

**BIOLOGICAL ASSESSMENT
FOR THE
CALIFORNIA VALLEY SOLAR RANCH PROJECT
SAN LUIS OBISPO COUNTY, CALIFORNIA**

Covering the California Jewel-flower, San Joaquin Woollythreads, Kern Primrose Sphinx Moth, Longhorn Fairy Shrimp, Vernal Pool Fairy Shrimp, Blunt-nosed Leopard Lizard, California Condor, Mountain Plover, San Joaquin Kit Fox, and Giant Kangaroo Rat

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EXECUTIVE SUMMARY

INTRODUCTION

High Plains Ranch II, LLC (HPR II), a wholly owned subsidiary of SunPower Corporation, Systems (“SunPower”) proposes to construct a 250-megawatt (MW) solar photovoltaic (PV) energy plant, the California Valley Solar Ranch (CVSR Project), on approximately 4,747 acres of rangeland in eastern San Luis Obispo County, California. The CVSR Project includes construction and operation of the Solar Generation Facility where the solar array complexes and facilities will be located; construction and operation of a generation tie-line to convey electricity generated by the Solar Generation Facility to a switchyard; construction and operation of the switchyard, where transfer of electricity from the generation tie-line to an existing Pacific Gas & Electric Company (PG&E) transmission line will occur; reconductoring of the PG&E transmission line to allow it to handle increased electrical capacity; and expansion and operation of a quarry from which aggregate materials will be obtained for the Project. All of these activities will be part of a single federal action, as described in the next section. However, the reconductoring component of the Project is analyzed in a separate Biological Assessment (BA) prepared by ICF on behalf of PG&E. Therefore, this BA covers the effects of the activities concerning the Solar Generation Facility, generation tie-line, switchyard, and quarry. The total development footprint in these latter four areas encompasses approximately 1,475 acres. The CVSR Project incorporates important conservation measures, including Applicant-Proposed Measures (APMs) designed to reduce impacts on biological resources; the preservation, enhancement, and maintenance of approximately 3,272 acres that would be managed on-site as conservation lands to support special-status species; and preservation, enhancement, and maintenance of off-site conservation lands for special-status species to support a regional strategy for the conservation of these species in the Carrizo Plain.

PURPOSE OF THIS BIOLOGICAL ASSESSMENT

On August 27, 2010, the Department of Energy (DOE) Loan Guarantee Program Office (LGPO) selected SunPower’s application for due diligence review for a federal loan guarantee for the CVSR, officially commencing a proposed federal action on the CVSR Project. The proposed action under consideration by DOE is whether to issue a federal loan guarantee under Title XVII of the Energy Policy Act of 2005 (EPAct 05), as amended by Section 406 of the American Recovery and Reinvestment Act of 2009, P.S. 111-5 (the “Recovery Act”). As a proposed federal action, all components of the Project are subject to NEPA compliance. This action, as described in this BA, involves DOE providing a loan guarantee to support the construction and start-up of the CVSR Project. Because construction and operation of the proposed CVSR may affect species listed under the federal Endangered Species Act (ESA), DOE is requesting formal consultation of the USFWS under Section 7(a)(2) of the ESA.

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DESCRIPTION OF PROPOSED ACTION

INTRODUCTION/OVERVIEW

High Plains Ranch II, LLC (HPR II), a wholly owned subsidiary of SunPower Corporation, Systems (“SunPower”) proposes to construct a 250-megawatt (MW) solar photovoltaic (PV) energy plant, the California Valley Solar Ranch Project (CVSR Project or Project), on a 4,747-acre site in eastern San Luis Obispo County, California. The Project footprint will encompass 1,475 acres and includes construction and operation of the Solar Generation Facility where the solar array complexes and facilities will be located; construction and operation of a generation tie-line to convey electricity generated by the Solar Generation Facility to the Caliente Switching Station; construction and operation of the switching station, where transfer of electricity from the generation tie-line to an existing Pacific Gas & Electric Company (PG&E) transmission line will occur; reconductoring of the PG&E transmission line to allow it to handle increased electrical capacity; and expansion and operation of an existing quarry (Twisselman Quarry) from which aggregate materials will be obtained for the Project. All of these activities will be part of a single federal action, as described in the next section. However, the reconductoring component of the Project is the subject of a separate Biological Assessment (BA) being prepared by ICF on behalf of PG&E. Therefore, this BA covers the effects of the activities concerning the Solar Generation Facility, generation tie-line, switching station, and quarry. Approximately 3,272 acres of the Project site will be left undisturbed or temporarily impacted then restored to pre-Project conditions. Most of this undeveloped area will be managed as on-site conservation lands as part of a conservation strategy to maintain or enhance conditions supporting special-status species.

Solar energy will be captured and converted directly to electricity through solar PV panels. The PV panels will be attached to SunPower T0 Tracker units. The T0 Tracker system is a single-axis, horizontal solar tracking system configured to optimize energy capture by following the daily path of the sun (Photo 1).



Photo 1. T0 Tracker Unit at Tolosa Winery in San Luis Obispo County. Vegetation between and under panels was cut and herbicided.

The T0 Tracker is designed to have a low profile, typically 5–6 feet above the ground (Photo 2). The original design of the Project called for the use the SunPower T20 Tracker Units, a more land intensive product. The T20 was designed to use concrete ballasted foundations which have been replaced with new Low Impact Penetrating (LIP) Foundations, resulting in a large reduction of concrete. T0 Trackers sit on foundations of large metal screws or helical piles that are driven directly into the ground without the need for excavation or concrete foundations.

The layout of the Project will feature the equivalent of 312 Tracker blocks, each with four Trackers of 18 rows each. These 312 blocks will be configured to make up the 10 arrays areas. (Note that project maps make reference to 11 Arrays, but Array 3 has been deleted to avoid listed species.) Within a block, multiple rows are linked by a steel drive strut, which is oriented perpendicular to the axis of rotation. Each row is connected to the drive strut by a torque arm, which acts as a lever, enabling the drive strut to rotate the rows together as the drive unit moves the drive strut forward and backward (Photo 3). The drive unit is typically mounted at the first row in a building block, and consists of a ½-horsepower, bi-directional AC motor that actuates the drive strut via an industrial screw jack. The forces developed by the motor and screw are sufficient to actuate a single block. Each of the 312 blocks will contain four ½-horsepower motors.



Photo 2. Example of T0 array height.



Photo 3. T0 drive strut and torque arm.

The space and ground beneath the trackers will remain open and vegetated. In photos 1 through 3, Tolosa Winery cut and sprayed herbicide under the panel to control vegetated as preserving wildlife habitat within the array was not an objective. As the sun arcs across the sky, it radiates the ground beneath the trackers. No permanently shaded areas are created by the panels mounted in this configuration. Existing vegetation will be able to continue to grow, and small animals will be able to inhabit the area around and under the trackers. The single-axis design allows them to tilt ± 45 degrees and track the sun as it arcs east to west across the sky. In the morning and evening hours when the sun is low, the panels rotate to a horizontal position in order to avoid the eastern or western-most panels casting shadows across the array. Then as the sun rises above

the array's plane, the panels tilt and track the sun until sunset. This process known as "backtracking" allows the panels to change direction to avoid shading other panels and maximize solar input.

Although it is currently unknown exactly how much shade will be created, preliminary calculations suggest that approximately 40 to 80% of the array footprint will be partially shaded, but all areas will receive some sun during parts of the day. The solar panels, facing upward at noon, will shade approximately 40% of the array area with maximum shading occurring in the early morning and late evening hours. Ian Herdman, Director of Operations, at the Tolosa Winery reported no observable difference in vegetation composition, abundance, or vigor under the T0 panel rows versus between the panel rows (personal communication 28 July 2010).

The CVSR Project has a rated capacity of 250 MW and will generate renewable energy for delivery to PG&E under a long-term contract. The net annual energy output for the Project is estimated at 714,000 MWh. The solar electric power generated by HPR II's proposed CVSR Project is a 100% renewable energy source that is clean and quiet, producing no harmful emissions, requiring no fuel, and needing only minimal detergent-free water for periodic washing. PG&E estimates that the Project will produce enough electricity to power approximately 110,000 homes. According to calculations provided by the U.S. Environmental Protection Agency, the CVSR Project will offset the production of more than 750 million pounds of carbon dioxide per year, the equivalent of removing more than 2 million cars off the road over the life of the Project.

For the purpose of the section 7 consultation facilitated by this Biological Assessment (BA), the 5,009-acre Biological Study Area (BSA) originally studied for the CVSR Project consists of the Solar Generation Facility south and north of SR 58, conservation lands south and north of SR 58, the generation tie-line with two potential switching station sites (to connect the Solar Generation Facility to the existing 230 kV Morro Bay-Midway transmission lines), the Twisselman Quarry, and the roadway that will be used for transportation of quarried rock from the Twisselman Quarry to the rest of the Project site. The BSA acreage is slightly greater than the 4,747-acre Project site, as the BSA includes a slightly greater area that was studied for biological resources, as well as the locations of two potential switching station alternatives (whereas only one will be used).

The approximately 34-mi segment of the PG&E Morro Bay-Midway 230 kV transmission line between the solar energy projects on the Carrizo Plain and the Midway Substation near Buttonwillow will be recondored (i.e., new conductor lines will be installed) to increase capacity of the existing transmission lines to support solar power projects, including the CVSR Project, on the Carrizo Plain. The survey area for this component of the federal action is in addition to the 5,009-acre BSA and is fully described in the BA analyzing the effects of the recondoring prepared on behalf of PG&E.

This description of the proposed action includes information regarding the Project's location; factors considered during site selection; a description of the vegetation communities within the Project site; a description of the Project's physical components, maintenance/operational components, and construction methodology; and a description of the conservation measures that are incorporated into the Project to avoid, minimize, and compensate for Project effects on federally-listed species.

PROJECT LOCATION

The CVSR Project will be located on approximately 4,747 acres of rangeland immediately north of the California Valley subdivision at the northeastern fringe of the Carrizo Plain in eastern San Luis Obispo County (Figures 1 and 2). The Project site is adjacent to the Temblor Range, 56 mi east of San Luis Obispo and 52 mi southeast of Paso Robles. The site is bisected by SR 58. The majority of the arrays in the Solar Generation Facility, as well as most associated components and improvements such as the substation, operations and maintenance (O&M) facility, and visitor center, will be located south of SR 58 on property under option for future ownership by HPR II (Figure 3). North of SR 58, Project components include one solar array (array 10); a 250-ft-wide generation tie-line easement which would extend over privately owned land extending to the PG&E transmission lines 2 mi to the north; a switching station; and the existing Twisselman Quarry proposed for expansion. There are two former gypsum mines on the Project site, one in the southwestern part of the Solar Generation Facility site and another in the 320-acre "Martin parcel" in the south-central part of the Solar Generation Facility site (where array 11 is proposed). The northern boundary of the Carrizo Plain National Monument is located approximately 2 mi south of the site, and Soda Lake is 1 mi farther south within the National Monument. The Project site is bounded by privately owned, undeveloped and agricultural land in all directions. A partially developed residential subdivision known as California Valley is located south of the Project site and north of the National Monument. Sparse residential uses are located south, east, and west of the site. The Solar Generation Facility site comprises 26 parcels zoned for agriculture. These parcels are vacant, with abandoned farming structures and equipment, and are currently used as pastureland for cattle.

PROJECT SITE SELECTION

HPR II considered three primary requirements in selecting the best site for this new solar facility: access to electrical transmission lines with available power capacity, suitable land, and high solar resource.

Some of California's best renewable energy resources are remote and lack adequate transmission infrastructure, such as the Tehachapi Mountains (wind) and the Mojave Desert (solar thermal). While efforts are underway to build new transmission corridors to these areas, none will be completed in time to contribute to the state's 2010 Renewable Portfolio Standard (RPS) which mandates each investor-owned utility (such as PG&E) to deliver 20% of its electricity from

renewable energy sources. Looking forward, the State has set an even more challenging 2020 Renewable Portfolio Standard of 33%.

