

RECOMMENDED ADDITIONAL DATA COLLECTION AMARGOSA VALLEY SOLAR ENERGY ZONE

Introduction

The Solar PEIS provides in-depth data collection and environmental analysis for solar energy zones (SEZs). The primary purpose of this rigorous analysis is to provide documentation from which the BLM can tier future project authorizations, thereby limiting the required scope and effort of project-specific NEPA analyses in these priority areas. As part of the Solar Energy Program, the BLM committed to collecting additional SEZ-specific data and conducting additional analysis in order to more effectively facilitate future development in SEZs. In the Supplement to the Draft Solar PEIS (BLM and DOE 2011), the BLM presented an action plan for each SEZ; that action plan, with appropriate updates, was used as the basis for recommended additional data collection for the Amargosa Valley SEZ presented below. Action plans described useful additional data for individual SEZs and proposed data sources and methods for collecting that additional data. Additional data and analyses for SEZs will be publicly released through the Solar Energy Program Implementation Web Site (<http://blmsolar.anl.gov>) as they become available.

The Amargosa Valley SEZ has a total area of 8,479 acres (34.3 km²). It is located in Nye County in southern Nevada near the California border. The towns of Beatty and Amargosa Valley are located about 11 mi (18 km) north of, and 12 mi (20 km) southeast of the SEZ, respectively.

Recommended Additional Data Collection for the Amargosa Valley SEZ

Military and Civilian Aviation

The BLM should continue to consult with the U.S. Department of Defense regarding potential issues with military training routes.

Minerals

Additional information to inform the Department of the Interior's decision on a proposed 20-year withdrawal of SEZ lands has been provided through six Mineral Reports addressing each SEZ (one report for each state in the study area). The Mineral Report for Nevada addresses the status of minerals within the Amargosa Valley SEZ (BLM 2012).

Water Resources

The Final Solar PEIS provided a planning-level water resources inventory of the Amargosa Valley basin, an assessment of ephemeral stream reaches sensitive to land disturbance, and a simplified one-dimensional groundwater modeling analysis of potential groundwater withdrawal impacts associated with solar development. The following additional

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data and actions would help further characterize potential impacts on water resources for the Amargosa Valley SEZ. A more detailed discussion of these activities is included in the water resources action plan for the SEZs (Attachment A).

- Identify additional ephemeral stream channels for non-development areas through consultation with the Nevada BLM, Nevada Division of Water Resources (NDWR), U.S. Environmental Protection Agency, and U.S. Army Corps of Engineers (USACE) with a focus on:
 - Unnamed ephemeral streams flowing northwest to southeast across SEZ
 - Tributary channels of Amargosa River within the SEZ
- Conduct a field survey to:
 - Survey ephemeral stream channels and tributary channels of the Amargosa River for surface elevations, high water marks, and sediment conditions.
- Coordinate with the USACE (Sacramento District) regarding jurisdictional water determinations for the SEZ. Water features to be considered include:
 - Channels feeding into the Amargosa River
- Monitoring and adaptive management for the SEZ should include the formation of a stakeholder committee to conduct long-term monitoring of water resources. This activity would entail:
 - Identifying key stakeholder agencies,
 - Discussing general features of a monitoring program, and
 - Working with U.S. Geological Survey (USGS) to develop groundwater monitoring well design and numerical groundwater models.
- Perform groundwater modeling analyses for the Amargosa Valley in the region of the SEZ to estimate potential impacts of full build-out groundwater pumping scenarios (according to estimated, technology-specific water requirements). Tasks include:
 - Coordinate with USGS-NV regarding modeling analyses and use of (Death Valley Regional Flow System (DVRFS) model, and
 - Address potential impacts on groundwater relevant to Ash Meadows National Wildlife Reserve and Devil's Hole.
(Note: This work is being conducted as a part of follow-on analyses for the Solar PEIS.)

