground-Water Flow System and Stream-Aquifer Relations in the Mesilla Basin, Doña Ana County, New Mexico and El Paso County, Texas*, U.S. Geological Survey. Available at http://nm.water.usgs.gov/projects/mesilla/index.html, last updated Aug. 19, 2009.

Nickerson, E.L., and R.G. Myers, 1993, *Geohydrology of the Mesilla Ground-Water Basin, Dona Ana County, New Mexico, and El Paso County, Texas*, Water Resources Investigations Report 92-4156, U.S. Geological Survey.

NMBGMR (New Mexico Bureau of Geology and Mineral Resources), 2006, *New Mexico—Earth Matters: Volcanoes of New Mexico*, Winter.

NMDA (New Mexico Department of Agriculture), 2009, *New Mexico Noxious Weed List*, updated April 2009. Available at http://nmdaweb.nmsu.edu/animal-and-plant-protection/noxious-weeds/weed_memo_list.pdf. Accessed Aug. 27, 2010.

NMDGF (New Mexico Department of Game and Fish), 2010, *Biota Information System of New Mexico*. Available at http://www.bison-m.org. Accessed Aug. 17, 2010.

NM DOT (New Mexico Department of Transportation), 2009, *2008 Annual Traffic Report*, April. Available at http://nmshtd.state.nm.us/main.asp?secid=14473. Accessed Aug. 21, 2010.

NM DOT, 2010, *Traffic Flow Maps 2007 & 2008*. Available at http://nmshtd.state.nm.us/main.asp?secid=16260. Accessed Aug. 16, 2010.

NMED (New Mexico Environment Department), 2000a, *Dust Storms and Health*, March. Available at http://www.health.state.nm.us/eheb/rep/air/DustStormsAndHealth.pdf. Accessed Aug. 23, 2009.

NMED, 2000b, *Natural Events Action Plan for High Wind Events, Dona Ana County*, Santa Fe, N.M., Dec. 22. Available at http://www.nmenv.state.nm.us/aqb/NEAP/neap-final.pdf. Accessed Aug. 23, 2010.

NMED, 2010, *The Storm Water Regulatory Program at the Surface Water Quality Bureau, NMED*. Available at http://www.nmenv.state.nm.us/swqb/stormwater. Accessed Aug. 18, 2010.

NMOSE (Office of the State Engineer, New Mexico), 2004, Part 13, "Active Water Resource Management,"; Title 19, "Natural Resources and Wildlife,"; Chapter 25, "Administration and Use of Water—General Provisions," Dec. 30.

NMOSE, 2005a, *Rules and Regulations Governing the Appropriation and Use of the Surface Waters of New Mexico*. Available at http://www.ose.state.nm.us/water_info_rights_rules.html. Accessed June 16, 2010.

NMOSE, 2005b, *Rules and Regulations Governing Well Driller Licensing; Construction, Repair, and Plugging of Wells*. Available at http://www.ose.state.nm.us/water_info_rights_rules.html. Accessed Aug. 18, 2010.

NMOSE, 2006a, *Rules and Regulations Governing the Appropriation and Use of Groundwater in New Mexico*. Available at http://www.ose.state.nm.us/water_info_rights_rules.html. Accessed June 16, 2010.

NMOSE, 2006b, *Proposed Rules and Regulations Providing for Active Water Resources Administration of the Waters of the Lower Rio Grande Water Master District*, Nov. 14.

NMOSE, 2010a, *Active Water Resource Management*. Available at http://www.ose.state.nm.us/water_info_awrm.html. Accessed June 17, 2010.

NMOSE, 2010b, *District Offices*. Available at http://www.ose.state.nm.us/water_info_rights_offices.html. Accessed June 21, 2010.

NMOSE, 2010c, *Priority Administration*. Available at http://www.ose.state.nm.us/water_info_awrm_admin.html. Accessed June 18, 2010.

NMOSE, 2010d, *Water Information*. Available at http://www.ose.state.nm.us/water_info_index.html. Accessed June 16, 2010.