Of the state's existing transmission lines, few have the available capacity to integrate additional power generation without cost-prohibitive upgrades. The transmission line north of the Solar Generation Facility site—the PG&E-owned Morro Bay–Midway transmission line—does have the available capacity to accept significant additional power generation with minor reconductoring modifications. This line runs from Morro Bay, across San Luis Obispo County, to the Midway substation at Buttonwillow, near the intersection of SR 58 and Interstate 5. Previously used to connect the natural-gas-fired power plant at Morro Bay to the statewide electrical grid, the line now operates at only a fraction of its total capacity due to a reduction in the plant's energy production.

When considering land suitability near the Morro Bay–Midway transmission line, HPR II reviewed the site's topography, agricultural viability, and current use. The Solar Generation Facility site's topography, with its low slope, allows HPR II's T0 Tracker systems to be placed on the ground with relatively little disturbance, following the contours of the land.

Unsuited for sustainable irrigation, the Solar Generation Facility site has low agricultural resource value limited to abandoned attempts at dry land farming and limited grazing. Irrigated, productive agricultural land was also excluded from consideration due to its higher value for crop production. Land preserved for agriculture under the California Land Conservation Act of 1965 ("Williamson Act") was also excluded from siting consideration. Currently, the site sustains cattle for grazing and consists of a privately-owned, abandoned ranch complex with two inactive gypsum mines to the south of SR 58 and the active Twisselman Quarry to the north of SR 58. The site had previously been used for dry farming but for the last 12 years has been used solely for limited cattle grazing. For the two decades before dry land farming was abandoned on the property, farming only made economic sense because of federal subsidies. With the advent of changes in Federal farm subsidy programs, dry land farming was abandoned. The land has not been commercially farmed (without federal subsidies) for many years. The Solar Generation Facility site also has severe water quality and quantity restrictions that prevent the site from being irrigated.

The ranch structures are in disrepair and largely collapsed. Although their permits are still open, the site's gypsum mines south of SR 58 have been inactive for over a decade, and rusted strip-mining equipment still sits idle adjacent to one of the mine areas. As part of the Project HPR II will reclaim the mine sites and close their permits. Closure will involve grading the previously mined area to a smooth natural grade and applying topsoil to allow for revegetation. Detailed plans will be incorporated into the overall grading design for the site.

The most important factor HPR II considered in selecting this Solar Generation Facility site was the solar resource availability. The solar resource is the percentage of available sunlight that can be converted into electricity. The area around California Valley has the highest solar resource in

PG&E's service territory and is identified by the San Luis Obispo County General Plan's Energy Element as an area of high solar potential where solar energy development should be encouraged. California Valley's very nature makes it the ideal location for solar energy production. It is protected from coastal fog by the Coastal and La Panza mountain ranges to the West. The Temblor Range to the East protects it from San Joaquin Valley ground fog. The weather in California Valley is stable, marked by very low rainfall, moderate temperatures and consistent sunshine. At an elevation near 2,100 ft, this microclimate contains air that is dry and relatively low in particulate matter, boosting the sun's intensity.

PROJECT SITE DESCRIPTION

The 5,009-acre BSA that encompasses the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites is topographically diverse, being dominated by slightly sloping grasslands intergrading into the moderate and steeper slopes of the Temblor Range and associated scarps and drainages. The majority of the BSA is currently used for grazing. There are abandoned quarry sites in the southwestern and south-central portions of the BSA.

As indicated on Figure 3, the portion of the BSA north of SR 58 includes the roadway that will be used for transportation of quarried rock from Twisselman Quarry. The switching station will also be located north of SR 58. The precise location of the switching station will be determined based on the results of studies currently underway related to biological resource constraints, geology, construction feasibility, and other factors. Because the precise switching station location has not yet been identified, the entire area in which it may be located is included in the BSA. This area includes two switching station alternatives (13.1 acres and 14 acres in size). Therefore, the BSA is larger than the actual Project footprint. However, the actual area to be used for the tie-line and the PG&E Caliente Switching Station represents approximately half of the area indicated on Figure 3 as "switchyard alternative locations."

Seven vegetation community-landform types are present within the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites: Annual Grassland, Interior Coast Range Saltbush Scrub, Wildflower Field, Desert Sink Scrub, Tamarisk Scrub, Alkaline Seasonal Wetlands-Wildflower Field Complex, and Ephemeral Drainages (Figure 4). Forty-two ephemeral drainages are present within the BSA. In addition to the vegetation community types described below, the existing Twisselman Quarry comprises 11.5 acres of open quarry that is considered developed.

Most of the vegetation communities are represented by multiple vegetation community associations. The approximate acreage of each vegetation community and landform type in the BSA is shown in Table 1. Dominant plant species are also listed for each vegetation community and community association in Table 2.

Table 1. Vegetation Community/Landform Type Acreages in the BSA.

Vegetation Communities/Landforms	Approximate Acreage
Annual Grassland	3,973
Interior Coast Range Saltbush Scrub	524
Wildflower Field	319
Desert Sink Scrub	152
Tamarisk Scrub	2
Alkaline Seasonal Wetlands-Wildflower Field Complex	14
Ephemeral Drainages	13
Disturbed/Developed	12
Total Acres	5,009*

* The BSA includes the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites and some immediately adjacent areas, as well as two potential alternative locations for the PG&E Caliente Switching Station, and it thus includes slightly more acreage than the Project site.

Annual Grassland is the dominant vegetation community on the Project site. This community type is especially prevalent in the areas south of SR 58. The on-site Annual Grassland vegetation community is characterized by a variably dense cover of annual grasses. Although annual grasses form the dominant plant species composition, often native annual forbs offer the greatest diversity in select areas, especially in years of favorable rainfall. Areas of especially high densities of native forbs intergrade with the Wildflower Field community. Annual Grassland on the site is characterized by grasses including slender wild oats (*Avena barbata*), wild oats (*Avena fatua*), soft chess (*Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), and red brome (*Bromus madritensis*). Characteristic forbs include broad leaf filaree (*Erodium botrys*), redstem filaree (*Erodium cicutarium*), fiddleneck (*Amsinckia menziesii*), and common peppergrass (*Lepidium nitidum*). Two perennial grasses are found on the Project site, but not in significant enough concentrations to constitute a distinct vegetation community (i.e., no areas contain more than 10 percent native grasses or cover more than one contiguous acre). The perennial grasses found on the Project site include nodding needlegrass (*Nasella cernua*) and one-sided blue grass (*Poa secunda*). Annual Grasslands on-site have an average height of one foot in areas that are not subject to intensive grazing. However, much of the site comprises much shorter vegetation, as the site conditions (compacted soil, prior farming activity in some areas, very limited water supply, and heavy grazing) are unfavorable for healthy growth.

Table 2. Vegetation Communities and Series Associations Found within the Solar Generation Facility, Generation Tie-Line, Switching Station, and Twisselman Quarry Sites.

Vegetation Communities- Landform Types	Vegetation Community Associations
Annual Grassland	Redstem filaree/fiddleneck/peppergrass/ red brome Soft chess/ripgut brome/wild oats Soft chess/foxtail fescue/wild oat Soft chess/slender wild oats/few-flowered fescue Red brome/peppergrass/chick lupine Common peppergrass/slender wild oats Great valley phacelia/Russian thistle/small wire lettuce
Interior Coast Range Saltbush Scrub	Allscale/bladderpod/alkali goldenbush Allscale/Mt. Diablo milkvetch Alkali goldenbush/allscale Allscale/small wire lettuce
Wildflower Field	Goldfields/chick lupine Goldfields/chick lupine/purple owl's clover Chick lupine/goldfields/Great Valley phacelia Goldfields/chick lupine/Great Valley phacelia
Desert Sink Scrub	Alkali heath/saltgrass/silverscale Saltgrass/silverscale Saltgrass/silverscale/alkali weed Bush seepweed/alkali heath/saltgrass/four-wing saltbush
Tamarisk Scrub	Saltcedar/saltgrass/ball saltbush Unvegetated wetland fed by artificial hydrology (contains one large athel tamarisk tree)
Alkaline Seasonal Wetlands- Wildflower Field Complex	Crownscale/goldfields/alkali heath
Ephemeral Drainages	N/A (Mostly unvegetated or containing similar vegetation to surrounding community type)

Interior Coast Range Saltbush Scrub comprises the second most abundant type on the Project site, and is the dominant habitat north of SR 58, east of the generation tie-line area. The on-site Interior Coast Range Saltbush Scrub vegetation community is associated with the foothills of the Temblor Range within the Project site. In some areas, this community type is located in rocky alluvial fans produced by ephemeral drainages, which flow onto the site out of the Temblor foothills. Interior Coast Range Saltbush Scrub is a common vegetation type in upland habitats in the drier portions of California with non-alkaline soils, especially on sandy to loamy soils and rolling or hilly dissected alluvial fans (Holland 1986). Much of this community has been type-converted to Annual Grassland by year-round grazing, both on the Project site and throughout its range. This vegetation community is characterized by moderate to dense, shoulder-high scrub

dominated by allscale (*Atriplex polycarpa*), Mormon tea (*Ephedra californica*), and bladderpod (*Isomeris arborea*), usually with a grassy understory dominated by red brome (*Bromus madritensis*). Other characteristic species include Mt. Diablo milkvetch (*Astragalus oxyphysus*), California buckwheat (*Eriogonum fasciculatum*), and alkali goldenbush (*Isocoma acradenia*).

The on-site Wildflower Field vegetation community occurs most extensively in the foothills north of SR 58, but several locations south of SR 58 support this community type as well. The two ephemeral drainages that intersect with the road leading to the Twisselman Quarry may also support wildflower fields, although surveys conducted in 2010 occurred after the floristic period. This vegetation community is usually found on nutrient-poor, shallow and rocky soil sites and may be surrounded by productive sites dominated more heavily by non-native species. This community can occur in valleys and foothills across lower and mid-elevation areas of the Californian Floristic Province except the wet north coast and dry desert regions (Holland 1986). Characteristic species include California poppy (*Eschscholzia californica*), common tidy-tips (*Layia platyglossa*), miniature lupine (*Lupinus bicolor*), narrow leaved owl's clover (*Castilleja attenuata*), and purple owl's clover (*Castilleja exserta*). The Wildflower Fields in the central and southwest regions of the Solar Generation Facility site are not as diverse in forb composition as in the foothills; however, the forb composition within these fields is the most diverse among the community types south of SR 58. The increased diversity in these areas could be due to particular soil or topography in the area being more conducive to germination of native plant species than other areas on the Project site, or the below-average precipitation during the 2009 growing season could have exacerbated the difference in composition.

The on-site Desert Sink Scrub is typically found on poorly drained soils with extremely high alkalinity. Often, such areas are associated with a high water table and a salt crust at the surface (Holland 1986). This vegetation community typically occurs in moist valley bottoms and seasonally dry lakebeds. Desert Sink Scrub is characterized by widely spaced plants with most species being succulent chenopods. Characteristic species include four-wing saltbush (*Atriplex canescens*), alkali heath (*Frankenia salina*), alkali weed (*Cressa truxillensis*), greasewood (*Sarcobatus vermiculatus*), and bush seepweed (*Suaeda moquinii*). Desert Sink Scrub is found in several locations within the Solar Generation Facility and generation tie-line areas. The area of desert sink scrub in the northeastern portion of the Solar Generation Facility site is a wetland sink with a large (approximately 4-acre), unvegetated playa pool in the center.

Tamarisk Scrub is found in four locations within the Solar Generation Facility and generation tie-line areas. Tamarisk Scrub vegetation typically occurs on sandy or gravelly braided washes or intermittent streams, often in areas where high evaporation increases the stream's salinity. Tamarisk Scrub vegetation communities tend to be weedy monocultures of non-native, invasive *Tamarix* species, which usually replace native riparian scrub vegetation (Holland 1986). On the Project site, this community type is heavily influenced by anthropogenic activities, such as excavation of areas near a groundwater seep, excavation of a basin to contain tail water from the gypsum mine, or artificial hydrology from a leaking water tower. The "scrubs" found surrounding the excavated seep and the gypsum mine mainly support saltcedar (*Tamarix*

ramosissima) stands, while the “scrub” near the abandoned farmhouse consists of one large athel tamarisk (*Tamarix aphylla*) tree.

