

RECOMMENDED ADDITIONAL DATA COLLECTION FOURMILE EAST 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 Fourmile East 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 Fourmile East SEZ has a total area of 2,882 acres (11.7 km²). It is located in Alamosa County in south-central Colorado. The town of Alamosa is located about 13 mi (21 km) west of the SEZ.

Recommended Additional Data Collection for the Fourmile East SEZ

Recreation

The San Luis Valley-wide effort to promote recreational use could warrant additional consideration. The status of off-highway vehicle use designation in the area may also warrant additional consideration.

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 Colorado addresses the status of Minerals within the Fourmile East SEZ (BLM 2012).

Water Resources

The Final Solar PEIS provided a planning-level water resources inventory of the southern portion of the San Luis 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 Fourmile East SEZ. A more detailed discussion of each of these activities is included in the water resources action plan (Attachment A).

- Perform field surveys and hydrologic analyses to support jurisdictional water determinations and floodplain identifications. Tasks include:
 - Surveying wetland and low-lying areas 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 U.S. Army Corps of Engineers (USACE) (Albuquerque District) regarding jurisdictional water determinations for the SEZ. Water features to be considered include:
 - Small wetland features.
- Identify 100-year floodplain exclusion areas for the SEZ. This task would require coordination with the Federal Emergency Management Agency and the Colorado Water Conservation Board.
- 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 and Colorado Division of Water Resources (CDWR) (Division 3) to develop groundwater monitoring well design and numerical groundwater models. (Groundwater monitoring should coordinate with the Rio Grande Decision Support System through the CDWR [Division 3].)

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 Fourmile East SEZ:

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

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the SEZ that may be affected by hydrologic changes, including groundwater elevations, and changes in water, sediment, and contaminant inputs associated with runoff. Such effort may help determine habitat characteristics, including water source, hydrologic regime, and dominant plant species.

- Identify and map the location and areal extent of sand dunes and sand transport systems within the SEZ.

Wildlife. The following additional data-gathering action 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 elk, mule deer, and pronghorn.

Aquatic Biota. Investigations recommended under the water resources action plan would be useful in characterizing and protecting habitat available to aquatic biota. Wetlands identified within the SEZ 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.

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) listed by the State of Colorado as threatened or endangered; or (3) designated as sensitive by the Colorado 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 Colorado Division of Wildlife (CDOW). The BLM has conducted surveys for various special status species (e.g., mountain plover, western burrowing owl, Gunnison prairie dog) within the State of Colorado. In areas where these surveys overlap with the Colorado SEZs and areas of direct effects, the BLM survey information should be used to make appropriate determinations regarding the potential occurrence of species and their habitats. Additional survey efforts may be necessary, as appropriate.

The Draft Solar PEIS presents a table of special status species for which potential impacts need to be evaluated prior to development in the Fourmile East SEZ. The list of species presented in Table 10.3.12.1-1 of the Draft Solar PEIS also includes species listed by the State of Colorado and species ranked

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TABLE 1 Special Status Species That May Occur on the Fourmile East SEZ^a

