

## **RECOMMENDED ADDITIONAL DATA COLLECTION MILFORD FLATS SOUTH 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 Milford Flats South 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 Milford Flats South SEZ has a total area of 6,252 acres (25.3 km<sup>2</sup>). It is located in Beaver County in southwestern Utah. The towns of Minersville and Milford are about 5 mi (8 km) east of, and 13 mi (21 km) north–northeast of, the SEZ respectively.

### **Recommended Additional Data Collection for the Milford Flats South SEZ**

#### **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 Utah addresses the status of Minerals within the Milford Flats South SEZ (BLM 2012).

#### **Water Resources**

The Final Solar PEIS provided a planning-level water resources inventory of the Milford area 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 data and actions would help further characterize potential impacts on water resources for the Milford Flats South 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 dry lakes, ephemeral stream channels and alluvial fan features for non-development areas through consultation with BLM Utah,

## Milford Flats South SEZ Data Needs

- Utah Division of Water Resources, Utah Division of Water Rights Stream Alteration Program, U.S. Environmental Protection Agency, and U.S. Army Corps of Engineers (USACE) with a focus on:
- Unnamed washes throughout the SEZ draining north and northwest off of the Black Mountains, and
  - The agricultural ditches in the southern portion of the SEZ.
- Perform field surveys and hydrologic analyses to support jurisdictional water determinations and floodplain identifications. Tasks include:
    - Surveying unnamed washes for surface elevations, high water marks, and 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:
    - Unnamed washes.
  - Identify 100-year floodplain non-development areas (if they exist) for unnamed washes identified during the field survey. This task would require coordination with the Federal Emergency Management Agency and the following agencies:
    - Utah Department of Public Safety, and
    - Utah Geological Survey.
  - 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 action would help further characterize potential impacts on wildlife resources for the SEZ:

- Identify and map the location and areal extent of dry wash and greasewood flat habitats within the SEZ. Identify and map the location and areal extent of these habitats, as well as playa and riparian 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.

**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 mule deer and pronghorn.
- Identify and map the location and areal extent of playa habitat within the SEZ. Wildlife surveys should be conducted along Minersville Canal in order to confirm that the non-development area identified for this feature is adequate to protect amphibian, bird, and mammal species. 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. Washes in the Milford Flats South SEZ are typically dry. These surface water features may or may not contain aquatic biota; therefore, preliminary evaluations of these features could be conducted to determine the potential for aquatic communities to be present.

**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); or (2) designated as sensitive by the Utah 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 USFWS and UDWR.

The Draft Solar PEIS presents a table of special status species for which potential impacts need to be evaluated prior to development in the Milford Flats South SEZ. The list of species presented in Table 13.2.12.1-1 of the Draft Solar PEIS also includes species listed by the State of Utah and species ranked S1 or S2 or as species of concern by the State of Utah. 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 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.

Milford Flats South SEZ Data Needs

**TABLE 1 Special Status Species That May Occur on the Milford Flats South SEZ<sup>a</sup>**

Common Name	Scientific Name	Listing Status <sup>b</sup>	Habitat <sup>c</sup>
<b>Plants</b>			
Compact cat's-eye	<i>Cryptantha compacta</i>	BLM-S	Salt desert shrub and mixed shrub communities at elevations between 5,000 and 8,400 ft. <sup>d</sup> Known from southwestern Millard County and northwestern Beaver County, Utah, and eastern Nevada. Nearest recorded occurrence is 45 mi <sup>e</sup> northwest of the SEZ. About 2,430,377 acres <sup>f</sup> of potentially suitable habitat occurs within the SEZ region.
Jone's globemallow	<i>Sphaeralcea caespitosa</i>	BLM-S	Known from at least four occurrences in western Utah and six occurrences in eastern Nevada on federal and state lands on dolomite calcareous soils in association with mixed shrub, pinyon-juniper, and grassland communities at elevations between 5,000 and 6,500 ft. Nearest recorded occurrence is 27 mi northwest of the SEZ. About 4,077,164 acres of potentially suitable habitat occurs within the SEZ region.
Long-calyx milkvetch	<i>Astragalus oophorus lonchocalyx</i>	BLM-S	Endemic to the Great Basin in western Utah and eastern Nevada in pinyon-juniper woodlands, sagebrush, and mixed shrub communities at elevations between 5,800 and 7,500 ft. Nearest recorded occurrences are 12 mi east of the SEZ. About 3,961,336 acres of potentially suitable habitat occurs within the SEZ region.
Money wild buckwheat	<i>Eriogonum nummulare</i>	BLM-S	Western Utah and eastern Nevada on gravelly washes, flats, and slopes in saltbush and sagebrush communities and pinyon-juniper woodlands. Nearest recorded occurrence is 40 mi northwest of the SEZ. About 3,468,227 acres of potentially suitable habitat occurs within the SEZ region.
<b>Birds</b>			
American white pelican	<i>Pelecanus erythrorhynchos</i>	BLM-S	May occur as a summer resident and migrant in large reservoirs within the SEZ region. Species is likely to be a transient only in the vicinity of the SEZ. Nearest recorded occurrence is from the Minersville Reservoir, approximately 11 mi east of the SEZ. About 81,437 acres of potentially suitable habitat occurs within the SEZ region.
Bald eagle	<i>Haliaeetus leucocephalus</i>	BLM-S	Known as a winter resident throughout the SEZ region, most commonly along large bodies of water where fish and waterfowl prey are available. Wintering areas are associated with open water. May occasionally forage in arid shrubland habitats. Nearest recorded occurrences are from the Beaver River within 10 mi east of the SEZ. About 2,540,607 acres of potentially suitable habitat occurs within the SEZ region.
Ferruginous hawk <sup>g</sup>	<i>Buteo regalis</i>	BLM-S	A year-round resident in the SEZ affected area. Grasslands, shrublands, agricultural lands, and the periphery of pinyon-juniper forests throughout the SEZ region. Quad-level occurrences intersect the SEZ and other portions of the affected area. About 1,761,837 acres of potentially suitable habitat occurs within the SEZ region.