The Alkaline Seasonal Wetlands-Wildflower Field Complex is found in the southwest corner of the Solar Generation Facility site. Unlike areas on-site mapped as Desert Sink Scrub, this area conforms to the characteristics of a wetland fed by concentration of surface precipitation, exhibiting indicators of hydrology such as soil cracking and bare soils in depressions, heavy clay hydric soils on the surface, and hydrophytic vegetation in lower areas. Unlike the large wetland mapped as Desert Sink Scrub, which is a true sink, there is no claypan below the surface of the soil in the Alkaline Seasonal Wetlands to trap subsurface moisture for extended periods of time, only a thin clay layer that seasonally holds surface saturation and facilitates ponding in years with sufficient precipitation. These wetland depressions are surrounded by clayey uplands dominated by goldfields. The Alkaline Seasonal Wetlands in the southwest corner of the Solar Generation Facility site was previously farmed, unlike an otherwise similar off-site area to the southwest. Off-site, where soils have remained undisturbed, a thick sodic layer has accumulated in similar shallow depressions as seen in the Alkaline Seasonal Wetlands within the Solar Generation Facility site. This layer of salts, which can take many thousands of years to form, seals when inundated forming a restrictive layer. However, if a sodic layer occurred previously on-site, it was destroyed by farming practices. Existing now is an area of heavy clay, alkaline soils with well-drained loams below a thin clay surface. This disturbed soil still enables water to briefly pond in especially wet years, but does not operate as an intact sink or support vernal pool features such as the nearby areas off-site. Off-site, vernal pool vegetation occurs, such as coyote thistle (*Eryngium* sp.) and woolly marbles (*Psilocarphus* sp.). On-site, however, the dominant species in this vegetation community include crowscale (*Atriplex coronata*), goldfields, and alkali heath. No subsurface claypan or hardpan was observed in these areas.

Forty-two ephemeral drainages run through the BSA. These areas are mostly unvegetated or contain vegetation resembling that of the surrounding vegetation community. Such areas are typified by incision, often with loose, gravelly, sandy, or cobbly soils within the bed and banks. Some drainages lead into wide alluvial fans with significant cobbles and sediment deposition, and such areas lack true banks. These features collect and convey flows through the site during and immediately following precipitation events, generally running in a westerly or southerly direction.

No ponds or long-lived pools are known to occur within the Solar Generation Facility, generation tie-line, switching station, or Twisselman Quarry areas. Observations of wetlands in the Alkaline Seasonal Wetlands-Wildflower Field Complex on approximately 14 acres in the southwest corner of the Solar Generation Facility site have demonstrated that these areas pond water; however, their very shallow topographic nature suggests that ponding for long durations is unlikely. A playa in the northeastern portion of the Solar Generation Facility site is a wetland sink with a large (approximately 4-acre), unvegetated playa pool in the center, though the duration of ponding in this feature is currently unknown. The playa pool and the wetlands in the

Alkaline Seasonal Wetlands-Wildflower Field Complex will not be directly affected by project development.

PROJECT DESCRIPTION

The CVSR Project entails the construction of a 250-MW solar PV power plant that would include approximately the equivalent of 312 HPR II “T0” tracker blocks configured within 10 distinct arrays, separated by several corridors containing access roads, habitat areas, and buffer areas (Figure 3). Each Tracker block contains four Trackers of 18 rows. The single-axis Tracker has a low profile, typically 5–6 feet above the ground. Each row of Trackers is connected to the drive strut by a torque arm, which acts as a lever, enabling the drive strut to rotate the rows together. The drive unit, a ½-horsepower motor, moves the drive strut forward and backward and is typically mounted in the center of an array row at approximately 2.5 ft above the ground.

Since the design of the original alternative, HPR II has continued to refine the array layout in order to minimize adverse effects on listed species and sensitive habitats while maintaining the ability to produce 250 MW of electrical power. This approach is an important element of the conservation strategy and, therefore, the precise location of each of the 10 solar arrays will be finalized using the most updated survey information prior to constructing each phase of the Solar Generation Facility. Each array layout will occupy a subset of the areas shown as “Potential Solar Array Footprints” on Figure 3; the ultimate extent of the arrays will thus be less than the areas shown as “Potential Solar Array Footprints” on that figure. The most precise design to date, termed the “M3” or “Mitigated Alternative 3”, is depicted by the areas labeled “M3 Alternative Solar Panel Arrays” on Figure 3. Throughout this BA, the M3 alternative is the one that is depicted on figures, and the effects analysis in this BA is based on the M3 alternative. The effects of the final layout, in terms of impact acreage and effects on listed species will be no greater than is analyzed for the M3 alternative.

Individual components of the proposed construction activities are described below.

Temporary Facilities

The CVSR Project site will contain the following temporary facilities during the installation period:

Covered Assembly Areas

- Two temporary covered assembly areas, each 39,400 ft in size and 35 ft high.
- A gable-style shelter with frame of heavy duty 4-inch square galvanized steel tubing fabricated into 42-inch-deep truss ribs on 20-ft centers with 20-oz. heavy duty white translucent vinyl fabric reinforced with polyester cord scrim. No end walls.
- Self-cleaning polyvinylidene fluoride resin fabric coating to enhance fire, UV, and chemical aging resistance.

Concrete Batch Plant

- An 8,100-square-ft site identified for site-specific engineering design.
- Two temporary 5,000-gallon portable tanks may be used for concrete batch plant operations during fabrication and construction.
- Batch plant equipment up to 47 ft tall.

Temporary Construction Trailer Park

- A 5-acre temporary construction trailer park, with 50 park spaces and interior roadways, available for the exclusive use of Project workers.
- Utilities, including water (gravity flow from central project water tank), garbage dumpsters, recycling bins, and propane tanks.
- A septic system serving individual park spaces and/or an on-site dump station for wastewater disposal.
- A chain link security fence with slats around the park site.
- Ground illuminating pole-mounted lighting may be installed.
- A 2000-square-ft utility building to house laundry (washers, dryers), TV room, vending machines, miscellaneous storage, and bathroom and shower facilities.
- Site improvements including grading to facilitate drainage, the installation of fire hydrants per State CalFire regulations, and picnic tables and barbecue areas for outdoor use by occupants.

Permanent Facilities

When fully installed, the Project site will contain the following permanent structures and features (see Figure 3):

Photovoltaic Arrays

- Photovoltaic solar panels will be mounted on SunPower T0 Tracker units which will be arranged in 10 distinct arrays (Figure 3).
- Each array contains perimeter fire access roads, internal access drives and electrical utilities to support the array.
- Up to the equivalent of 312 SunPower T0 Tracker blocks will be installed as part of the Project. Each complete block consists of four trackers of 18 rows each.

- The Tracker units are linked together and attached to a drive motor in rows. These Tracker rows are laid out parallel to one another to create a Tracker block. These blocks are configured to create an array, with space in-between each row to avoid one row shading the next. Typical Tracker block configuration includes up to 18 units sharing a centralized tracker drive motor assembly that controls the angle of the Tracker units in relationship to the sun through the day. The drive bar that connects the Trackers rows is 2.5 ft off the ground.
- The Tracker units have 0 degrees south tilt, single-axis East-West tracking with morning and evening backtracking to avoid shading between rows. Their single-axis allows them to tilt ± 45 degrees and optimize energy capture by following the path of the sun throughout the day.
- The T0 Tracker System has a minimum 30-year design life and has a proven record of reliability in the field, requiring virtually no maintenance. Metal structural elements are constructed of corrosion-resistant, galvanized steel. The drive motor is a robust hardware design with nearly 40 years worth of field operational experience.
- Tracker units are installed with minimal penetration of the ground surface set on screw or helical pile foundations.

DC-AC Inverters

- Electrical energy generated by the Trackers is gathered via a DC cable systems laid in above ground trays running the length of the Tracker rows and underground trenches connecting to centralized electrical equipment enclosures housing banks of inverters and step up transformers.
- Each complete or partial Tracker block supplies an inverter and equipment enclosure. Plans currently include the equivalent of 312 Tracker blocks but actually because of isolated partial blocks there will be 325 electrical equipment enclosures with inverter capacity in each enclosure based on the size of the block.
- Due to the layout of the arrays not all blocks are a standard size. Consequently, more equipment enclosures than the overall MW capacity of the Project would indicate are included on the project description. Ultimately, equipment enclosures will be sized and spaced according to final design and engineering requirements.
- The Project will utilize from 250 to 1000 inverters. The enclosures are designed to protect equipment from the elements and dampen noise.
- The enclosures are placed on concrete foundations measuring 15 x 35 ft.
- All inverter and associated equipment enclosures will be at least 200 ft from external property lines.

- HPR II has yet to select the final inverter for the Project, but instead has provided manufacturers’ specifications on two candidate inverter models including their rated noise (dB) levels (Table 3).

Table 3. Candidate Inverter Models for Acoustical Analysis

Inverter Type	dB level at 3 meters
SatCon 500kW	<65
Siemens SINVER 1700 MS	<80

Note: These inverters will be in steel and concrete equipment enclosures and will not present these levels of audible noise outside the container. Maximum anticipated inverter noise levels assuming no enclosure or noise barrier installation regardless of model selected is 80 dBA at 10 ft.

Medium Voltage Collection Lines

- Electrical energy is gathered from the inverter units and transmitted at 34.5kV (AC) to the Substation via a system of medium voltage (MV) collection lines.
- MV collection lines beginning at the inverters are located in trenches until output from 10-15 Tracker blocks is gathered and transferred at risers to a system of overhead MV collection lines for transmission to the substation. MV collection line designs will be composed of three pole styles which range in height from 35-60 ft tall. They are unpainted standard utility poles.

Substation

- The substation houses transformers that step up the voltages from the 34.5 kV medium voltage level to the 230 kV high voltage level prior to being fed into the electrical grid. Electricity is transmitted at high voltages to reduce energy loss in transmission.
- Located in the Solar Generation Facility area south of Array 2 and north of Array 8, approximately 5,700 ft south of the main entrance road of SR 58.
- Substation equipment will cover an area of approximately 4.8 acres, surfaced with compacted road base all within the existing proposed fence line around the substation. Substation equipment ranges in height from 20 to 60 ft.
- Served by an internal fire access road from within the Solar Generation Facility site.
- Enclosed by standard chain link fencing topped with barb wire.
- The proposed overhead generation tie-line is a 230kV high voltage connection running approximately 3 mi between the substation and the Project’s PG&E Caliente Switching Station, which is the point of connection to the PG&E system.
- The majority of the generation tie-line occurs north of the Solar Generation Facility within a transmission line easement. The generation tie-line easement is 250 ft wide and approximately 3 mi in length (with approximately 2 mi being north of SR 58).

- The generation tie-line runs in four northerly straight-line segments and is supported by 32 single column steel poles which vary in height from 90 to 105 ft above ground level.
- The generation tie-line is built with two types of poles of which eight are dead end or angle supporting poles and 14 are straight line poles.
- The Project also includes deeded rights to the access road running parallel to the generation tie-line from SR 58 northward to the PG&E Caliente Switching Station, as well as rights to access the generation tie-line route for both construction and maintenance as needed. The route was chosen to utilize existing access roads with minimal new spur roads required for construction.
- The generation tie-line placement and tower heights have been designed to insure that the generation tie-line towers are as low as possible. There is a tradeoff between the height of the towers and the number of towers necessary. Our tower heights are as low as possible given the full range of design parameters applicable to the site.
- The area in which the generation tie-line will be constructed was also selected to avoid steep slopes and the San Andreas Fault Rupture Hazard zone to the east and to be visually unobtrusive. A short perpendicular crossing of the fault zone will allow the line to survive a major seismic event. The design also complies with California Public Utilities Commission General Order 95 safety requirements which require a minimum of 30-ft ground clearance for power lines. The design assumes maximum sag conditions based on a 212-degree Fahrenheit conductor temperature. The final location for the tie-line will be determined based on the results of studies currently underway related to biological resource constraints, geology, construction feasibility, and other factors.