Common Name	Scientific Name	Listing Status ^b	Habitat ^c
Plants			
Brandegee's milkvetch	<i>Astragalus brandegeei</i>	BLM-S	Sandy or gravelly banks, flats, and stony meadows within pinyon-juniper woodlands. Substrates are usually sandstone with granite or basalt. Elevation ranges between 5,400 and 8,800 ft. ^d Nearest occurrences are located 40 mi ^e southwest of the SEZ. About 733,938 acres ^f of potentially suitable habitat occurs within the SEZ region.
Fragile rockbrake	<i>Cryptogramma stelleri</i>	BLM-S	Moist soils on shaded limestone cliffs at elevations greater than 7,000 ft and often in association with mosses. The nearest known occurrences are located in the San Juan Mountains, about 50 mi to the west of the SEZ. About 12,297 acres of potentially suitable habitat occurs within the SEZ region.
Many-stemmed spider-flower ^g	<i>Cleome multicaulis</i>	BLM-S	San Luis Valley on saturated soils created by waterfowl management on public lands. Nearest occurrences intersect the affected area from the Blanca Wetlands, about 3 mi west and northwest of the SEZ. About 4,439 acres of potentially suitable habitat occurs within the SEZ region in the Blanca Wetlands.
Ripley's milkvetch	<i>Astragalus ripleyi</i>	BLM-S	Mixed conifer and shrubland habitats on rocky substrates at elevations above 8,000 ft. The nearest known occurrences are located 30 mi to the west of the SEZ. About 394,308 acres of potentially suitable habitat occurs within the SEZ region.
Rock-loving aletes	<i>Neoparrya lithophila</i>	BLM-S	Igneous rock outcrops on north-facing cliffs and ledges within pinyon-juniper woodlands at elevations greater than 7,000 ft. Endemic to south-central Colorado. Found as near as 15 mi southwest of the SEZ. About 434,485 acres of potentially suitable habitat occurs within the SEZ region.
Birds			
American peregrine falcon	<i>Falco peregrinus anatum</i>	BLM-S	Year-round resident in the SEZ region. Open spaces associated with high, near-vertical cliffs and bluffs above 200 ft in height overlooking rivers. Nearest occurrences are from the Rio Grande National Forest about 40 mi northwest of the SEZ. About 3,277,511 acres of potentially suitable habitat occurs within the SEZ region.
Bald eagle	<i>Haliaeetus leucocephalus</i>	CO-T	Year-round resident in the SEZ region. Seldom seen far from water, especially larger rivers, lakes, and reservoirs. Occurs locally in semiarid shrubland habitats where there is an abundance of small mammal prey. Known to occur in riparian habitats along the Rio Grande about 10 mi west of the SEZ. About 2,072,279 acres of potentially suitable habitat occurs within the SEZ region.
Ferruginous hawk	<i>Buteo regalis</i>	BLM-S	Summer resident in the affected area, but year-round resident in portions of the SEZ region. Grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodlands. Known to occur in San Luis State Park and Wildlife Area, about 10 mi northwest of the SEZ. About 1,360,614 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.)			
Mountain plover	<i>Charadrius montanus</i>	BLM-S	Summer resident in the SEZ region. Prairie grasslands and arid plains and fields. Nests in shortgrass prairies associated with prairie dogs, bison, and cattle. Known to occur within 25 mi southeast of the SEZ. About 1,709,413 acres of potentially suitable habitat occurs within the SEZ region.
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	ESA-E; CO-E	Nests in thickets, scrubby and brushy areas, open second growth, swamps, and open woodlands in the Alamosa National Wildlife Refuge along the Rio Grande, about 7.5 mi southwest of the SEZ. Suitable habitats may occur in the Blanca Wetlands about 3 mi west of the SEZ. About 210,962 acres of potentially suitable habitat occurs within the SEZ region.
Western burrowing owl	<i>Athene cunicularia hypugaea</i>	BLM-S; CO-T	Open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports throughout the SEZ region. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Known to occur in the San Luis Valley. About 2,209,000 acres of potentially suitable habitat occurs in the SEZ region.
Mammals			
Big free-tailed bat	<i>Nyctinomops macrotis</i>	BLM-S	Year-round resident in the SEZ region. Roosts in rock crevices on cliff faces or in buildings. Forages primarily in coniferous forests and arid shrublands to feed on moths. May occur in the San Luis Valley. About 2,745,262 acres of potentially suitable habitat occurs within the SEZ region.
Fringed myotis	<i>Myotis thysanodes</i>	BLM-S; FWS-SC	Summer or year-round resident in wide range of habitats, including woodland, riparian, and shrubland habitats. Roosts in caves, crevices, and buildings. About 3,800,000 acres of potentially suitable habitat occurs within the SEZ region.
Gunnison's prairie dog	<i>Cynomys gunnisoni</i>	ESA-C	Mountain valleys, plateaus, and open brush habitats in the project area at elevations between 6,000 and 12,000 ft. Known to occur as near as 20 mi south of the SEZ. About 1,938,641 acres of potentially suitable habitat occurs within the SEZ region.
Pale Townsend's big-eared bat	<i>Corynorhinus townsendii pallascens</i>	BLM-S	Year-round resident in the SEZ region. Semiarid shrublands, pinyon-juniper woodlands, and montane forests to elevations of 9,500 ft. Roosts in caves, mines, rock crevices, under bridges, or within buildings. Known to occur in the San Luis Valley about 25 mi southwest of the SEZ. About 3,075,160 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) Colorado 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; CO-E = listed as endangered by the State of Colorado; CO-T = listed as threatened by the State of Colorado; ESA-C = candidate for listing under the ESA; ESA-E = listed as endangered under the ESA.