Ecological Resources

Vegetation and Plant Communities. The following additional data-gathering actions would help further characterize potential impacts on vegetation and plant communities for the Amargosa Valley SEZ:

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- Identify and map the location and areal extent of desert dry washes and playa habitats within the SEZ. Identify and map the location and areal extent of these habitats, as well as wetland, riparian, greasewood flat, desert chenopod scrub, and mesquite bosque habitats, and Amargosa River shrub communities, outside the SEZ that may be affected by hydrologic changes, including groundwater elevations, and changes in water, sediment, and contaminant inputs associated with runoff. Such efforts could help determine habitat characteristics, including water source, hydrologic regime, and dominant plant species.
- Identify and map the location of cactus species within the SEZ.

Wildlife. The following additional data-gathering actions would help further characterize potential impacts on wildlife resources for the SEZ:

- Conduct pre-disturbance surveys within the SEZ to determine the use of the SEZ as movement/migratory corridor or as important habitat for the mule deer.
- Identify and map the location, areal extent, and wildlife use of intermittent stream habitat (Amargosa River) within the SEZ. These areas provide important habitat for a number of wildlife species.

Aquatic Biota. Investigations recommended under the water resources action plan would be useful in characterizing and protecting habitat available to aquatic biota. The Amargosa River floodplain likely contains aquatic biota and has been identified a non-development area. Therefore, a preliminary evaluation of that area is not necessary. However, if it is determined that the Amargosa River or its floodplain could be affected indirectly by water withdrawals, changes in drainage patterns, and construction activities, the potential for aquatic communities to be affected in these areas would require further investigation prior to development.

Special Status Species. The following additional data-gathering actions would be useful in further characterizing and protecting habitat available to special status species:

- Conduct pre-disturbance surveys within the SEZ to determine the presence and abundance of those special status species that are (1) federally listed, proposed for listing, candidates for listing, or under review for listing under the Endangered Species Act; or (2) protected by the State of Nevada; or (3) designated as sensitive by the Nevada BLM State Office. These species are listed in Table 1. Surveys should focus on areas identified as potentially suitable, and the suitability of these habitats to support these special status species should be determined in the field. All field-determined suitable

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TABLE 1 Special Status Species That May Occur on the Amargosa Valley SEZ^a

Common Name	Scientific Name	Listing Status ^b	Habitat ^c
Plants			
Death Valley beardtongue	<i>Penstemon fruticiformis</i> ssp. <i>amargosae</i>	BLM-S	Known only from the Death Valley region of California and southern Nevada. It inhabits Mojave desert scrub communities at elevations between 2,800 and 4,600 ft. ^d Nearest recorded occurrence is approximately 13 mi ^e east of the SEZ. About 2,424,000 acres ^f of potentially suitable habitat occurs within the SEZ region.
Holmgren lupine	<i>Lupinus holmgrenianus</i>	BLM-S	Known only from the Death Valley region of California and southern Nevada. It inhabits dry desert slopes, washes, and valleys on volcanic substrates, sometimes in association with pinyon-juniper woodlands. The species occurs at elevations between 4,600 and 8,200 ft. Nearest recorded occurrence is from the Death Valley NP, approximately 15 mi northwest of the SEZ. About 132,350 acres of potentially suitable habitat occurs within the SEZ region.
White-margined beardtongue	<i>Penstemon albomarginatus</i>	BLM-S	Inhabits desert sand dune habitats and Mojave desert scrub communities at elevations below 3,600 ft. Nearest recorded occurrence is approximately 17 mi east of the SEZ. About 2,464,200 acres of potentially suitable habitat occurs within the SEZ region.
Amphibians			
Amargosa toad	<i>Bufo nelsoni</i>	ESA-UR; BLM-S; NV-P	Endemic to the Amargosa Valley in Nye County, Nevada, where it is confined to isolated riparian and spring-fed habitats along the Amargosa River. Usually observed near water at the outflow of warm springs. Nearest recorded occurrence is approximately 8 mi north of the SEZ in the vicinity of Beatty, Nevada. About 24,600 acres of potentially suitable habitat occurs within the SEZ region.
Reptiles			
Desert tortoise ^g	<i>Gopherus agassizii</i>	ESA-T; NV-P	Desert creosotebush communities on firm soils for digging burrows. Often found along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Known to occur on the SEZ. About 2,717,800 acres of potentially suitable habitat occurs within the SEZ region.
Birds			
Crissal thrasher	<i>Toxostoma crissale</i>	BLM-S	A local and uncommon resident in southern Nevada outside of the Colorado River Valley. Occupies dense thickets of shrubs or low trees in riparian habitats. About 4,000 acres of potentially suitable habitat occurs within the SEZ region.