PG&E Caliente Switching Station

- The PG&E Caliente Switching Station will connect the transmission lines to the electrical collection grid at PG&E's existing Morro Bay-Midway transmission lines.
- The site for the PG&E Caliente Switching Station is being identified and is covered in environmental permitting for HPR II and will be constructed by PG&E, with the generation tie-line and access road into the Station being built as part of CVSR.
- The PG&E Caliente Switching Station site will be between the existing PG&E 230 KV transmission line (immediately to the north) and the existing PG&E 115 KV transmission line (immediately to the south). These lines run parallel to each other across the Carrizo Plain.
- Permanent ground/habitat impacts from the transmission lines to the PG&E Caliente Switching Station will be limited to the footprints of towers supporting the lines.
- Currently there are two potential sites for the switching station (narrowed from six previous alternatives), ranging from 13.1 acres (Alternative 2) to 14 acres (Alternative 3) in footprint size. For the purposes of impact assessments in this BA, Alternative 3 has

been selected since the impacts that would result from the use of PG&E Caliente Switching Station Alternative 3 represent the alternative with the greatest impact (i.e., acreage of the PG&E Caliente Switching Station and associated tie-line). The final PG&E Caliente Switching Station site will be selected based on results of studies currently underway related to biological resource constraints, geology, construction feasibility, and other factors.

- The overall fenced area of the PG&E Caliente Switching Station Alternative 3 is 15 acres, and the total footprint of the switching station and the associated tie-line route is approximately 36.3 acres. Approximately half of the total acreage of the switching station and associated generation tie-line is considered temporarily impacted, since the area will be restored to its pre-construction condition after construction has been completed. The permanent impacts are associated with installing access roads, transmission poles, and the switching station foundation.
- The fenced area of the PG&E Caliente Switching Station area is surfaced with a combination of concrete pads, compacted road base for internal access roads and compacted earth. It is enclosed by standard chain link fencing topped by barb wire.
- PG&E Caliente Switching Station equipment ranges in height from approximately 20 to 55 ft.
- A microwave transmission tower up to 200 feet in height will be placed at the PG&E Caliente Switching Station. Depending upon final design a 20-ft tall x 30-ft wide passive microwave reflector will be installed on Twisselman property northwest of the switching station location to bounce the microwave signal to a PG&E microwave receiver in Kern County. The base of the reflector will be approximately 20 ft x 20 ft in size. The reflector will look much like a billboard.
- To access the PG&E Caliente Switching Station, the generation tie-line will need to cross over the existing PG&E 115 KV transmission line which will require the following facilities modifications are proposed:
 - Remove two existing 115 kV towers
 - Install two low profile, horizontally configured towers
 - Install one additional low profile, horizontally configured tower, depending on ground clearance and terrain.
 - Heights will be determined based on vertical positions of existing structures.
- To loop the Morro Bay-Midway 230 kV lines into the PG&E Caliente Switching Station the following facilities modifications are proposed:
 - Install four new 230 kV DE (dead end) towers
 - Install four new 230 kV TSPs (tubular steel poles)
 - Remove existing tower(s) between the new ones

- Heights will be determined based on vertical positions of existing structures.

Operations and Maintenance (O&M) Building

- Approximately 5,000 square ft in size, with a maximum height of 25 ft
- Includes office space, shop space, indoor storage, meeting space, receiving docks and an open hanger area (85% of the space) for maintenance equipment, spare parts, small tools and supplies used in the routine upkeep of electrical equipment and facilities.
- Construction materials will include zinc cladding, corrugated metal siding, translucent polycarbonate, COR-TEN steel panels, low-e glazed windows, and standing seam metal roofing.
- Outdoor storage for road maintenance materials, non-operational equipment, gasoline, and maintenance vehicles will be located in the fenced laydown yard south of the O&M building.
- A 45 kW propane powered standby electrical generator will be installed east of the O&M building along with its propane fuel tank.

Visitor Center

- 2,540 square ft in size, with a maximum height of 16 ft
- Built off-site as a modular building and installed directly adjacent to the O&M building.
- ADA compliant.
- Includes exhibit space, office, storage spaces, and a unisex restroom.
- Constructed of the same materials as the O&M Building.

Viewing Summits

- Two outdoor viewing summits will offer visitors expansive view of the site's arrays and will be accessed by hiking trails.
- The Sunset Overlook is an approximately 0.8-mi walk northwest of the Visitor Center.
- The second is the Sunrise Overlook, which is on the east side of the Solar Generation Facility site off Baker Road.
- ADA-accessible path of travel to the Sunset Overlook

Access Roads

- The main access road will enter the site from SR 58 at the location of the existing ranch road. The existing ranch road will be improved to a 24-ft wide section surface with aggregate base.
- Fire access roads will be located along the perimeter of the Solar Generation Facility site. Fire access roads have a 24-ft based section. They are designed to have an excavated road bed that is compacted to 95% and aggregate base materials place up to the original ground level per the engineering design.
- Temporary roadways for use in construction referred to as access drives will be cleared, compacted and treated with water or a soil binder for stabilization and dust control during construction. During operation, access drives will remain as open areas for annual maintenance and emergency access.
- All proposed roads and access drives will be at-grade. The finished elevation of all access roads will meet and not exceed elevations of native grade. Roads will not obstruct or alter natural drainage patterns across the site.
- Excess fill from removing topsoil to allow placement of aggregate base in roadways is planned to be hauled to the Twisselman Quarry site.

Highway Signage

- Monument signage will mark the intersection of the Solar Generation Facility entry, Boulder Creek Road with SR 58, to announce the Project to visitors. The signage will be supported by rammed earth columns set in a landscaped area of enhanced native vegetation.

Fencing

- A perimeter eco-friendly ranch style security fence will be set back from the arrays by 35 ft and will be no closer than 260 ft from SR 58.
- Existing fencing will be retained and repaired for continued use, if feasible and consistent with wildlife conservation measures.
- New, substantially rebuilt, or replaced barbed-wire fences will have the lowest string of the barb wire positioned at least 12 inches above the ground, consistent with the County's San Joaquin kit fox (*Vulpes macrotis mutica*) mitigation standards.
- "Recommendations for Management of Fencing to Reduce Barriers to Pronghorn Antelope Movement," prepared by H. T. Harvey and Associates, are incorporated into the Project design including:
 - Identification and maintenance of likely and feasible movement pathways,

- Removal of non-essential interior fencing,
- Retaining and constructing fencing necessary to deter pronghorn from entering the solar arrays,
- Fencing modifications to enable pronghorn movement through the Solar Generation Facility site (see Figure 5).

Water Tank

- A 271,000-gallon water tank will be located approximately 1 mi northwest of the O&M/Visitor Center area at 2,172 ft in elevation.
- The tank will serve water supply and fire safety requirements.
- The tank will be 48 ft in diameter and 20 ft tall and has been relocated in order to reduce grading and increase the elevation of the tank as necessary to provide gravity-fed hydrants for CalFire use.

Lighting

- All lighting fixtures will be constructed and maintained so as to be shielded so that neither the lamp nor the related reflector interior surface is visible from adjacent properties. Light hoods will be dark colored.
- Permanent lighting will be restricted to the O&M building/Visitor Center, PG&E Caliente Switching Station, substation, and Project entry intersection at SR 58.
- Directional lighting will backlight the entry monument sign.

Structures

The Solar Generation Facility site will include two permanent structures: an O&M building (5,000 square ft, and 25.75 ft high) and a Visitor Center (2,540 square ft, 16 ft high) (see Figure 3). The structures will be developed separately but will be attached together. The Visitor Center will be used for education and public outreach programs in order to familiarize the community and travelers with the Solar Ranch technology and the area in general. The Visitor Center will not be made available for hire or for events such as weddings or parties. It provides an additional visitor serving facility on the Carrizo Plain which will be supportive of visitors planning to visit the Solar Generation Facility or the Carrizo Plain National Monument.

To view the property, visitors will leave the center along a path that crosses a wash and progresses up a slight hill to the Sunset Overlook which will provide panoramic views over the solar arrays. On the east side of the Solar Generation Facility off of Baker Road, the Project includes a corresponding Sunrise Overlook, which features a small parking area and a trail to the top of a small ridge with eastward views of the Solar Generation Facility and the adjacent San Andreas fault scarp. Access to both viewing areas will be via compacted and stabilized

decomposed granite hiking trails colored to match the soil. There will be no lighting along walking trails.

Temporary structures used during installation and then dismantled will include two covered assembly areas (each 180,275 square ft, 35 ft high), a concrete batch plant (8,100 square ft, 47 ft high), and a 50 unit temporary construction trailer park, including a 2000-square ft utility building, covering up to 5 acres that will be restored to a preconstruction state at the end of the construction period. These installations will be located adjacent to the Visitor Center and O&M facilities.

Twisselman Quarry

Aggregate mining currently takes place at the Twisselman Quarry, located 2.5 mi north of SR 58 (Figure 3). The quarry's owner proposes to expand the quarry to service multiple projects, including the road maintenance within the California Valley subdivision, First Solar Topaz Project, and the CVSR Project. The Twisselman Quarry expansion area comprises an area of 25.5 acres. Of this area, 11.5 acres are currently heavily disturbed by ongoing quarry activities. Outside the active quarry footprint, approximately 14 acres comprise annual grassland and 0.02 acres comprise two ephemeral drainages.

Continued mining and expansion of the quarry will take place in multiple phases. The first phase will occur over a 2-year period, with the majority of the extracted materials being used for construction aggregate for the CVSR Project. Materials extracted during subsequent phases will be primarily used for purposes other than the CVSR Project, although a small amount of materials may be used by the CVSR Project for roadway maintenance and other, minor operational purposes during future quarry expansion phases. The duration of the other expansion phases will depend on demand for construction aggregates and may last 20 to 30 years. The hours of operation of the quarry will be from 6:00 a.m. to dusk, Monday through Friday.

Landscape Design

The landscape design for the Solar Generation Facility site is consistent with the existing botanical nature and visual quality of the site. Visual and physical impacts will be minimized and areas disturbed during installation will be reseeded according to the Project's Revegetation Plan to reestablish existing native species. Additional plants that are indigenous to the region will also be included to create more diversity and wildlife habitat.

If necessary, supplemental irrigation will be applied to help establish new plant materials. To conserve water, these supplemental irrigation systems will minimize runoff, over-spray and daytime evaporation. Once the plantings are established, the irrigation systems will be removed or adjusted to reduce application rates to the minimum necessary for plant maintenance.

Trees and shrubs will be planted at the entrance road (in a limited area along SR 58) to screen views of the substation from SR 58 and to screen the O&M building/Visitor Center. The tree

plantings are intended to be reminiscent of hedgerow plantings around farm buildings in agricultural areas.

The design of all signs, monuments, walls, and other structures will blend into the natural environment or reflect the area's ranching background.

Landscaped areas will be planted near the O&M center, entry monument area at the intersection of the Main Access Road and SR 58 and surrounding the substation. The annual water requirements for landscape establishment during the construction phase will be 5.6 acre-ft/year and will be reduced to 3.1 acre-ft/year during the operational phase. Water for landscaping will be divided between irrigating the substation screening, including large trees and shrubs (approximately 514,000 gallons/year), while the rest of the water will be used at the entry monument area and Visitor Center. Landscape irrigation usage should drop by 45% after the landscape is established for 3 to 5 years.

Excess cut will be disposed of in two areas. A majority of the excess cut will be used to reclaim the former mine in Array 11 in the south-central portion of the Solar Generation Facility. This area will be the site of a large array area. In addition soils generated north of SR 58 from array 10 grading, road construction, and grading for the PG&E Caliente Switching Station will be stockpiled at the Twisselman Quarry (County Permit # DRC2009-00004) being expanded in part to provide aggregate materials for the Project's road construction. The soil stockpile area will be shared with the surface mine, and the materials will be transported to the mine as backhaul in association with the delivery of road base for the Solar Generation Facility.