NMSPD (New Mexico State Parks Division), 2010, *Mesilla Valley Bosque State Park*. Available at http://www.emnrd.state.nm.us/PRD/mesillavalley.htm. Accessed Aug. 10, 2010.

NMSU (New Mexico State University), 2007, *Weed Information Database Search*. Available at http://weeds.nmsu.edu/databasesearch.php. Accessed Aug. 27, 2010.

NPS (National Park Service) and BLM (Bureau of Land Management), 2004, *El Camino Real de Tierra Adentro National Historic Trail: Comprehensive Management Plan/Final Environmental Impact Statement*, prepared by Long Distance Trails Group, Santa Fe, National Park Service, and New Mexico State Office, Bureau of Land Management, Santa Fe, N.M.

NRCS (Natural Resources Conservation Service), 2008, *Soil Survey Geographic (SSURGO) Database for Doña Ana County, New Mexico*. Available at http://SoilDataMart.nrcs.usds.gov.

NRCS, 2010, *Custom Soil Resource Report for Doña Ana County (covering the proposed Afton SEZ), New Mexico*, U.S. Department of Agriculture, Washington, D.C., Aug. 17.

Opler, M.E., 1941, *An Apache Life-Way: The Economic, Social, and Religious Institutions of the Chiricahua Indians*, University of Chicago Press, Chicago, Ill.

Opler, M.E., 1947, "Notes on Chiricahua Apache Culture: 1. Supernatural Power and the Shaman," *Primitive Man* 20(1/2):1–14.

Opler, M.E., 1983a, "Apachean Culture Pattern and Its Origins," pp. 368–392 in *Handbook of North American Indians, Vol. 10, Southwest*, A. Ortiz (editor), Smithsonian Institution, Washington, D.C.

Opler, M. E., 1983b, "Chiricahua Apache," pp. 401–418 in *Handbook of North American Indians, Vol. 10, Southwest*, A. Ortiz (editor), Smithsonian Institution, Washington, D.C.

PNM (Public Service Company of New Mexico), 2002, *PNM's Afton Generating Station Up & Running*, news release, Dec. Available at http://www.pnm.com/news/2002/1204_afton.htm. Accessed Aug. 9, 2010.

Reuters, 2010, *El Paso Electric Company*. Available at http://www.reuters.com/finance/stocks/companyProfile?rpc=66&symbol=EE. Accessed Aug. 9, 2010.

Robson, S.G., and E.R. Banta, 1995, *Ground Water Atlas of the United States: Arizona, Colorado, New Mexico, Utah*, HA 730-C, U.S. Geological Survey.

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.

Sanford, A.R., and K. Lin, 1998, *Strongest Earthquakes in New Mexico: 1860 to 1998*, New Mexico Tech Geophysics Open File Report 87, June.

Sanford, A.R., et al., 2002, *Earthquake Catalogs for New Mexico and Bordering Areas: 1869–1998*, Circular 210, New Mexico Bureau of Geology and Mineral Resources.

Scholle, P.A., 2003, *Geologic Map of New Mexico (1:500,000)*, New Mexico Bureau of Geology and Mineral Resources, published in cooperation with the U.S. Geological Survey.

Schroeder, A.H., 1979, "Pueblos Abandoned in Historic Times," pp. 236–254 in *Handbook of North American Indians, Vol. 9, Southwest*, A. Ortiz (editor), Smithsonian Institution, Washington, D.C.

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.D., 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, Boston, Mass.

Stoeser, D.B., et al., 2007, *Preliminary Integrated Geologic Map Databases for the United States: Central States—Montana, Wyoming, Colorado, New Mexico, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Iowa, Missouri, Arkansas, and Louisiana, Version 1.2*, U.S. Geological Survey Open File Report 2005-1351, updated Dec. 2007.

Stoffle, R.W., et al., 1990, *Native American Cultural Resource Studies at Yucca Mountain, Nevada*, University of Michigan, Ann Arbor, Mich.

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.