Milford Flats South SEZ Data Needs

**TABLE 1 (Cont.)**

Common Name	Scientific Name	Listing Status <sup>b</sup>	Habitat <sup>c</sup>
<i>Birds (Cont.)</i>			
<b>Greater sage-grouse</b>	<i>Centrocercus urophasianus</i>	ESA-C; BLM-S	A year-round resident in the SEZ region. Plains, foothills, and mountain valleys dominated by sagebrush throughout the SEZ region. Lek sites are located in relatively open areas surrounded by sagebrush or in areas where sagebrush density is low. Nesting usually occurs on the ground where sagebrush density is higher. Quad-level occurrences intersect the affected area east of the SEZ. Crucial brooding habitat for the species exists about 1 mi south of the SEZ and intersects the transmission corridor. About 1,646,504 acres of potentially suitable habitat occurs within the SEZ region.
Long-billed Curlew	<i>Numenius americanus</i>	BLM-S	Summer resident and migrant throughout the SEZ region in short-grass grasslands near standing water. Species is likely to be transient only in the vicinity of the SEZ. Nearest recorded occurrences are from the Beaver River, approximately 10 mi east of the SEZ. About 285,000 acres of potentially suitable habitat occurs within the SEZ region.
Northern Goshawk	<i>Accipiter gentilis</i>	BLM-S	A year-round resident in the SEZ region. Mature mountain forest and riparian zone habitats throughout the SEZ region. Nests in trees in mature deciduous, coniferous, and mixed forests. Forages in both heavily forested and relatively open shrubland habitats. Nearest recorded occurrences are approximately 18 mi southeast of the SEZ. About 704,300 acres of potentially suitable habitat occurs within the SEZ region.
<b>Short-eared owl</b>	<i>Asio flammeus</i>	BLM-S	A year-round resident in portions of the SEZ region, although only winter (nonbreeding) habitat is expected to occur in the affected area. Grasslands, shrublands, and other open habitats throughout the SEZ region. Quad-level occurrences intersect the SEZ and other portions of the affected area. About 3,938,700 acres of potentially suitable habitat occurs within the SEZ region.
<b>Western burrowing owl</b>	<i>Athene cunicularia hypugaea</i>	BLM-S	A year-round resident in the SEZ region. Open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports throughout the SEZ region. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Quad-level occurrences intersect the SEZ and other portions of the affected area. About 2,432,600 acres of potentially suitable habitat occurs within the SEZ region.
<i>Mammals</i>			
<b>Dark kangaroo mouse</b>	<i>Microdiposops megacephalus</i>	BLM-S	Occurs in the Great Basin region in sagebrush-dominated areas with sandy soils. Nocturnally active during warm weather, the species remains in underground burrows during the day and cold winter months. Quad-level occurrences intersect the SEZ and other portions of the affected area. About 620,100 acres of potentially suitable habitat occurs within the SEZ region.
Fringed myotis	<i>Myotis thysanodes</i>	BLM-S	Wide range of habitats, including lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roost sites have been reported in buildings and caves. Nearest recorded occurrences are 40 mi southeast of the SEZ. About 4,555,400 acres of potentially suitable habitat occurs within the SEZ region.