Site Disturbance

Permanent disturbance at the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry will consist of: access roads, structures, parking areas, tracker foundations, tie-line tower pads, equipment pads, hiking trails, substation, PG&E Caliente Switching Station, water supply facilities, security stations, and expansion of the Twisselman Quarry. Permanent site conversion affecting suitable giant kangaroo rat habitat totals 107 acres. The expansion of the Twisselman Quarry increases the area of permanent impacts to 121 acres.

Surfaces of existing roads in the California Valley subdivision along the outer margins of the Solar Generation Facility will be improved with additional aggregate. The area involved is approximately 8.5 acres but is not counted in the above permanent site disturbance total, since the existing roads will not be widened.

The ecological functionality of approximately 1,368 acres of land will be affected as a result of temporary habitat disturbance associated with the installation of solar arrays, grading, construction of associated infrastructure, construction of drainage features, laydown/staging areas, and trenching during construction. This comprises approximately 30% of the site.

The largest proportion (approximately 91%) of temporary and permanent site disturbance will occur in Annual Grasslands (Figure 4). Other vegetation communities impacted by the Project include Wildflower Fields (4%), Interior Coast Range Saltbush Scrub (3%), and Desert Sink Scrub (2%). Minor disturbance (< 1% each) will occur to the other vegetation communities within the BSA.

With the installation of helical piers, the welding of support frames, the installation of tracker panel assemblies, and the attachment of rod and electrical connections, there will be some temporary disturbance around each installation, lasting for 1-2 days as installations in any one area are completed. For construction of Arrays 1, 2, 5, 6, and 8 very little ground disturbance will occur. Rather, trenching for installation of underground conduit and wire, grading for access roads, and screwing the supports for the arrays into the ground will comprise the only ground-disturbing activities necessary for the construction of these arrays. In these areas, construction of the arrays comprises an assembly process more than a typical construction process.

For construction of Arrays 4, 7, 9, 10, and 11, grading will be required to achieve the slopes appropriate for capture of solar energy by the arrays. It is anticipated that material will be moved within arrays and the Twisselman Mine to reduce the slopes in those areas.

There will be a low level of temporary disturbance throughout the entire construction area during installation. Temporarily disturbed areas will be restored in accordance with the Project Revegetation Plan, including re-establishment of native California grassland species after installation is complete. Ultimately, approximately 70% (3,272 acres) will be managed as on-site conservation lands.

An inactive gypsum mine is located in the southwestern portion of the Solar Generation Facility site and includes a large excavated area with nearby storage of mining equipment including abandoned trucks, bulldozers, and scrapers. In addition to closing the mine's permit, HPR II proposes to fill existing pits in the mine and enhance habitat in this 23.2-acre area. Approximately 160 acres of another inactive gypsum mine in the south-central part of the Solar Generation Facility will be regraded; a portion will be used for solar arrays, while habitat for special-status species will be restored in the remainder of this area.

Erosion Control

Erosion control designs for the Project will be prepared by a registered Civil Engineer in conformance with industry standards. A stormwater pollution prevention plan (SWPPP) will outline the various Best Management Practices (BMPs) and define techniques for placement and maintenance. A SWPPP will be prepared prior to the issuance of grading or construction permits based on the final approved design. The erosion control plans will employ typical erosion control devices including straw wattles, check dams, fabric blankets, and silt fencing. All erosion control materials will be biodegradable and natural fiber. No wheel or tire washing is proposed for erosion control measures.

Utilities

Telephone and electrical power service for the Project will be placed underground.

Water Supply Facilities

The Solar Generation Facility site will be served by a new, on-site well. Water to be used for construction and operations is brackish and will be obtained from the on-site well. The water supply from the well has high levels of Total Dissolved Solids (TDS). Proposed water supply facilities include a 400-ft deep well capable of producing 50 gallons per minute, the 271,000 gallon water tank (described above), a small building that will hold reverse osmosis water treatment equipment, and a 1.5-acre brine evaporation pond. All of these facilities are located to the northwest of Array 4 and are designed to meet both water supply and fire safety requirements.

Water will be used during installation for concrete production and dust control. During Solar Generation Facility operations, water will be used for: commercial/office purposes, including the Visitor Center; the operations and maintenance center; and maintenance purposes, such as panel washing and dust control. No additional water will be needed for wheel or tire washing. The water usage requirements for the construction and operation periods are included below in Table 4. The panel washing demand was calculated based on a federally funded research paper written by the University of Las Vegas for HPR II and the U.S. Department of Energy. The sanitary use was based on the San Luis Obispo County Planning and Building Department CEQA water demand calculation spreadsheet for commercial usages. Landscaping water use was calculated by the Project’s landscape architect using standard irrigation factors. Reverse osmosis reject water production was based on manufacturers’ specifications.

Table 4. California Valley Solar Ranch Water Usage during Construction and Operation.

Construction Phase	Daily Demand (Gallons)	Annual Water Demand (Acre-Feet)	Reject Water Production (Acre-Feet)	% of Total Reject Water
Dust Control	20,000	22.4	0.0	0%
Concrete Manufacturing	800	0.9	0.3	7%
Panel Washing	2,350	2.6	0.9	21%
Sanitary Uses	3,000	3.4	1.1	27%
Landscaping	5,000	5.6	1.9	45%
Reverse Osmosis Reject Water	3,717	4.2	4.2	100%
Total	34,867	39		
Operation Phase	Daily Demand (Gallons)	Annual Water Demand (Acre-Feet)	Reject Water Production (Acre-Feet)	% of Total Reject Water

Construction Phase	Daily Demand (Gallons)	Annual Water Demand (Acre-Feet)	Reject Water Production (Acre-Feet)	% of Total Reject Water
Panel Washing	4,700	5.3	1.8	57%
Sanitary Uses	830	0.9	0.3	10%
Landscaping	2,732	3.1	1.0	33%
Reverse Osmosis Reject Water	2,726	3.1	3.1	100%
Total	10,989	12.3		

HPR II intends to install a Reverse Osmosis (RO) system to remove excess TDS from its water supplies. RO systems remove all of the dissolved solids and as a byproduct produce “reject water,” containing high concentrations of minerals and salts, which must be appropriately disposed of in order to protect water quality and comply with water quality objectives set by the Central Coast Regional Water Quality Control Board (RWQCB).

Large scale industrial/municipal systems can have production efficiencies of up to 80% because they can generate the higher pressures needed for efficient reverse osmosis filtration. In comparison, small capacity household RO systems have recovery rates of 5 to 15%. They generate inversely larger quantities of reject water. For the CVSR Project, it is assumed that the large high pressure RO system will only produce 25% reject water.

Reject water from the RO process will be disposed of in two lined evaporation ponds that will be subject to the jurisdiction of the RWQCB. The evaporation ponds will be constructed using synthetic liners and using a carefully engineered design. The lined ponds will gradually fill with solids from the evaporation of the reject water and the solids will be removed on a regular basis. Waste materials will be hauled to an appropriate landfill for disposal.

Reject water is conveyed to the evaporation ponds where it is spread out over a large area and allowed to evaporate. The Project will include two ponds that will be used during the Construction Phase when reject water flows will be high and then be managed to allow one to be periodically taken off line for maintenance during the Operation Phase. The sizing on the ponds will take into account standard engineering parameters based on the Construction Phase water usage, thus being oversized for the Operation Phase.

Periodic maintenance includes allowing the evaporation pond to set idle to firm the consistency of the precipitated salts, cleaning the ponds by removing and transporting the precipitated salts to a landfill, and inspecting the protective lining system.

Evaporation ponds are most effective in arid climates such as the Carrizo Plain which have high net evaporation rates. High net evaporation rates decrease the pond area required because evaporation occurs in less time. Preliminary engineering analysis suggests a 1.5-acre pond with another acre for supporting earthwork will be adequate. Final designs will be prepared by an

experienced sanitary engineer. The pond will be sited near the water tank and designed with 2 ft of freeboard.

Wastewater

A septic tank and leach field will be constructed north of the O&M building/Visitor Center to treat wastewater flows from the Solar Generation Facility. This system will also serve the 50-unit temporary trailer park during construction. A qualified soils engineer will direct leach field construction in an area of engineered fill using suitable soils necessary for system-appropriate percolation rates. No effects are anticipated on groundwater or any community wastewater service provider. No surface discharges are proposed, other than natural storm water runoff. Proposed leach field areas are located within an area with a depth of at least 10 ft of engineered fill. The field will be in the fill high about native soils. The engineered fill will be designed to create a profile to handle the percolation of wastewater effluent consistent with all County and RWQCB regulations.

Site Circulation

- All fire access roads will be improved to a standard 24-ft width with two 10-ft travel lanes and two 2-ft shoulders with an aggregate base surface.
- Access drives within each arrays will be cleared, compacted and treated with a soil binder for stabilization during the construction phase and left open during operation for infrequent maintenance access and emergency use.
- Access to east-west aisles will be obtained via access drives within each array.
- The site will not require wider aisles as those already shown on the site plan are sufficient for CalFire access.

Vegetation Management for Fire Suppression

HPR II will implement a controlled grazing plan to manage annual grassland fuel loading and heights on the site so as to control vegetation for fire deterrence purposes. Sheep and/or goats will be utilized for grazing in the array area, allowing consumption of undesired vegetation that may increase the likelihood of a grass fire. Grazing in the on-site conservation areas will utilize cattle, which are more effective at maintaining suitable habitat conditions for the target special-status species and which are currently grazing the Solar Generation Facility site. The grazing program will significantly reduce fire intensity by lowering fuel levels. Research conducted in California annual grasslands shows that livestock grazing results in a decrease in vegetation height and volume and an increase in small mammal populations (Page et al. 1978). Grazing management will be a key to the prevention of wild fires from impacting the Project and will be carried out in a manner to protect wildlife populations.

In the spring of each year, the areas under and around the solar arrays, and the conservation areas, will be grazed to reduce vegetation heights to less than 6 inches prior to the start of the

summer fire season. Given the arid nature of the Carrizo Plain, a one-time annual grazing, if needed, is expected to be sufficient to achieve this goal. The exact target vegetation height for the array areas will be determined in coordination with CalFire, the California Department of Fish and Game (CDFG) and the U.S. Fish and Wildlife Service (USFWS) during the Endangered Species approval process. Given that the endangered species of principal concern on the site, such as the San Joaquin kit fox and giant kangaroo rat (*Dipodomys ingens*), thrive in areas of low grass heights, it is expected that the dual goals of enhanced fire safety and endangered species habitat protection can be achieved.

Primary Staging Area

A primary staging area, approximately 6 acres in area, will be constructed to handle major operations throughout the installation period. This area will include the facility's O&M building, two temporary covered assembly areas, a large fenced yard surfaced with aggregate base, employee parking, and a temporary concrete batch plant. The O&M building will include Project office space, a first aid station and loading and unloading docks. This area will be serviced by portable toilets in addition to the permanent restrooms in the O&M building.

During peak installation times, up to 96 workers will assemble the individual tracker units and foundations within the covered assembly areas. The tracker units will then be loaded onto flatbed trucks for distribution throughout the site. Assembly rates will ramp up early in the installation period as the electrical infrastructure is built. Continuous tracker deployment on-site will begin halfway through Phase 1 and continue until the site is fully operational at the end of Phase 3.

Installation Phases

Installation of facilities on the Project site will occur in three phases, each phase lasting less than 1 year. Phase 1 will encompass general site improvements. Access points and fire access roads will be developed. Installation of the underground and overhead medium voltage collection system will begin along the fire access roads and between tracker rows. The substation and PG&E Caliente Switching Station locations will be cleared, graded, and constructed. The substation, PG&E Caliente Switching Station, and transmission lines will be completed during the first year of installation, allowing the solar arrays to begin operation as soon as the first tracker systems are deployed and generate solar power. This phase will also include the development of the primary staging area.