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TABLE 1 (Cont.)

Common Name	Scientific Name	Listing Status ^b	Habitat ^c
Ferruginous hawk	<i>Buteo regalis</i>	BLM-S	Winter resident in the SEZ region. Forages in grasslands, shrublands, agricultural lands, and the periphery of pinyon-juniper forests. Known to occur in Nye County, Nevada. About 1,239,000 acres of potentially suitable habitat occurs within the SEZ region.
Golden eagle	<i>Aquila chrysaetos</i>	BLM-S	An uncommon to common permanent resident and migrant in southern Nevada. Habitat includes rolling foothills, mountain areas, and desert shrublands. Nests on cliff faces and in large trees in open areas. About 2,800,000 acres of potentially suitable habitat occurs within the SEZ region.
Gray vireo	<i>Vireo vicinior</i>	BLM-S	An uncommon summer resident in arid environments such as pinyonjuniper, chaparral, and desert shrublands. Builds open-cup nests of plant material in forked branches of shrubs or small trees. About 3,600,000 acres of potentially suitable habitat occurs within the SEZ region.
Le Conte's thrasher	<i>Toxostoma lecontei</i>	BLM-S	An uncommon to rare local resident in southwestern deserts. Occurs primarily in open desert wash, desertscrub, alkali desertscrub, and desert succulent scrub habitats. Nests in dense, spiny shrubs or densely branched cactus in desert wash habitat. About 1,500,000 acres of potentially suitable habitat occurs within the SEZ region.
Loggerhead shrike	<i>Lanius ludovicianus</i>	BLM-S	A common winter resident in lowlands and foothills in southern Nevada. Prefers open habitats with shrubs, trees, utility lines, or other perches. Highest density occurs in open-canopied foothill forests. About 2,270,000 acres of potentially suitable habitat occurs within the SEZ region.
Long-eared owl	<i>Asio otus</i>	BLM-S	An uncommon yearlong resident in southern Nevada. Occurs in desert shrubland environments in proximity to riparian areas such as desert washes. Nests in trees using old nests from other birds or squirrels. About 2,500,000 acres of potentially suitable habitat occurs within the SEZ region.
Lucy's warbler	<i>Vermivora luciae</i>	BLM-S	An uncommon summer resident and breeder in desert riparian areas. Occurs in desert wash habitats, especially those dominated by mesquite and saltcedar. Nests in tiny cavities in riparian woodlands. About 4,500 acres of potentially suitable habitat occurs within the SEZ region.
Phainopepla	<i>Phainopepla nitens</i>	BLM-S; NV-P	Desert scrub, mesquite, and pinyon-juniper woodland communities. Also occurs in desert riparian areas and orchards. Nests in trees or shrubs in riparian habitats from 3 to 45 ft above the ground. About 1,369,100 acres of potentially suitable habitat occurs within the SEZ region.
Prairie falcon	<i>Falco mexicanus</i>	BLM-S	Year-round resident in the SEZ region, primarily in open habitats in mountainous areas, steppe, grasslands, or cultivated areas. Typically nests in well-sheltered ledges of rocky cliffs and outcrops. About 2,338,500 acres of potentially suitable habitat occurs within the SEZ region.

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TABLE 1 (Cont.)