SunZia, 2010, *Welcome to the SunZia Southwest Transmission Project*. Available at http://www.sunzia.net. Accessed Aug. 23, 2010.

TCEQ (Texas Commission on Environmental Quality), 2005, *Water Administration Overview—New Mexico,* Oct. 12. Available at http://www.tceq.state.tx.us/assets/public/compliance/R15_Harlingen/US-MX%20BGC%20Water%20table%20documents/US%20States/New%20Mexico/new_mexicomx_water_english_101205.doc. Accessed July 25, 2010.

Texas Comptroller's Office, 2009, *Texas County Population Projections: 2000 to 2030: Total Population*. Available at http://www.window.state.tx.us/ecodata/popdata/cpacopop1990_2030.xls.

TSHAOnline, 2010, *Butterfield Overland Mail*. Available at http://www.tshaonline.org/handbook/online/articles/BB/egb1.html). Accessed Aug. 30, 2010.

Tweedie, M.J., 1968, "Notes on the History and Adaptation of the Apache Tribes," *American Anthropologist* 70(6):1132–1142.

University of New Mexico, 2009, *Population Projections for New Mexico and Counties*, Bureau of Business and Economic Research. Available at http://bber.unm.edu/demo/table1.htm.

UP (Union Pacific) Railroad, 2009, *Allowable Gross Weight Map*. Available at http://www.uprr.com/aboutup/maps/attachments/allow_gross_full.pdf. Accessed March 4, 2010.

U.S. Bureau of the Census, 2009a, *County Business Patterns, 2008*, 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), 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, 2008, *Jornada Experimental Range*. Available at http://www.ars.usda.gov/main/site_main.htm?modecode=62-35-15-00. Accessed Aug. 17, 2010.

USDA, 2009a, *2007 Census of Agriculture: New Mexico State and County Data, Vol. 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/New Mexico/index.asp.

USDA, 2009b, *2007 Census of Agriculture: Texas State and County Data, Vol. 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/Texas/index.asp.

USDA, 2010, *Natural Resources Conservation Service, Plants Database*. Available at http://plants.usda.gov. Accessed June 23, 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 the Interior, 2010, *Native American Consultation Database*, National NAGPRA Online Databases, National Park Service. Available at http://grants.cr.nps.gov/nacd/index.cfm.

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_10.html.

U.S. Department of Justice, 2009c, *Crime in the United States: 2007*, Federal Bureau of Investigation. Available at http://www.fbi.gov/ucr/cius2006/about/table_title.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 for States*, 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.

USFS (U.S. Forest Service), 2007, *Wild Horse and Burro Territories*, U.S. Forest Service, Rangelands, 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), 2002, *Environmental Assessment Mountain Lion Management to Protect the State Endangered Desert Bighorn Sheep*, Sept. Available at http://www.fws.gov/southwest/refuges/newmex/sanandres/PDF/Final%20Lion%20EA%20902.pdf. Accessed Aug. 18, 2010.

USFWS, 2007, *Environmental Assessment Opening of Hunting for San Andres National Wildlife Refuge*, Feb. Available at http://www.fws.gov/southwest/refuges/newmex/sanandres/PDF/ENVIRONMENTALASSESSMENT.pdf. Accessed Aug. 18, 2010.

USFWS, 2009, *National Wetland Inventory*, U.S. Department of the Interior, Washington, D.C. Available at http://www.fws.gov/wetlands.

USFWS, 2010, *Environmental Conservation Online System (ECOS)*, U.S. Fish and Wildlife Service. Available at http://www.fws.gov/ecos/ajax/ecos/indexPublic.do. Accessed May 28, 2010.

USGS (U.S. Geological Survey), 1978a, *Black Mesa Quadrangle, New Mexico*, map 1:24,000, 7.5 Minute Series, U.S. Department of the Interior, Reston, Va.

USGS, 1978b, *Afton NW Quadrangle, New Mexico*, map 1:24,000, 7.5 Minute Series, U.S. Department of the Interior, Reston, Va.