Phase 2 will extend the development of fire access roads and the medium voltage collection system as the site's arrays are installed. Ten temporary staging areas, each up to 6 acres in area and totaling 54 acres, will be constructed as needed to support installation of each array area for job trailers, outdoor storage space, first aid stations, employee parking, and sanitary stations. Temporary lay down areas less than 1 acre in size will be constructed at the intersection of each fire access road. The temporary staging and laydown areas will be deconstructed and overlaid with tracker units as installation progresses throughout the site.

Phase 3 will continue the progress made in Phase 2 with additional road improvements, temporary staging and laydown areas, and infrastructure installation. As the arrays near completion, all temporary staging and laydown areas will be deconstructed and removed from site, the land will be reseeded and revegetated, and T0 Tracker units will be installed in those areas. Once installation is complete, the primary staging area will be downsized and converted to contain an O&M facility, Visitor Center, office space, and material storage facility. These permanent facilities will be serviced solely by the septic system and temporary restroom facilities will be removed.

For the CVSR Project, workers will be grouped into three categories:

- (1) HPR II management and supervisory personnel;
- (2) Grading, construction, and electrical contractors; and
- (3) Assembly workers.

For an illustrative 3-year construction period, activities will include the following:

- Initial grading, construction of staging areas and related facilities (water treatment, water storage and assembly areas), and grading of access roads for initial array construction (approximately 1 month).
- On-site assembly of trackers, support post installation, tracker installation, and electrical equipment for initial array; simultaneous construction of substation, transmission line, PG&E Caliente Switching Station, O&M building, and simultaneous grading of access roads for subsequent array (months 2-8 for common facilities and 2-36 for arrays).
- Continued and increased on-site assembly and installation of trackers and electrical equipment for subsequent arrays, and simultaneous grading of access roads for each subsequent array (months 2-36).
- On-site assembly and installation of trackers and electrical equipment for final arrays, completion of visitor facilities, and related final construction (months 35-36).

The construction stages described above overlap one another, with grading and access road construction preceding the installation of trackers and associated equipment within each array area. After the common facilities are completed in the earlier stages the workforce can be devoted more to array construction in the later stages. The workforce projection is based on assembling and installing arrays at a rate of 4 MW per month for the first 6 months (approximately 38 tracker assemblies per day), with increases to 6 and then 14 MW per month for the later 2 years of construction, respectively.

Personnel

During the installation period, construction workers will be on-site in three staggered shifts with arrivals and departures scheduled between 7:00am-4:00pm, 8:00am-5:00pm, and 9:00am-6:00pm, 5 days-a-week, year-round, except for standard U.S. holidays. Managerial staff would typically have more varied schedules with arrivals and departures between 6:00am-7:00pm. Due to extreme heat in the summer months (June-August), the construction crews may shift hours to start as early as 5:00am and end as late as 8:00pm, to allow for work during cooler hours of the day. Normal maintenance activities will not occur during night hours. Security personnel will be on-site every hour, every day during the construction and installation phases, working in 8-hour shifts. A 50-unit temporary construction trailer park will be available for personnel during construction phase. The spaces will be used for an average of 250 days per year, with many workers not on-site during weekends and occasional vacancies. The hours of operation of the Twisselman Quarry will be from 6:00 a.m. to dusk, Monday through Friday.

The Solar Generation Facility will be partially operational approximately 1 year into the installation period, becoming fully operational once installation of the arrays is complete. The facility will operate 7 days/week during daylight hours. During this time, O&M personnel will work in the O&M building and monitor the system's performance. The Visitor Center will be open for limited hours of operation and for scheduled tours and educational and public outreach events.

Personnel and Off-site Traffic

During peak installation times, up to 500 workers may be on the Project site. A 50-unit temporary construction trailer park will be available for Project personnel. Carpools and dedicated buses will be established for workers to commute to the site to reduce overall traffic to the site. A dedicated Park & Ride location will be designated in the San Luis Obispo and Paso Robles-Atascadero areas, with 10 shuttle trips per day from both locations. During the 36-month construction and installation period, the average number of workers on-site will be 214; the anticipated high number of workers will be 353; and the short-term peak number of workers may be as high as 500. The worker traffic projections are based on the short-term peak number of 500 and represent a worst-case analysis regardless of the length of the construction period assumed. Updated worker traffic estimates are as follows:

- Bus trips per day: 10
 - 35-passenger motor coach, no more than 40 ft in length
- Automobiles trips per day (2 trips/worker-day): 625
 - Personal vehicles

Adjusting the traffic estimates for the average of 214 workers per day:

- Bus trips per day: 4
 - 35 passenger motor coach, no more than 40 ft in length
- Automobile trips per day (2 trips/worker-day): 268

Origin and travel distance for workers:

- 25% from San Luis Obispo area (approximately 60 mi)
- 25% from Paso Robles – Atascadero (approximately 60 mi)
- 25% from Kern County (up to 60 mi)
- 25% from “local” area (<35 mi)

Employee bus service will be provided for the San Luis Obispo and Paso Robles – Atascadero areas only, and assumes that 75% of workers from these areas will rely on the bus service.

Traffic projections are summarized in Table 5.

Table 5. California Valley Solar Ranch Traffic Information.

Traffic Type	Total Roundtrips During Construction	Daily Construction Roundtrips and (trip ends)	Trip Types: “Site”= < 5 miles “Local”= <30 miles “Remote”= >30 mi.
Aggregate Base Material ¹ (foundation, access roads)	10,977	17 (34)	Site
Backhaul excess cut	11,665	16 (32)	Site
Water Trucks, dust control	3,780	5 (10)	Site
Concrete Raw Material	4,537	8 (16)	87% Local 13% Remote See Table 7-
PV Module Delivery Trucks	3,160	5 (10)	Remote
Steel Tracker Components	3,476	3 (6)	Remote
Transmission Towers	60	1 (2)	Remote
Substation, Switching Station Equipment	250	1 (2)	Remote
Electrical Bill of Materials	1,991	3 (6)	Remote
TOTAL TRUCK TRIPS DURING CONSTRUCTION	47,933	77 (140)	Site = 42 (74) Local = 14 (26) Remote = 21 (40)
EMPLOYEE TRIPS Car and Bus Trips During Construction	247,590	328 Vehicles (5 buses (10 1- way trips/day) with 35 people per bus 323 individual vehicles (635 1-way trips/day). See text for distances.	

¹Refers to traffic/travel for transporting base aggregate material from the Twisselman Quarry to the rest of the Project site.

Construction traffic originating in Kern County (Bakersfield) will be directed along SR 58 West. Traffic originating in San Luis Obispo County (San Luis Obispo and Paso Robles) will be directed along Highway 46 to Shell Creek Road.

A majority of all equipment will be delivered to the Project site in standard width and length 53-ft covered vans or 48-ft flatbed trailers. Substation equipment and cranes will be delivered to the site on wide load trailers. These trailers will require pilot cars and are not expected to make more than 64 round trips throughout the installation period. Deliveries will be intermittent throughout the day. A majority of the delivery and truck traffic will travel along Highway 46 to Shell Creek Road as determined through consultation with CalTrans and County Public Works.

The projected number and length of daily truck deliveries, based on a 36-month construction schedule that will occur when accessing the proposed aggregate mine, are shown in Table 6 below.

Table 6. Projected Number and Length of Daily Truck Deliveries.

Description and Purpose	Approx. Distance	Average Daily Trips
“On-site” trips between the Twisselman surface mine and Project site, for the purpose of hauling road base from the surface mine to the site, hauling export material from the Project site to the stockpile area at the surface mine, watering for dust control.	5.2 mi	74 (32 trips per day for base material transport + 32 trips per day for site export + 10 trips per day for water truck, mostly on HPR II site)
“Local” trips to bring PC grade aggregate to Project site from nearest suitable supplier.	30 mi (Navajo Quarry is approximately 23 mi)	26
“Remote” trips to deliver equipment, panels, trackers, and construction supplies.	>30 mi (typical distance from nearest cities is 60 mi)	40

“Remote” trips involve large trucks delivering electrical equipment, tower components, and other large items. The total number of such deliveries anticipated during the 36-month construction period is 11,233. This results in twice the number of truck trips of 22,466. Spread evenly over the 36-month construction period, this amounts to 40 heavy truck trips per day.

On-site Vehicle Movement

On-Site Vehicle Movement during Project Construction/Installation

During installation, all traffic will enter the site at the Solar Generation Facility entry along SR 58 at Boulder Creek Road. Here, there will be a required security check-in point where all

vehicles will then be directed to the appropriate area on-site. Temporary parking will be adjacent to the security check-in point to avoid back-up on SR 58. All vehicles will travel along fire access roads to traverse the site. In inclement weather, a traffic control plan will limit disturbance to on-site roads.

During construction, a variety of equipment will remain on-site for construction use for months or years at a time. A list of construction equipment expected to be used on the Solar Generation Facility, generation tie-line, and switching station sites appears in Table 7 below.

Table 7. Construction Equipment Overview.

Vehicle Traffic Use	Vehicle Type	Max Weight (lbs)	Tread Type	Qty On-site
Grading & Travel On Main Roads	Scraper	77,800	Dual Axle	3
	Motor Grader	30,000	Dual Axle	3
	Excavator	36,000	Tractor	4
	Dozer	44,582	Tractor	3
	Dump Truck	35,000	Dual Axle	4
	Pad Drum Vibratory Roller	27,340	Dual Axle	2
Between Tracker Rows	4000 gallon water truck	53,220	Triple Axle	6
	Concrete Trucks	46,000	Triple Axle	6
	Backhoe Loader	13,046	Dual Axle	2
	Truck mounted crane	28,800	Dual Axle	4
	Grade-all	10,000	Dual Axle	4
	Flatbed trucks w/ Precast Concrete Foundations	60,000	Triple Axle	4
	Trencher	5,500	Dual Axle	3
	Light Weight Trucks	6,000	Dual Axle	50

Vehicles needed for installation of the site’s tracker units will travel on temporary construction access drives and tracker aisle areas within the site’s array sections. The length, width, and acreage of the temporary access drives required during construction and for limited use during operations and length, width, and acreage of the temporary access drives required during construction and for limited use during O&M activities are summarized in Table 8 below.

Table 8. Access Areas during Construction and O&M.

	Length	Width (ft)	Area (acres)
Access Drives	41,034 ft (7.8 mi)	20	18.8
Array Drive Aisles	350,102 ft (66.3 mi)	12	96.4

A Bobcat-sized piece of equipment is used to drive the foundation screws or helical piles for the T0 Tracker foundations. Once the foundations are placed, flatbed trucks carrying pre-assembled T0 Tracker units will place them onto the foundations. Lightweight vehicles will be used to access each tracker for wiring. When possible, all vehicles traversing through each row will

travel from east to west or vice versa. Approximately 20 small gasoline generators will be used to power welding machines to assemble trackers and for use in the field to construct tracker arrays.

On-Site Vehicle Movement during Project Operations

Once installation is complete and the Solar Generation Facility is fully operational, all traffic (staff and visitor) will enter the site from SR 58 at Boulder Creek Road. To access the Visitor Center, vehicles will travel along Boulder Creek Road. Aside from the Visitor Center, hiking trails and viewing areas, the facility will be restricted to O&M staff and security personnel only. The O&M staff will use lightweight vehicles and all-terrain vehicles for traversing the site along fire access roads.

Security staff will traverse the site around the clock, 7 days/week in lightweight vehicles and all-terrain vehicles primarily along perimeter fire access roads. Maintenance staff will traverse the site in lightweight vehicles and all-terrain vehicles 5 days per week.

Panel washing crews are scheduled to clean the panels during daytime hours approximately two times per year. They will traverse the site in a purpose-built lightweight to medium duty truck 5 days per week which will be fitted with a water tank and air compressor to operate a high-pressure sprayer and cleaning brush system without the use of solvents or chemicals.