Common Name	Scientific Name	Listing Status ^b	Habitat ^c
Birds (Cont.)			
Western burrowing owl	<i>Athene cunicularia hypugaea</i>	BLM-S	Open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports. Nests in burrows constructed by mammals (prairie dog, badger, etc.). About 4,559,600 acres of potentially suitable habitat occurs within the SEZ region.
Mammals			
Big brown bat	<i>Eptesicus fuscus</i>	BLM-S	Occurs throughout the southwestern United States in various habitat types. Uncommon in hot desert environments but may occur in areas in close proximity to water sources such as lakes and washes. Roosts in buildings, caves, mines, and trees. About 1,500,000 acres of potentially suitable habitat occurs within the SEZ region.
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>	BLM-S	A fairly common year-round resident in southern Nevada. Occurs in a variety of habitats, including woodlands, shrublands, and grasslands. Roosts in caves, crevices, and buildings. About 1,800,000 acres of potentially suitable habitat occurs within the SEZ region.
California myotis	<i>Myotis californicus</i>	BLM-S	A common year-round resident in southern Nevada. Occurs in a variety of habitats, including desert, chaparral, woodlands, and forests. Roosts primarily in crevices, but will also use buildings, mines, and hollow trees. About 2,000,000 acres of potentially suitable habitat occurs within the SEZ region.
Fringed myotis	<i>Myotis thysanodes</i>	BLM-S; NV-P	Year-round resident in the SEZ region in a wide range of habitats including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roosts in buildings and caves. Nearest recorded occurrence is from the DOE Nevada Test Site, approximately 13 mi east of the SEZ. About 3,348,000 acres of potentially suitable habitat occurs within the SEZ region.
Hoary bat	<i>Lasiurus cinereus</i>	BLM-S	The most widespread North American bat species, occurs throughout southern Nevada in various habitat types. Occurs in habitats such as woodlands, foothills, desert shrublands, and chaparral. Roosts primarily in trees. About 1,800,000 acres of potentially suitable habitat occurs within the SEZ region.
Long-legged myotis	<i>Myotis volans</i>	BLM-S	Common to uncommon year-round resident in southern Nevada. Uncommon in desert and arid grassland environments. Most common in woodlands above 4,000 ft elevation. Forages in chaparral, scrub, woodlands, and desert shrublands. Roosts in trees, caves, and crevices. About 1,800,000 acres of potentially suitable habitat occurs within the SEZ region.

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TABLE 1 (Cont.)

Common Name	Scientific Name	Listing Status ^b	Habitat ^c
Mammals (Cont.)			
Pallid bat	<i>Antrozous pallidus</i>	BLM-S; NV-P	Year-round resident in the SEZ region in low-elevation desert communities, including grasslands, shrublands, and woodlands. Roosts in caves, crevices, and mines. Nearest recorded occurrence is from the DOE Nevada Test Site, approximately 13 mi east of the SEZ. About 3,500,600 acres of potentially suitable habitat occurs within the SEZ region.
Silver-haired bat	<i>Lasionycteris noctivagans</i>	BLM-S	Uncommon year-round resident in desert habitats of southern Nevada. Forages in coniferous forests, foothill woodlands, and montane riparian habitats. May also forage in desert shrublands. Primarily roosts in hollow trees. About 1,400,000 acres of potentially suitable habitat occurs within the SEZ region.
Spotted bat	<i>Euderma maculatum</i>	BLM-S; NV-P	Year-round resident in the SEZ region near forests and shrubland habitats throughout the SEZ region. Roosts and hibernates in caves and rock crevices. About 2,955,200 acres of potentially suitable habitat occurs within the SEZ region.
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	BLM-S; NV-P	Year-round resident in the SEZ region in all but subalpine and alpine habitats, and may be found at any season throughout its range. Roosts in caves, mines, tunnels, buildings, or other man-made structures. Nearest recorded occurrence is approximately 12 mi north of the SEZ. About 3,739,000 acres of potentially suitable habitat occurs within the SEZ region.
Western pipistrelle	<i>Pipistrellus Hesperus</i>	BLM-S	A common year-round resident of deserts, grasslands, and woodlands in southern Nevada. Occurs in various habitats, including mountain foothill woodlands, desert shrublands, desert washes, and pinyon-juniper woodlands. Roosts primarily in rock crevices; occasionally in mines and caves. About 2,500,000 acres of potentially suitable habitat occurs within the SEZ region.
Western small-footed myotis	<i>Myotis ciliolabrum</i>	BLM-S	Year-round resident in the SEZ region in a variety of woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Nearest recorded occurrence is from the DOE Nevada Test Site, approximately 13 mi east of the SEZ. About 4,194,700 acres of potentially suitable habitat occurs within the SEZ region.

^a The listings for (1) federally listed, proposed for listing, or candidates for listing under the ESA, and (2) Nevada BLM State Office sensitive species have been updated since the release of the Draft Solar PEIS.

