RECOMMENDED ADDITIONAL DATA COLLECTION
MILLERS 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 Millers 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 Millers SEZ has a total area of 16,534 acres (66.9 km^2). It is located in Esmeralda County in southern Nevada (Figure C.4.5-1). The nearest town is Tonopah, Nevada, about 15 mi (24 km) west in Nye County, with a population of approximately 1,500.

Recommended Additional Data Collection for the Millers SEZ

Military and Civilian Aviation

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

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 Millers SEZ (BLM 2012).

Water Resources

The Final Solar PEIS provided a planning-level water resources inventory of the Tonopah Flat portion of the Big Smoky Valley, 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 data and actions would help further characterize potential impacts on water resources for the

Millers SEZ. A more detailed discussion of each of these activities is included in the water resources action plan for the SEZs (Attachment A).

- Identify additional ephemeral stream channels and alluvial fan features for non-development areas through consultation with BLM Nevada, Nevada Division of Water Resources (NDWR), U.S. Environmental Protection Agency, and U.S. Army Corps of Engineers (USACE) with a focus on:
  - Tributaries to Ione Wash,
  - Alluvial fan base features located adjacent to Ione Wash, and
  - Ephemeral stream channels located along the eastern edge of the SEZ (e.g., tributaries of Peavine Creek, an intermittent stream just east of the SEZ).

- Perform field surveys and hydrologic analyses to support jurisdictional water determinations and floodplain identifications. Tasks include:
  - Surveying Ione Wash (and adjacent alluvial fan base), Peavine Creek, and tributaries of these streams for surface elevations, high water marks, sediment conditions; and
  - Conducting hydrologic rainfall-runoff-routing analyses to identify 100-year floodplain areas.

- Coordinate with the USACE (Sacramento District) regarding jurisdictional water determinations for the SEZ. Water features to be considered include:
  - Ione Wash, and
  - Peavine Creek (portion adjacent to the SEZ and tributaries within the SEZ).

- Identify 100-year floodplain non-development areas (if they exist) for Ione Wash and Peavine Creek (channel is outside of the SEZ, but its potential floodplain may be inside the SEZ). This task would require coordination with the Federal Emergency Management Agency and the following agencies:
  - NDWR (Floodplain Management Program), and
  - Esmeralda County.

- 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 the U.S. Geological Survey to develop groundwater monitoring well design and numerical groundwater models.

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 Millers SEZ:

- Identify and map the location and areal extent of desert dry wash, greasewood flat, wetland, and playa habitats, and Ione Wash shrub communities within the SEZ. Identify and map the location and areal extent of these habitats 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.

- Survey for candelaria blazing star, a plant species on the NNHP watch list during a period when it is flowering and easily documented. If individuals are located, individuals or populations could be avoided through fencing and flagging of the area, including an appropriate buffer area.

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 a movement/migratory corridor or as important habitat for the mule deer.

- Identify and map the location and areal extent of wash and playa habitats within the SEZ. These areas are important habitat for a number of wildlife species.

Aquatic Biota. Investigations recommended under the water resources action plan would be useful in characterizing the habitat available to aquatic biota. Most washes and dry lakes in the Millers SEZ are typically dry and contain water only for brief periods following precipitation. They may or may not contain aquatic biota; therefore, preliminary evaluations of these surface water features could be conducted to determine the potential for aquatic communities to be present. Any aquatic biota found in these features would likely be desiccation adapted aquatic invertebrates typical of the region. The primary value of these features may be to nonaquatic animals that consume aquatic biota within the SEZ.

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, or candidates for listing under the Endangered Species Act (ESA); (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 habitats for special status species should be mapped. Target species and survey protocols should be developed in coordination with the U.S. Fish and Wildlife Service 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 Millers SEZ. The list of species presented in Table 11.7.12.1-1 of the Draft Solar PEIS also includes species listed by the State of Nevada and species ranked by the State of Nevada as S1 or S2 or species of concern. 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 ephemeral wetland habitats, including desert wash and playa habitats within the SEZ, including habitat characteristics (such as water source, hydrologic regime, and dominant plant species), both within the wetland boundaries and in adjacent non-wetland habitats. A species potentially associated with these habitats includes the Eastwood milkweed.