Operations

The full-time staff of the CVSR Project is expected to consist of 1 site manager, 4 technicians, and 6 security personnel. Additionally, wash crews of approximately 4 workers will be employed to keep the PV panels clean to maximize performance.

A major focus of the operations of the Project is monitoring system operational status, performance, and diagnostics from the main control room in the O&M Facility. System production forecasting and scheduling with PG&E and the California ISO will also occur in the O&M Facility along with operational planning. Operations activities will also include meter reading and production reporting along with updating O&M manuals. Visitor and educational tours are expected to be a regular part of the operational activities of the Solar Ranch. Vehicle use associated with on-site tours will occur on a weekly basis.

During operations, service traffic is expected to average one delivery per day. This would include delivery of any parts, material, and documents, and service trips by vendors or other contractors.

Security monitoring will also occur from the Solar Generation Facility's main control room and through visual inspection from routinely driving the perimeter roads. The Solar Ranch will be equipped with day/night closed circuit security cameras throughout including motion detection triggering automatic recording, video recording and analysis, and an intelligent video

management system. The Solar Ranch will also be equipped with a perimeter detection system and a perimeter position system with an intelligent analytics to distinguish between different signal events and locate their position. No fixed lighting will be installed as part of the security equipment for the Project.

One or two dozers comprise the primary equipment that will be used for quarrying of rock from the Twisselman Quarry.

Maintenance

Preventative Maintenance

- System testing to ensure the Solar Ranch is operating at peak performance
- Visual inspections of array mechanical components, PV mounting systems, and PV modules
- Visual inspection of AC and DC electrical components, including conductors, conduit, connectors, fused and unfused disconnects, and switchgear
- Inspection of tracker control enclosures and components
- Inverter inspection and cleaning of fans and enclosures
- Annual lubrication of worm gear lubricant
- Testing of DC array circuits
- Check torque on electrical terminations throughout system
- Check torque on mechanical connections throughout system
- Meter reading
- Routine system maintenance to include correction of loose electrical connections, ground connections, replacement of defective modules found during testing, other minor maintenance repair work
- Landscape maintenance, including signage described in *Conservation Measures Incorporated into the Project* below.

Corrective Maintenance

- Replacement of broken or non-functioning PV panels
- Tracker troubleshooting and repair
- DC and AC circuit troubleshooting and repair, including fault situations
- Monitoring equipment and sensor troubleshooting and repair
- Major system repairs

- System troubleshooting and repair both in the field and in the Operations & Maintenance Facility shop

Washing

- To optimize performance of the Solar Ranch the solar PV panels will be washed approximately two times per year, during daytime hours.
- Washing requires only water—no solvents or other chemicals are needed.
- Panels are sprayed with high-pressure water and agitated with a brush to loosen dust and dirt and sprayed again to wash them clean.
- Approximately 1 gallon of water is needed to wash a single solar panel.

Lighting

Temporary pole mounted directional generator lights will be used to:

- Support construction activities during early morning and late afternoon in the winter.
- Support emergency operations during outages at the substation or other areas of the Project site.
- Illuminate portions of the temporary construction trailer park for safety purposes.

Permanent lighting will be added at the O&M building, Visitor Center, substation, switching station, and water treatment plant. New light sources will be minimized, and lighting will be designed (e.g., using downcast lights) to limit the lighted area to the minimum necessary.

Noise

Noise from the Solar Generation Facility during operations will be limited to light duty vehicle traffic for security patrols, maintenance staff, and wash crews. High voltage transmission lines and transformers emit low levels of noise. See Table 9 for a listing of relative noise levels (those associated with activities on the CVSR Project are boldfaced).

The Project design specifies the use of helical piles or ground screws. These elements are installed with rotary drilling equipment similar to that used for hollow stem augers. Such equipment may range in size from a small unit mounted on a “bobcat” sized vehicle, to larger drilling rigs mounted on specialty trucks. Noise results from the motor exhaust and from the mechanical noise of the rotary drill. A typical noise level for this equipment is 90 dBA at 10 ft, similar to that of many typical construction vehicles.

Table 9. Typical Sound Levels for Select Noise Sources.

Type of Activity	Sound Level in Decibels (dB)	Subjective Impression
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Type of Activity	Sound Level in Decibels (dB)	Subjective Impression
Civil Defense Siren (100 ft)	140	Pain Level
Jet Takeoff (200 ft)	120	Pain Threshold
Loud Automobile Horn (3 ft)	115	Extremely Loud
Jet Takeoff (2,000 ft)	105	Very Loud
Pile Driver (50 ft)	100	Very Loud
Freight Cars (50 ft)	95	Very Loud
Heavy Truck (50 ft)	90	Very Loud
Ambulance Siren (100 ft)	90	Very Loud
Riding Inside a City Bus	83	Loud
Pneumatic Drill (50 ft)	80	Loud
Alarm Clock (2 ft)	80	Moderately Loud
Average Traffic on Street Corner	75	Moderately Loud
Freeway (100 ft)	70	Moderately Loud
Vacuum Cleaner (10 Ft)	69	Moderately Loud
Conversational Speech	60	Medium
Department/Large Retail Store	60	Medium
Light Auto Traffic (100 ft)	55	Medium
Large Transformer (200 ft)	40	Quiet
Library	35	Quiet
Soft Whispering (5 ft)	30	Quiet
Transmission Line	20	Quiet
Hearing Threshold	10	Very Quiet

Decommissioning

The same features of SunPower's T0 Tracker technology that contribute to the low impact nature of its deployment also make it simple to decommission. If at the end of the contract term to sell energy to the utility buyer, no contract extension is available or no other buyer of the energy emerges, the solar plant can be de-commissioned and dismantled.

The solar PV panels will still have a useful life and will still be capable of producing electricity. Decommissioning would first involve removing the panels for sale into a secondary solar PV panel market. The majority of the components of a solar PV installation can be easily removed from the site and are made of aluminum and glass, both materials that can be readily recycled. The tracker structures and mechanical assemblies are made from galvanized steel.

The LIP foundation design minimizes the use of concrete. What concrete is present may not be economical to recycle because of its low value and the site's distance from markets, and this concrete may be processed with a portable crusher for use locally as a high quality road base or for use as clean fill. Wiring is made from copper and/or aluminum. Equipment such as drive controllers, inverters, transformers, and switchgear can be either re-used or their components recycled.

Underground conduit and wire can be removed by uncovering trenches and backfilling when done. Appropriate erosion control measures will be utilized throughout the decommissioning process, and a revegetation plan will be implemented to repair any temporary disturbance from decommissioning activities. This would be very similar to the detailed revegetation plan outlined to repair temporary disturbance from installation activities.

The steps to demolish a solar field include:

- (1) Dismantle PV panels, palletize and transport to SunPower California warehouse
- (2) Disassemble tracker, cut all wires
- (3) Load steel from trackers into dumpsters and truck to recycling plant
- (4) Load concrete bases (inverter foundations, drive motor bases) into dumpsters and truck to crushing plant
- (5) Coil and load copper wire into dumpster and truck to recycling plant
- (6) Load inverters, transformers, combination boxes, and substation equipment into dumpsters and truck to landfill and/or recycler
- (7) Remove wire cabling from trenches, cut and load into dumpster and truck to recycling plant
- (8) Load drive skid motor assembly into dumpster and truck to recycling plant for steel recovery
- (9) Clean up site, remove debris, revegetate disturbed areas, and leave as it was 25 years prior.

Precedence exists in this area for solar PV plant decommissioning. The ARCO Solar PV installation that was in operation from 1983 to 1994 was dismantled in the late 1990s. The land is currently in use for dry farming, the same as its prior use and the current use of adjacent parcels. Many of the panels have been put into productive use on a small scale at individual ranches and residences in the local area to offset a portion of their grid power.

- HPR II is planning the CVSR Project such that almost all of the Solar Generation Facility site (with the exception of the water tank and buildings) can be realistically considered restorable and has provided a financial analysis demonstrating how the residual value of the solar equipment would make it financially feasible to remove the equipment and to restore the site at the end of the Project period of operations, if at the end of the contract term to sell energy to the utility buyer, no contract extension is available or no other buyer of the energy emerges. Roadways would be left in place to support future agricultural operations, and the O&M Building and Visitor Center could be converted to an agricultural related use or other use consistent with County policies in place at the time of closure. The revegetation plan that will be prepared for the site, as described

under *Design Measures* below, will include a section on site revegetation following decommissioning of the site, should decommissioning occur.

Hazards and Hazardous Materials

All fuels, fluids, and components with hazardous materials/wastes will be handled in accordance with applicable regulations. All such materials will be kept in segregated storage with secondary containment as necessary. HPR II will maintain all records of storage and inspection and will provide for proper offsite disposal.

The small quantities of hazardous materials to be stored at the site during construction and operations are listed in Table 10 below. These materials will be stored in a neat, orderly manner in their appropriate containers in an enclosed and secured location such as portable outdoor hazardous materials storage cabinets equipped with secondary containment to prevent contact with rainwater. The portable hazardous materials storage cabinets may be moved with each block of development, as deemed necessary.

The products described in Table 10 below will be present on the Project site during construction and operations:

Table 10. Hazardous Materials.

Product	Use
Diesel fuel	Vehicle maintenance
Gasoline fuel	Vehicle maintenance
30W motor oil & used motor oil	Vehicle maintenance
Antifreeze & used coolant	Vehicle maintenance
Transmission and hydraulic fluids	Vehicle maintenance
Envirotemp FR3 cooling fluid product	Transformers coolant
Mobilgrease XHP 461	Lubricating drive motors
DuPont Corlar® Epoxy Paint	Tracker maintenance
DuPont Corlar® Activator	Tracker maintenance
ZRC® Cold Galvanizing Compound	Tracker maintenance
Surfactant (such as Liquinox and Alconox)	Tracker maintenance
Light lubricating oils (WD-40)	General maintenance
Latex and oil based paints	General maintenance
Paint thinners/solvents	General maintenance
Cleaning products	General maintenance
APCD approved dust suppressant	General maintenance
Propane fuel	Emergency generator, space heating
Acetylene gas	General maintenance
Compressed oxygen	General maintenance
Herbicides, pesticides, fertilizers	Landscape maintenance
Water treatment chemicals	General maintenance

BMPs will be implemented to reduce the risk of spills and other accidental exposure to hazardous materials and waste during construction and operation of the Solar Ranch. During construction as staging areas are established across the site, temporary hazardous materials storage will not be located immediately adjacent to any drainage. If excess materials must be disposed of, it shall be done in accordance with local, state, and federal regulations.

An above-ground gasoline storage tank of up to 2,000 gallons will be located to the south of the O&M building in order to support permanent operations (this is a tentative sizing based on 3 to 6 months of fuel for O&M uses). Gasoline storage and dispensing plan would be developed in order to allow for more efficient on-site refueling of construction and operations and maintenance vehicles. A Certified Unified Program Agency (CUPA) Business Plan will be filed through the San Luis Obispo County Division of Environmental Health prior to the start of construction.

During construction, a refueling truck (4,000 gallon capacity) will supply fuel to on-site equipment. A maintenance truck carrying oil, hydraulic fuel, antifreeze, and grease, will periodically service equipment on site. Quantities and storage details for these substances depend on the service provider. These materials are typically stored and transported in dual walled tanks on refueling trucks or on specialized service trucks carrying 400 gallons of oil, 200 gallons of both hydraulic fluid and antifreeze, 120 pounds of grease, and salvage tanks of 200-400 gallons. These sizes and amounts are approximations only, since they depend on the details of equipment used by service contractors.

No significant use of herbicides is proposed, but very small volumes may be kept in the maintenance building for spot use in landscaped areas.