^b BLM-S = listed as a sensitive species by the BLM; ESA-T = listed as threatened under the ESA; ESA-UR = under review for listing under the ESA; NV-P = protected by the State of Nevada.

Footnotes continued on next page

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Table 1 (Cont.)

^c For plant species, potentially suitable habitat was determined by using Southwest Regional Gap Analysis (SWReGAP) land cover types (USGS 2005). For terrestrial vertebrate species, potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

Footnotes (continued):

- ^d To convert ft to m, multiply by 0.3048.
- ^e To convert mi to km, multiply by 1.609.
- ^f To convert acres to km², multiply by 0.004047.
- ^g Species in bold text have been recorded or have designated critical habitat in the affected area.

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habitats for special status species should be mapped. Target species and survey protocols should be developed in coordination with the USFWS and NDOW.

- The Draft Solar PEIS presents a table of special status species for which potential impacts need to be evaluated prior to development in the Amargosa SEZ. The list of species presented in Table 11.1.12.1-1 of the Draft Solar PEIS also includes species listed by the State of Nevada and species ranked by the States of California or Nevada as S1 or S2, or species of concern by the states of California or Nevada. No additional special status species were identified as potentially present in the SEZ in the Final Solar PEIS. On the basis of the design features presented in the Final Solar PEIS, the potential for impacts on these additional species will also need to be addressed before development could occur in the SEZ.
- Identify and map the location and areal extent of desert wash or riparian habitats within the SEZ. The suitability of these habitats for special status species should be determined. Species potentially associated with these habitats include the Holmgren lupine, Amargosa toad, phainopepla, and western small-footed myotis.
- Identify and map the location and areal extent of woodland habitats within the SEZ. The suitability of these habitats for special status species should be determined. Species potentially associated with these habitats include the ferruginous hawk, phainopepla, fringed myotis, pallid bat, spotted bat, and western small-footed myotis.

Visual Resources

A summary of the Final Solar PEIS visual contrast analysis for the Amargosa Valley SEZ is provided in Table 2. This table includes only the sensitive visual resource areas (SVRAs) and sensitive viewing locations (SVLs) that would be subject to moderate or strong visual contrast from solar energy development in the Amargosa Valley SEZ, which are the following:

- Big Dune Special Recreation Management Area (SRMA)
- California Desert National Conservation Area
- Death Valley National Park (NP)
- Death Valley Wilderness Area (WA)

In addition, the following other lands and resource areas would be subject to moderate or strong visual contrasts from solar development:

- State Route 374

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- U.S. 95

The following steps could be taken to better understand potential impacts on these areas from solar development in the Amargosa Valley SEZ:

- Identify key observation points (KOPs) within these areas through working with the management agency or other local stakeholders.
- Conduct viewshed analyses from the KOPs to determine how much of the SEZ would be in view from each KOP.
- As deemed necessary, based on viewshed analysis results, prepare wireframe Google Earth™ visualizations of hypothetical solar facilities in the SEZ depicting the 80% development scenario to better estimate potential impacts.

This additional analysis may help judge potential visual contrast more accurately for most KOPs. For KOPs of particularly high sensitivity, a site visit with photography and superimposition of the wireframe models onto the photos might be required or desired.

TABLE 2 Summary of Potential Visual Impacts on SVRAs and SVLs within the 25-mi (40 km) Viewshed of the Amargosa Valley SEZ^a

Feature Type	Feature Name/ Linear Distance (Total Acreage ^b)	Feature Area or Linear Distance ^c		
		Visible within 5 mi	Visible Between	
			5 and 15 mi	15 and 25 mi
National Park	Death Valley (3,397,062 acres)	0 acres (0%)	58,953 acres (2%)	29,504 acres (1%)
Was	Death Valley (3,074,256 acres)	0 acres (0%)	40,892 acres (1%)	13,900 acres (0%)
SRMA	Big Dune (11,572 acres)	10,230 acres (88%)	858 acres (7%)	0 acres (0%)
National Conservation Area	California Desert (25,919,319 acres)	0 acres (0%)	44,903 acres (0%)	31,191 acres (0%)

^a As revised for the Final Solar PEIS, assuming a target height of 650 ft (198.1 m).

^b To convert acres to km², multiply by 0.004047.