## Milford Flats South SEZ Data Needs

**TABLE 1 (Cont.)**

Common Name	Scientific Name	Listing Status <sup>b</sup>	Habitat <sup>c</sup>
<b>Kit fox</b>	<i>Vulpes macrotis</i>	BLM-S	Open prairie, plains, and desert habitats where it inhabits burrows and preys on rodents, rabbits, hares, and small birds. Quad-level occurrences intersect the affected area north of the SEZ. About 1,960,500 acres of potentially suitable habitat occurs within the SEZ region.
Pygmy rabbit	<i>Brachylagus idahoensis</i>	BLM-S	Sagebrush-shrubland habitats throughout the SEZ region. Prefers loose soils to dig burrows. Nearest recorded occurrences are about 10 mi southeast of the SEZ. About 967,900 acres of potentially suitable habitat occurs within the SEZ region.
Spotted bat	<i>Euderma maculatum</i>	BLM-S	Near forests and shrubland habitats throughout the SEZ region. Uses caves and rock crevices for day roosting and winter hibernation. Nearest recorded occurrences are 15 mi north of the SEZ. About 3,269,200 acres of potentially suitable habitat occurs within the SEZ region.
<b>Townsend's big-eared bat</b>	<i>Corynorhinus townsendii</i>	BLM-S	Near forests and shrubland habitats below 9,000-ft elevation throughout the SEZ region. The species may use caves, mines, and buildings for day roosting and winter hibernation. Quad-level occurrences intersect the affected area north of the SEZ. About 3,111,000 acres of potentially suitable habitat occurs within the SEZ region.
<b>Utah prairie dog</b>	<i>Cynomys parvidens</i>	ESA-T	Endemic to southwestern Utah in grasslands in level mountain valleys and areas with deep, well-drained soils. Colonies reside in underground burrow systems, which are dynamic in size and location. Quad-level occurrences intersect the affected area south of the SEZ. Colonies are known to occur outside of the affected area within 10 mi south of the SEZ. About 825,000 acres of potentially suitable habitat occurs within the SEZ region.

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

<sup>b</sup> BLM-S = listed as a sensitive species by the BLM; ESA-C = candidate for listing under the ESA; ESA-T = listed as threatened under the ESA.

<sup>c</sup> 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.

<sup>d</sup> To convert ft to m, multiply by 0.3048.

<sup>e</sup> To convert mi to km, multiply by 1.609.

<sup>f</sup> To convert acres to km<sup>2</sup>, multiply by 0.004047.

<sup>g</sup> Species in bold text have been recorded or have designated critical habitat in the affected area.

- Identify and map the location and areal extent of woodland habitats within the SEZ. Woodland habitats that may occur in the area of direct effects include pinyon-juniper and oak/mahogany woodlands. The suitability of these woodland habitats for special status species should be determined. Species potentially associated with these habitats include the ferruginous hawk (nesting) and northern goshawk (nesting).
- Identify and map the location and areal extent of rocky cliffs and outcrops within the area of direct effects (particularly within the assumed transmission corridor). These habitats may be potential roost sites for special status bat species, including the fringed myotis, spotted bat, and Townsend's big-eared bat.

## Visual Resources

On the basis of the visual contrast analysis for the Milford Flats South SEZ provided in the Final Solar PEIS, solar development within the Milford Flats South SEZ is unlikely to cause even moderate visual impacts on highly sensitive visual resource areas (SVRAs), the closest of which is more than 25 mi (40 km) from the SEZ.

The following other lands and resource areas would be subject to moderate or strong visual contrasts from solar development:

- State Route 21 and 129

The following steps may be taken to better understand potential impacts on these areas from solar development in the Milford Flats South 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.

## **Paleontological Resources**

The Milford Flats South SEZ is located in an area where the Potential Fossil Yield Classification of the SEZ has been determined to be Class 2. Therefore, the potential for impacts on paleontological resources is low. No additional data collection is needed at this time, although verification of this classification is recommended at a project-specific level.

## **Cultural Resources and Native American Concerns**

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) trail networks through existing ethnographic reports, and (3) overall cultural sensitivity of the landscape.
- Conduct a Class II Stratified Random Sample Survey of the SEZ to obtain a 10% sample (roughly 648 acres [2.6 km<sup>2</sup>]). If the roughly 123 acres (0.5 km<sup>2</sup>) previously surveyed meets current survey standards, then approximately 525 acres (2.1 km<sup>2</sup>) of survey could satisfy a 10% sample. Areas of interest, as determined through a Class I review, should also be identified prior to establishing the survey design and sampling strategy.
- Prepare a cultural sensitivity map based on results of the Class II survey and Class I review.

Continue with government-to-government consultation. The Milford Flats South SEZ falls in the traditional use area of primarily the Southern Paiute, but also the Western Shoshone and Ute. Potential topics to be discussed during consultation include trail systems, mountain springs, habitation sites as places of cultural importance, clay and rock resources, burial sites, rock art, ceremonial areas, and plant and animal resources. A completed ethnographic study is available on the Milford Flats South SEZ page of the BLM Solar Energy Program Implementation Web site (<http://blmsolar.anl.gov/sez/ut/milfordflatssouth/>).

## **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 Utah*, prepared by Argonne National Laboratory, Argonne, Ill., July. Available at <http://solareis.anl.gov/documents/index.cfm>.



## 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.