^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.

Table 1 (Cont.)

^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.

by the State of Colorado 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.

Visual Resources

A summary of the Final Solar PEIS visual contrast analysis for the proposed Fourmile East SEZ is provided in Table 2. This table includes only those 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 Fourmile East SEZ, which are the following:

- Old Spanish National Historic Trail
- Sangre de Cristo Wilderness Area (WA)
- Los Caminos Antiguos Scenic Byway
- Blanca Wetlands Special Recreation Management Area (SRMA)
- Zapata Falls SRMA

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

- Blanca Peak
- Rio Grande Scenic Railroad.

The following steps could be taken to better understand potential impacts on these areas from solar development in the Fourmile East 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.

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

Feature Type	Feature Name (Total Acreage/ Linear Distance) ^{b,c}	Feature Area or Linear Distance ^d		
		Visible within 5 mi	Visible Between	
			5 and 15 mi	15 and 25 mi
National Historic Trail	Old Spanish ^d (2,700 mi)	12 mi (0%)	19.7 mi (1%)	13.1 mi (0%)
WAs	Sangre de Cristo (217,695 acres)	1,194 acres (1%)	2,339 acres (1%)	6,623 acres (3%)
Scenic Highways/Byways	Los Caminos Antiguos ^d (129 mi)	13.1 mi (10%)	45.0 mi (35%)	8.4 mi (7%)
SRMAs	Blanca Wetlands (8,598 acres)	7,515 acres (87%)	1,065 acres (12%)	0 acres
	Zapata Falls (3,702 acres)	20 acres (1%)	2,315 acres (63%)	0 acres

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

^bTo convert acres to km², multiply by 0.004047.

^c To convert mi to km, multiply by 1.609.

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

^d Source: America's Byways, 2011, Los Caminos Antiguos. Available at <http://byways.org/explore/byways/2111>. Accessed Feb. 22, 2012.

- 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 BLM Regional Paleontologist may have additional information regarding the paleontological potential of the SEZ. A preliminary paleontological survey could be conducted to verify the Potential Fossil Yield Classification (PFYC) of the SEZ as Class 4/5 as used in the Draft Solar PEIS and determine whether paleontological resources are likely to be affected.

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 288 acres [1.2 km²]). Areas of interest, as determined through a Class I review, should also be identified prior to establishing the survey design and sampling strategy, such as the dune areas throughout the SEZ. Subsurface testing of dune areas should be a component of the sampling strategy as well.
- Prepare a cultural sensitivity map based on results of the Class II survey and Class I review.
- Identify the location of the Old Spanish National Historic Trail in the vicinity of the SEZ and viewshed analyses from key points along the trail. A high-potential segment of the trail has been identified directly to the northeast from Crestone, Colorado, to the SEZ. It is clearly within the viewshed of the SEZ and would be affected visually. A mitigation strategy would need to be developed to address unavoidable impacts on the National Historic Trail.
- Continue with government-to-government consultation, including follow-up to up recent ethnographic studies covering some SEZs in Nevada and Utah with Tribes not included in the original studies to determine whether those Tribes have similar concerns. The Fourmile East SEZ falls in the traditional use area of primarily the Northern Cheyenne and the Northern Arapaho, although potentially significant sites and landscapes for the Navajo and the Pueblos may also be present near the SEZ (Blanca Peak, Great Sand Dunes, San Luis Lakes). Potential topics to be discussed during consultation include the above-mentioned places, trail systems, mountain springs, mineral resources, burial sites, ceremonial areas, water resources, and plant and animal resources.

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.

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BLM, 2012, *Assessment of the Mineral Potential of Public Lands Located within Proposed Solar Energy Zones in Colorado*, 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)

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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.