^c Percentage of total feature acreage or road length viewable.

Paleontological Resources

The BLM Regional Paleontologist may have additional information regarding Potential Fossil Yield Classification (PFYC) identifications in Nevada. A preliminary paleontological survey could be conducted to determine the PFYC of the SEZ, in order to update the temporary assignment of PFYC Class 2 used in the Draft Solar PEIS. The determination of PFYC Class 2 was based on preliminary field findings during a brief 2010 visit and comparable project area findings nearby.

Cultural Resources and Native American Concerns

A Class II sample survey was conducted by SWCA Environmental Consultants (SWCA 2013) on 438 acres, or approximately 5% of the SEZ. A summary of the results of the survey are available on the Amargosa Valley SEZ page of the BLM Solar Energy Program Implementation Web site (<http://blmsolar.anl.gov/sez/nv/amargosavalley/>). A cultural sensitivity map was also prepared as part of the sample survey effort and is presented with the survey summary.

The following additional data collection efforts could reduce the uncertainty about potential impacts on cultural resources:

- Conduct a Class I literature file search to better understand (1) the site distribution pattern in the vicinity of the SEZ, (2) potential trail networks through existing ethnographic reports, and (3) overall cultural sensitivity of the landscape. Continue with government-to-government consultation, including follow-up to recent ethnographic studies with Tribes not included in the original studies to determine whether those Tribes have similar concerns. The Amargosa Valley SEZ falls in the traditional use area of primarily the Western Shoshone and the Southern Paiute, but also of the Owens Valley Paiute. Potential topics presented in the Draft Solar PEIS and/or in an ethnographic study with the Timbisha Shoshone and the Pahrump Paiute to be discussed during consultation include Fortymile Canyon, Bare Mountain, Eagle Mountain, Big Dune, Amargosa River, Ash Meadows, Salt Song and Southern Fox Trails; rock art sites; clay, salt, and pigment sources; water resources; and plant and animal resources. The completed ethnographic study (SWCA and University of Arizona 2011) is available on the Amargosa Valley SEZ page of the BLM Solar Energy Program Implementation Web site (<http://blmsolar.anl.gov/sez/nv/amargosavalley/>).

References

BLM and DOE, 2011, *Supplement to the Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States*, DES 11-49, DOE/EIS-0403D-S, Oct.

BLM, 2012, *Assessment of the Mineral Potential of Public Lands Located within Proposed Solar Energy Zones in Nevada*, prepared by Argonne National Laboratory, Argonne, Ill., July. Available at <http://solareis.anl.gov/documents/index.cfm>.

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SWCA and University of Arizona (SWCA Environmental Consultants and Bureau of Applied Research in Anthropology), 2011, *Ethnographic and Class I Records Searches for Proposed Solar Energy Zones in California, Nevada, and Utah for the Bureau of Land Management's Solar Programmatic Environmental Impact Statement*, prepared by SWCA Environmental Consultants, Albuquerque, N.M., and Bureau of Applied Research in Anthropology, University of Arizona, Tucson, Ariz., Dec.

SWCA Environmental Consultants, 2013, *Class II Cultural Resources Inventory of the Amargosa Valley, Dry Lake Valley North, Gold Point, and Millers Solar Energy Zones, Nye, Lincoln, and Esmeralda Counties, Nevada*, prepared for the Bureau of Land Management, January.

ATTACHMENT A: WATER RESOURCES ACTION PLAN

As part of the Solar Energy Program, the BLM committed to collecting additional SEZ-specific data and conducting additional analysis in order to more effectively facilitate future development in SEZs. In the Supplement to the Draft Solar PEIS (BLM and DOE 2011), the BLM presented a water resources action plan applicable for each SEZ; that action plan is presented below with appropriate updates. Additional data and analyses obtained on the basis of recommendations in this water resources action plan will be publicly released through the Solar Energy Program Implementation Web Site (<http://blmsolar.anl.gov>) as they become available.

The main action plan items relating to water resources applicable for all SEZs were discussed in the water resources action plan presented in the Supplement to the Draft Solar PEIS. The following sections explain each action plan item, identify items that were completed as part of the Final Solar PEIS, and provide some additional consideration for consultation with other federal, state, and local agencies and feasible timelines for the additional work.