TABLE 1 Special Status Species That May Occur on the Millers SEZ[a]

Common Name	Scientific Name	Listing Status[b]	Habitat[c]
Plants			
Eastwood milkweed	*Asclepias eastwoodiana*	BLM-S	Endemic to Nevada from public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, or shale outcrops, generally barren and lacking competition. Frequently in small washes or other moisture-accumulating microsites at elevations between 4,700 and 7,100 ft.[d] Nearest recorded occurrence is 12 mi[e] southeast of the SEZ. About 379,398 acres[f] of potentially suitable habitat occurs within the SEZ region.
Nevada dune beardtongue	*Penstemon arenarius*	BLM-S	Endemic to western Nevada on sand dunes or deep sand occurring on deep, loose, sandy soils of valley bottoms, aeolian deposits, and dune skirts, often in alkaline areas, sometimes on road banks and other recovering disturbances crossing such soils in shadscale communities. Nearest recorded occurrence is along Peavine Creek, approximately 17 mi northeast of the SEZ. About 97,638 acres of potentially suitable habitat occurs within the SEZ region.
Sanicle biscuitroot	*Cymopterus ripleyi* var. *saniculoides*	BLM-S	Endemic to Nevada on loose, sandy to gravelly, often somewhat alkaline soils on volcanic tuff deposits and mixed valley alluvium within blackbrush, mixed-shrub, sagebrush, and lower pinyon-juniper communities. Elevation ranges between 3,150 and 6,700 ft. Nearest recorded occurrence is 12 mi northeast of the SEZ. About 4,039,523 acres of potentially suitable habitat occurs within the SEZ region.
Toquima milkvetch	*Astragalus toquimanus*	BLM-S	Endemic to Nevada on dry, stiff, sandy to gravelly, basic or calcareous soils along gentle slopes or flats at elevations between 6,500 and 7,500 ft. Nearest recorded occurrence is 21 mi east of the SEZ. About 1,156,759 acres of potentially suitable habitat occurs within the SEZ region.
Invertebrates			
Crescent Dunes aegialian scarab beetle	*Aegialia crescenta*	ESA-UR; BLM-S	Sand dune obligate species endemic to Nevada on the Crescent Dunes and possibly also to the San Antonio and Game Range Dunes. Nearest recorded occurrence is from the Crescent Dunes Special Recreation Management Area (SRMA), about 6 mi east of the SEZ. About 2,281 acres of potentially suitable habitat occurs within the SEZ region.
Crescent Dunes serican scarab beetle	*Serica ammomenisco*	ESA-UR; BLM-S	Sand dune obligate species endemic to Nevada on the Crescent Dunes. Nearest recorded occurrence is from the Crescent Dunes SRMA, approximately 6 mi east of the SEZ. About 2,281 acres of potentially suitable habitat occurs within the SEZ region.

TABLE 1 (Cont.)

Common Name	Scientific Name	Listing Status[b]	Habitat[c]
Birds			
Ferruginous hawk	*Buteo regalis*	BLM-S; NV-P	Year-round resident in the SEZ region. Grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodland. Nests in tall trees or on rock outcrops along cliff faces. Known to occur in Esmeralda County, Nevada. About 1,403,676 acres of potentially suitable habitat occurs within the SEZ region.
Golden eagle	*Aquila chrysaetos*	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 4,850,000 acres of potentially suitable habitat occurs within the SEZ region.
Greater sage-grouse	*Centrocercus urophasianus*	ESA-C; BLM-S	Plains, foothills, and mountain valleys dominated by sagebrush. Lek sites are located in relatively open areas surrounded by sagebrush or in areas where sagebrush density is low. Nesting usually occurs on the ground where sagebrush density is higher. Some populations may travel up to 60 mi between summer and winter habitats. Known to occur in Esmeralda County, Nevada. About 1,264,279 acres of potentially suitable habitat occurs within the SEZ region.
Loggerhead shrike	*Lanius ludovicianus*	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 4,800,000 acres of potentially suitable habitat occurs within the SEZ region.
Long-eared owl	*Asio otus*	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 4,800,000 acres of potentially suitable habitat occurs within the SEZ region.
Prairie falcon	*Falco mexicanus*	BLM-S	Year-round resident in open habitats in mountainous areas, steppe, grasslands, or cultivated areas. Nests in well-sheltered ledges of rocky cliffs and outcrops. Known to occur in Esmeralda County, Nevada. About 3,612,314 acres of potentially suitable habitat occurs within the SEZ region.
Swainson's hawk	*Buteo swainsoni*	BLM-S; NV-P	Summer breeding resident in the SEZ region. Savanna, open pine-oak woodlands, grasslands, and cultivated lands. Nests in solitary trees, bushes, or small groves. Known to occur in Esmeralda County, Nevada. About 847,596 acres of potentially suitable habitat occurs within the SEZ region.
Tecopa bird's beak	Cordylanthus tecopensis	BLM-S; FWS-SC; NV-S2	Known from Esmeralda and Nye Counties, Nevada, as well as Inyo County, California. Inhabits open, moist alkali-crusted clay soils of deep springs, seeps, and outflow drainages. About 97,000 acresi of potentially suitable habitat occurs within the SEZ region.

TABLE 1 (Cont.)