USGS, 1982, *Las Cruces, New Mexico–Texas*, map, 1:100,000, 30 × 60 Minute Quadrangle, U.S. Department of the Interior, Reston, Va.

USGS, 2004, *National Gap Analysis Program, Provisional Digital Land Cover Map for the Southwestern United States*, Ver. 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*, US 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*, Ver. 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. 2010.

USGS, 2010a, *National Biological Information Infrastructure, Gap Analysis Program (GAP), National Land Cover, South Central Dataset*. Available at http://www.gap.uidaho.edu/Portal/DataDownload.html. Accessed Aug. 17, 2010.

USGS, 2010b, *Texas Vertebrate Habitat Suitability Maps, Gap Analysis Program*. Available at http://www.gap.uidaho.edu/projects/FTP.htm. Accessed Aug. 17, 2010.

USGS, 2010c, *Monitoring Network of the Ground-Water Flow System and Stream-Aquifer Relations in the Mesilla Basin, Dona Ana County, New Mexico and El Paso County, Texas*. Available at http://nm.water.usgs.gov/projects/mesilla. Accessed Aug. 30, 2010.

USGS, 2010d, *Water Resources of the United States—Hydrologic Unit Maps*. Available at http://water.usgs.gov/GIS/huc.html. Accessed April 12, 2010.

USGS, 2010e, *National Water Information System*. Available at http://wdr.water.usgs.gov/nwisgmap. Accessed Aug. 16, 2010.

USGS, 2010f, *National Earthquake Information Center (NEIC)—Circular Area Database Search (within 100-km of the center of the proposed Afton SEZ)*. Available at http://earthquake.usgs.gov/earthquakes/eqarchives/epic/epic_circ.php. Accessed Aug. 2010.

USGS, 2010g, *Glossary of Terms on Earthquake Maps—Magnitude*. Available at http://earthquake.usgs.gov/earthquakes/glossary.php#magnitude. Accessed Aug. 8, 2010.

USGS and NMBMMR (U.S. Geological Survey and New Mexico Bureau of Mines and Mineral Resources), 2010, *Quaternary Fault and Fold Database for the United States*. Available at http://earthquake.usgs.gov/regional/qfaults. Accessed Aug. 2010.

Witcher, J.C., et al., 2004, *Sources of Salinity in the Rio Grande and Mesilla Basin Groundwater*, *New Mexico*, WRRI Technical Completion Report No. 330, Water Resources Research Institute. Available at http://wrri.nmsu.edu/publish/techrpt/tr330/downl.html. Accessed July 2010.

Wolf, J.A., and J.N. Gardner, 1995, "Is the Valles Caldera Entering a New Cycle of Activity?," *Geology*, Vol. 23, No. 5.

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, *Monthly Climate Sumary, Afton 6NE*, 290125. Available at: http://www.wrcc.dri.edu/cgibin/cliMAIN.pl?nm0125. Accessed Aug. 6, 2010.

WRCC, 2010b, *Monthly Climate Sumary, Las Cruces, 294799*. Available at http://www.wrcc.dri.edu/cgibin/cliMAIN.pl?nm4799. Accessed Aug. 6, 2010.

WRCC, 2010c, *Average Pan Evaporation Data by State.* Available at http://www.wrcc.dri.edu/htmlfiles/westevap.final.html. Accessed Jan. 19, 2010.

WRCC, 2010d, *Western U.S. Climate Historical Summaries*. Available at http://www.wrcc.dri.edu/Climsum.html. Accessed Aug. 13, 2010.

WSMR (White Sands Missile Range), 1998, *Final White Sands Missile Range Range-wide Environmental Impact Statement*, White Sands Missile Range, N.M., Jan.

WSMR, 2009, *Draft Environmental Impact Statement for Development and Implementation of Range-Wide Mission and Major Capabilities at White Sands Missile Range, New Mexico*, Feb. Available at http://aec.army.mil/usaec/nepa/wsmrdeis_feb09.pdf. Accessed Aug. 17, 2010.