1 Planning-Level Inventory of Water Resources

The Draft Solar PEIS summarized surface water and groundwater resources for individual SEZs at the programmatic level, but a more in depth or planning-level inventory was needed to provide a common resource for developers of individual SEZs. The following planning-level inventory data was provided in the Final Solar PEIS for all of the SEZs (sources in parentheses):

- Maps of basin valley and surrounding mountain ranges
 - All canals and perennial, intermittent, ephemeral streams (U.S. Geological Survey [USGS] National Hydrography Dataset [NHD])
 - HUC8 (8-digit, 4th-level hydrologic unit code) watersheds (USGS NHD)
 - Groundwater wells (USGS National Water Information System [NWIS] and Water Science Centers, National Resources Conservation Service [NRCS])
 - Springs (USGS NWIS)
 - Groundwater basin(s) (state water agency)
 - Wetlands (USFWS National Wetlands Inventory [NWI] or state agency)
 - Playas and dry lakes (USGS NHD or state agency)
 - Meteorological station locations (USGS NWIS, Western Regional Climate Center [WRCC], state agency climate stations, e.g., California Irrigation Management Information System [CIMIS] in California)
- Tabular information
 - Canals and perennial and intermittent streams (USGS NHD)
 - Total length of ephemeral stream channels (USGS NHD)
 - Total length of stream channels by stream order (USGS NHD)
 - Annual, seasonal, peak discharge values (USGS NWIS and Water Science Centers)
 - HUC8 watershed areas (USGS NHD)

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- Groundwater basins—area, generic properties (state water agency, PEIS, USGS NWIS and Water Science Centers, NRCS)
- Wetlands—areas, types (USFWS NWI or state agency)
- Springs—names, elevations, flows (USGS NWIS or state agency)
- Climate—precipitation, snowfall, evapotranspiration (USGS NWIS, WRCC, state agencies)

The following planning-level inventory data were not provided in the Final Solar PEIS, but would be useful to assemble prior to solar development in any SEZ:

- Google Earth™/geographic information system (GIS) data files, providing links to datasets (USGS NWIS)
 - Stream gages—flows and water quality
 - Groundwater wells—depth to groundwater and water quality
 - Meteorological stations—temperatures, precipitation, snowfall, etc.

2 Floodplain Determinations

In May 27, 1977, the President signed Executive Order 11988 “Floodplain Management,” which states that federal agencies should avoid surface disturbance activities within identified 100-year floodplains (*Federal Register*, Volume 42, page 117, May 27, 1977). Only a few SEZs (Afton, Dry Lake, Imperial East, and Gillespie) have prior floodplain analyses available to map exclusion floodplain areas. Identifying 100-year floodplain areas must be performed in order to define non-development areas within SEZs. Given the episodic and sometimes catastrophic nature of rainfall-runoff events in the desert southwest, floodplain analyses could extend beyond the 100-year floodplain to regions susceptible to extreme flooding events (e.g. alluvial fans, high gradient areas).

Except for the SEZs listed above, floodplain determinations had not been completed at the time of publication of the Final Solar PEIS and are still needed. Floodplain determinations require field surveys, consultations with the Federal Emergency Management Agency (FEMA) and state/local flood control agencies, and hydrologic analyses. The primary steps to identifying floodplain areas include the following:

- Identifying of main surface drainage pathways within and adjacent to SEZs
- Consulting with FEMA and state/local flood control agencies regarding floodplain mapping protocols
- Conducting field surveys
 - Channel geometries
 - High-water-mark indicator maps
 - Ground-truthing NHD channel networks
- Performing hydrologic analyses
 - Analysis of flood frequency
 - Hydraulic modeling of runoff routing

- Determination of inundation areas
- Obtaining approvals (BLM-coordinated)
 - FEMA/agency for floodplains

3 Jurisdictional Waters Determinations

Section 404 of the Clean Water Act (CWA) requires a permitting process for dredging and filling activities affecting “jurisdictional waters” of the United States. The U.S. Army Corps of Engineers (USACE) and EPA oversee the permitting process and make determinations on what constitutes jurisdictional water on a case-by-case basis. Jurisdictional water determinations can be made by using a variety of techniques, including topographic maps and aerial photographs, field surveys, and hydrologic analyses. The appropriate method for jurisdictional water determinations must be coordinated with the appropriate offices of the USACE and EPA. If field surveys are required, coordination with field surveys for floodplain determinations should be made. Jurisdictional water determinations for the SEZs had not been completed at the time of publication of the Final Solar PEIS and are still needed. Jurisdictional water determinations will not define non-development areas within SEZs but will determine where CWA Section 404 permitting will be required.