Common Name	Scientific Name	Listing Status[b]	Habitat[c]
Western burrowing owl	*Athene cunicularia hypugaea*	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.). Known to occur in Esmeralda County, Nevada. About 4,035,785 acres of potentially suitable habitat occurs within the SEZ region.
Wong's pyrg	*Pyrgulopsis wongi*	BLM-S; NV-S1	Known from Mineral County, Nevada and Inyo County, California. Occurs in aquatic habitats in the Owens River drainage and the Deep Springs, Fish Lake, and Huntoon Valleys. Nearest recorded occurrences are from Mineral County, approximately 48 mi[j] southwest of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.
Mammals			
Big brown bat	*Eptesicus fuscus*	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 3,700,000 acres of otentially suitable habitat occurs within the SEZ region.
Brazilian free-tailed bat	*Tadarida brasiliensis*	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 4,250,000 acres of potentially suitable habitat occurs within the SEZ region.
Fringed myotis	*Myotis thysanodes*	BLM-S; NV-P	Summer or year-round resident in wide range of habitats, including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roosts in buildings and caves. Known to occur in Esmeralda County, Nevada. About 4,549,929 acres of potentially suitable habitat occurs within the SEZ region.
Long-legged myotis	*Myotis volans*	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 3,700,000 acres of potentially suitable habitat occurs within the SEZ region.
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLM-S	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Uses desert lowland as corridors for travel between mountain ranges. Known to occur in Esmeralda County, Nevada. About 1,866,606 acres of potentially suitable habitat occurs within the SEZ region.

TABLE 1 (Cont.)

Common Name	Scientific Name	Listing Status[b]	Habitat[c]
Mammals (Cont.)			
Silver-haired bat	*Lasionycteris noctivagans*	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 4,150,000 acres of potentially suitable habitat occurs within the SEZ region.
Spotted bat	*Euderma maculatum*	BLM-S; NV-P	Summer or year-round resident near forests and shrubland habitats. Roosts and hibernates in caves and rock crevices. Nearest recorded occurrence is 30 mi south of the SEZ. About 3,863,972 acres of potentially suitable habitat occurs within the SEZ region.
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; NV-P	Summer or year-round resident near forests and shrubland habitats below 9,000-ft elevation. Roosts and hibernates in caves, mines, and buildings. Nearest recorded occurrence is 7 mi south of the SEZ. About 3,580,069 acres of potentially suitable habitat occurs within the SEZ region.
Western small-footed bat[g]	*Myotis ciliolabrum*	BLM-S	Summer or year-round resident in woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Nearest recorded occurrence is 4 mi north of the SEZ. About 4,949,592 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) Arizona 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-C = candidate for listing under the ESA; ESA-UR = under review for listing under the ESA; NV-P = protected in the state of Nevada under *Nevada Revised Statutes* (NRS) 501.110 (animals) or NRS 527 (plants).

[c] For plant species, potentially suitable habitat was determined by using Southwest Regional Gap Analysis Project (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.

[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 km^2, multiply by 0.004047.

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

Visual Resources

The Draft Solar PEIS visual contrast analyses for the Millers SEZ demonstrate that no federal, state, and BLM-designated sensitive visual resource areas are located within the 25-mi (40-km) viewshed of the Millers SEZ. No additional resources subject to moderate or strong visual contrasts were identified in the Final Solar PEIS.

Regarding other lands and resource areas, the Draft Solar PEIS analyses indicated that Highway U.S. 6 would be subject to moderate or strong visual contrasts from solar development. The following steps could be taken to better understand potential impacts on U.S. 6 from solar development in the Millers SEZ:

- Key observation points (KOPs) along U.S. 6 should be identified through working with the management agency or other local stakeholders.

- Viewshed analyses from the KOPs should be conducted to determine how much of the SEZ would be in view from each KOP.

- As deemed necessary, based on viewshed analysis results, wireframe Google Earth™ visualizations of hypothetical solar facilities in the SEZ depicting the 80% development scenario could be prepared to better estimate potential impacts.

This additional analysis may be sufficient to 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.

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 assignments of PFYC Class 3b (94%) and Class 2 (6%) used in the Draft Solar PEIS.

Cultural Resources and Native American Concerns

A Class II stratified random sample survey was conducted by SWCA Environmental Consultants (SWCA 2013) on 811 acres, or approximately 5% of the SEZ. A summary of the results of the survey are available on the Millers SEZ page of the BLM Solar Energy Program Implementation Web site (http://blmsolar.anl.gov/sez/nv/millers/). 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. The Millers SEZ falls in the traditional use area of primarily the Western Shoshone and the Northern Paiute. Potential topics to be discussed during consultation include Big Smoky Valley, sites and landscapes around Lake Tonopah, "cumulative effects to the places that gives songs to the Tribes" (per a comment from Duckwater Shoshone), and plant and animal resources, such as those listed above. A completed ethnographic study is available on the Millers SEZ page of the BLM Solar Energy Program Implementation Web site (http://blmsolar.anl.gov/sez/nv/millers/).

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.

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)

  - 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.