4 Significant Ephemeral Waters Determinations

In addition to floodplains and jurisdictional waters, several commenters and cooperators on the Draft Solar PEIS had concerns regarding the loss of ephemeral stream networks because of their importance to hydrology, geomorphology, and habitat. The Draft Solar PEIS identified significant washes to be excluded from development that showed physical evidence of conveying substantial flood flows (these areas will likely overlap with 100-year floodplain mapping). The Final Solar PEIS identified sensitive stream reaches for each SEZ on the basis of available geospatial datasets and professional judgment. Further analyses should be performed to identify dense ephemeral stream networks that overlap with critical habitat, provide significant groundwater connectivity, or constitute critical geomorphic features necessary for maintaining connected features (e.g., dunes, eolian transport corridors, and active alluvial fans). These additional analyses should use high-resolution imagery to identify stream reaches not accounted for in FPEIS analysis, as well as include consultation with local BLM offices, cooperating federal agencies, and state agencies regarding critical ephemeral stream networks for habitat, hydrologic, and geomorphic value.

5 Monitoring and Adaptive Management Programs

Careful siting and planning of solar facilities can reduce adverse impacts on surface water and groundwater resources, but there are many unknowns regarding both surface water and groundwater processes. Establishing a robust monitoring program and analysis tools for SEZs would gain important information on whether surface water or groundwater resources are being affected by solar facilities. Monitoring programs would need to incorporate stakeholder involvement including appropriate federal/state/local agencies (e.g., local BLM offices, USGS Water Science Centers, USFWS, National Park Service [NPS], state water resources agencies)

that conduct water resources monitoring. The Final Solar PEIS recommended a process and methods and tools for developing SEZ monitoring programs for water resources. The process should include identifying a stakeholder monitoring committee including agencies involved with water rights and resources. The committee should oversee the development and implementation of a monitoring program. The basic components of surface water and groundwater monitoring programs should include recommended monitoring parameters, measuring frequency, a plan for stakeholder involvement. The monitoring program could also include new or modified design features for the SEZ, such as a requirement to have water flow meters on groundwater pumps to accurately measure extractions (to be used in groundwater models and analyses to support long, term monitoring programs).

6 Groundwater Analyses

Utility-scale solar energy facilities have the potential to affect groundwater. For the Final Solar PEIS, an analysis of potential groundwater impacts for each SEZ was done quantitatively using a simple one-dimensional groundwater modeling approach (BLM and DOE 2012, Appendix O) and qualitatively by summarizing available information relative to groundwater processes and comparing that information to estimates of potential groundwater extractions for the four main solar energy technologies evaluated. The level of groundwater analysis needed for each SEZ will vary depending on the proposed level of water use (e.g., less detailed analyses may be needed for photovoltaic [PV] facilities than for higher water use facilities such as parabolic trough).

Seven SEZs were identified in the Final PEIS that would benefit from a more quantitative analysis: Afton, Amargosa Valley, Brenda, Dry Lake, Dry Lake Valley North, Imperial East, and Riverside East. At these seven SEZs, numerical groundwater models are being used to better address two major concerns: potential drawdown impacts on surface water features (e.g., loss of springs, change in river discharge) and drawdown impacts on other groundwater users and groundwater processes. Where there are existing groundwater models, the following will be added:

- Groundwater model refinements for SEZ analysis, and
- Analyses of full build-out pumping scenarios.

Where there are not existing groundwater models, the following will be provided:

- Simplified, superposition-based, groundwater modeling; and
- Analyses of full build-out pumping scenarios.

The groundwater models and reports for these SEZ will be released through the SEZ pages of the Solar Energy Program Implementation Web Site (<http://blmsolar.anl.gov/sez>) as they become available.