The Project transformers (both across the site and in the substation) will utilize an environmentally friendly cooling fluid product known as Envirotemp FR3. FR3 fluid is a soy-based (food grade), fire-resistant fluid and is PCB-free. FR3 fluid is the only non-silicone fluid that meets both the National Electric Code (NEC) and National Electric Safety Code (NESC) standards for less-flammable formulation as well as the UL listing requirements for use in electrical transformers (EOVK listing). Envirotemp FR3 fluid is also the only dielectric fluid to meet the strict quality control for optimum transformer cooling characteristics and offer additional advantages such as the highest flash/firepoint, best environmental profile, extended transformer insulation life, increased performance, and lowest cost. Normal industry practice is to use mineral oil based transformer fluids that are classified as hazardous materials.

Spill Response Plan

A site-specific spill response plan will be developed prior to construction and operation of the Solar Ranch. The spill response plan will include typical spill response plan elements, including:

- General information:

- Name and location of facility
- Description of facility operations
- General manager and emergency coordinator names and phone numbers (home, work, pager, and mobile contact information)
- Description of what is stored at the facility (contents and volume)
- Site diagram showing:
 - Hazardous materials storage areas
 - Drains (storm and sanitary)
 - Surface waters
 - Buildings
 - Surrounding neighborhood
- Prevention: a description of prevention measures to be taken during construction and operations, such as secondary containment, employee training, and proper storage.
- Preparedness: a description of the planned on-site equipment for spill response and its location. Also to be included:
 - The Applicant's plan for health and safety training, DOT required training, and spill response training.
 - Local, state, and federal regulatory agency reporting procedures and phone numbers, as well as emergency response contractor contact information and local hospital contact/local information.
 - Response Procedures: an outline of emergency response procedures, including physical spill cleanup procedures, reporting requirements, and stabilization techniques.

No large quantities of hazardous materials are expected to be used or stored on any portion of the Project site during construction or operation of the CVSR Project. Spill cleanup materials and equipment appropriate to the type and quantity of hazardous materials expected will be located on-site and all personnel will be informed of their location. The site superintendent will conduct routine inspections to ensure that all materials on-site are being stored and disposed of appropriately. Key employees will be trained in spill response procedures in accordance with local, state, and federal regulations. In addition, Material Safety Data Sheets (MSDS) will be kept on-site during construction and operation of the solar farm.

Products will be kept in their original containers with the original manufacturer's label and resealed when possible and manufacturer's recommendation for proper disposal shall be followed. Spill response materials including brooms, dust pans, mops, rags, gloves, absorbent

pads/pillows/socks, sand/absorbent litter, sawdust, and plastic and metal containers will be kept on site. Spill guidelines will include:

- All spills will be immediately cleaned up upon discovery.
- The spill area will be kept well ventilated and personnel will wear the appropriate protective clothing to prevent injury when cleaning up a spill.
- Reportable quantities of spills of hazardous materials will be reported to the appropriate local, state, and federal authorities.
- All vehicles leaking oil or fluids will be scheduled for maintenance and will have drip pans under the leak when parked prior to the maintenance event.

CONSERVATION MEASURES INCORPORATED INTO THE PROJECT

A number of conservation measures to reduce or compensate for impacts to federally listed species have been incorporated into the Project. These include efforts to design the Project to avoid or reduce impacts, measures that will be implemented during construction and operation of the Project to avoid and minimize impacts, and measures to compensate for impacts to listed species and their habitats through the enhancement, management, and preservation of habitat outside the Project's impact areas, both on-site and off-site. These measures are described below.

Design Measures

The boundary of the Solar Ranch arrays and transmission easement is based on a detailed analysis of recorded area maps. These boundaries were plotted onto a topographic map with 5-ft interval contours to create the base for the Solar Generation Facility design.

A hydrological review of the site analyzed both on- and off-site drainage conditions. Based on these hydrologic and topographic maps, a preliminary engineering design was crafted around the following objectives:

- Lowest impact development possible given priority resource avoidance
- Minimal permanent site disturbance
- Minimal temporary site disturbance
- Minimal or no change to existing drainage patterns
- Reclamation and enhancement of the existing gypsum mine
- Storm water quality and drainage infrastructure improvement
- Restoration of areas of temporary disturbance post installation
- Compatibility, to the extent practicable, with existing species and habitat

The topographic mapping revealed slopes of 5% or less throughout a majority of the site. In most areas, SunPower's T0 solar tracker units would thus require limited grading prior to installation, as they could be placed directly on most existing ground terrain. The need for grading would be limited primarily to those areas where slopes are unsuitable for solar arrays, but being developed to maximize avoidance of giant kangaroo rat precincts.

SunPower's T0 Tracker has several key attribute that make it the best choice for large-scale solar power generation. Compared to fixed-tilt systems, the T0 Tracker typically provides 15–30% higher energy output from the same size array or number of modules. This result is due to the fact that, while fixed-tilt system output peaks at midday when the sun is to the south, the T0 Tracker follows the sun's path precisely and constantly throughout the day. This increased output is realized with only a slightly more complex system, resulting in a much more cost-effective solution. This efficiency allows for increased energy output from a smaller footprint system.

Surface-mounted trackers, like the T0, minimize impact on local species and vegetation. Trackers rest lightly on the land, allowing sun, air and rain to reach the landscape below. Adjustable tracker legs allow each tracker to adjust to the topography, minimizing the need for grading.

The Biological Resources Assessment Report submitted to San Luis Obispo County for its use in preparing an Environmental Impact Report for the Project, as well as subsequent reports documenting biological resources in areas that were subsequently added to the BSA to reduce impacts, contains a review of habitats and sensitive species on the property. This information was used extensively in developing the layouts for the photovoltaic arrays and other facilities.

After a review of this biological resources information, HPR II proposed an array layout using the SunPower T20 tracker that required virtually no grading for installation of the arrays. However, due to constraints on the dimensions of feasible layouts and slopes suitable for the T20 tracker, that array layout would have required the placement of arrays on extensive areas that were found to support giant kangaroo rat precincts. In order to reduce impacts to that species, HPR II modified its approach by proposing the use of the T0 tracker, which allows for the collection of the same amount of solar energy in a smaller overall footprint, and by relocating several of the proposed arrays to areas supporting low densities of, or no, giant kangaroo rats. However, because the T0 tracker is not angled toward the sun, and because the areas supporting dense concentrations of giant kangaroo rat precincts were in some of the areas most conducive to placement of arrays without the need for grading, the need for grading has increased as a result of these design modifications. Nevertheless, impacts to high-quality habitat for listed species have been reduced considerably by these modifications.

Measures incorporated into the Project design and planning to avoid or minimize effects on biological resources include the following:

- Avoidance of areas of relatively high sensitivity, including:
 - Areas of greater giant kangaroo rat precinct densities
 - Atriplex scrub habitat, Interior Coast Range scrub and Wildflower Field, Retired dry-farmed field (all north of SR 58)
 - Alkalai sink habitat (south of SR 58)
 - Lower-elevation areas that contribute drainage to offsite vernal pools (Northern Claypan Vernal Pool habitat)
 - Ephemeral drainages and seasonal wetlands to the maximum extent practicable (with a buffer of at least 250 ft between any grading or solar arrays and seasonal wetlands in the southwestern part of the Solar Generation Facility and a buffer of 100 ft between solar arrays and ephemeral drainages wherever feasible)
 - Areas supporting evening primrose (*Camissonia* spp.), which could serve as a larval host foodplant for the Kern primrose sphinx moth (*Euroserpinus euterpe*)
 - Possible habitat areas for San Joaquin antelope squirrel (*Amмосpermophilus nelsoni*)
- Retention of land within the HPR II parcels for continued agricultural and conservation purposes, including large contiguous habitat areas supporting the greatest densities of giant kangaroo rats within the study area.
- Design of array foundations and supporting structures that preserves most of existing grassland ground cover and habitat for giant kangaroo rat, an important prey species of the San Joaquin kit fox.
- Design of a fencing program that allows passage through the fencing by pronghorn antelope (*Antilocapra americana*) and other species (see Figure 5).
- Design of the arrays to incorporate movement pathways for San Joaquin kit fox, pronghorn antelope, and other species between the arrays, maintaining connectivity within and through the site.
- Revegetation plan that incorporates California annual grassland species in areas of temporary disturbance. This plan will also include a section on site revegetation following decommissioning of the site, should decommissioning occur.
- Use of an on-site quarry (the Twisselman Quarry) as the source of base aggregate to minimize road travel by trucks, thus minimizing potential road mortality of special-status species.

Avoidance/Minimization Measures

The Project incorporates a number of measures that will be employed during Project construction and O&M activities to avoid or minimize adverse effects to species covered by this BA. These

measures include avoidance and minimization measures and BMPs derived from PG&E's San Joaquin Valley Operations and Maintenance HCP (Jones & Stokes 2006) and other measures that would reduce adverse effects on these species. In the following sections, general avoidance and minimization measures that apply to all (or at least multiple) species covered by this BA are listed first, followed by species-specific measures that will be implemented.

General Avoidance and Minimization Measures

- Pre-construction biological clearance surveys by qualified biologists will be performed at all activity areas to minimize impacts on special-status plants or wildlife species.
- Every effort will be made to minimize vegetation removal and permanent loss at activity sites. If necessary, native vegetation will be flagged for protection. A Project revegetation plan has been prepared for areas of native habitat temporarily affected during construction.
- Project personnel will avoid affecting wetlands, streambeds, and banks of any streams to the maximum extent practicable.
- Project personnel will be directed to use Best Management Practices (BMPs) where applicable, such as for prevention of soil erosion and sedimentation of streams and introduction and spread of invasive plant species. These measures will be identified prior to construction and incorporated into the construction and maintenance operations.
- Biological monitors will be assigned to the Project. The monitors will be responsible for ensuring that impacts to special-status species, native vegetation, wildlife habitat, or unique resources will be avoided to the fullest extent possible. Where appropriate, monitors will flag the boundaries of areas where activities need to be restricted to protect native plants and wildlife, or special-status species. These restricted areas will be monitored to ensure their protection during construction.
- When on-site monitoring is required, the monitor(s) shall inspect areas under vehicles and equipment, in and around stockpiled materials, and any other areas where listed species could take refuge to ensure that any such individuals are relocated out of harm's way before construction activities begin for the day.
- Prior to Project groundbreaking, the applicant shall submit to the USFWS and CDFG for their review the qualifications of its qualified biologist(s). The biologist(s) will be given the authority to stop any work that may result in the take of listed species. If the biologist(s) exercises this authority, the Service will be notified by telephone and electronic mail within one (1) working day. The on-site biologist will be the contact for any employee or contractor who might inadvertently kill or injure a listed species, or anyone who finds a dead, injured, or entrapped individual of these species. The on-site biologist will possess a working cellular telephone whose number will be provided to the USFWS.

- Prior to Project groundbreaking, the qualified biologist will determine, in consultation with the USFWS and CDFG, appropriate relocation techniques and locations for any listed species that may occur within the Project area and that may require relocation during construction. The relocation site(s) will provide suitable habitat and be located far enough from the construction area that the relocated individuals are unlikely to be impacted by construction.
- If at any time a listed animal, or any animal that is thought to potentially be a listed species, is discovered in the construction area by the on-site biologist or anyone else (including during pre-construction surveys), the following protocol will be followed:
 - All work that could result in direct injury, disturbance, or harassment of the individual animal will immediately cease.
 - The foreman and on-site biologist will be immediately notified.
 - The on-site biologist will allow the animal to disperse on its own outside the construction area or, if necessary, move the animal to a safe nearby location, as described previously. The animal will be monitored until it is determined that the animal is not imperiled by predators or other dangers.
 - The on-site biologist will document each occurrence when construction activities are affected by the presence of listed species and the outcome of the interaction on the individual animal.
- A Worker Environmental Education Program will be presented to Project personnel by a qualified biologist(s) provided by the applicant. This program will consist of a “tailgate” training session for all personnel who work on aspects of the Project that occur in or near natural habitats on the Project site. Printed training materials and briefings will include a discussion of all the listed species covered by this BA for which avoidance and minimization measures are required; a contact person in the event of the discovery of sensitive species on the site; and a review of avoidance and minimization requirements. Training sessions will be conducted by a qualified biologist. Maps showing the location of special-status plants and/or wildlife or other construction limitations will be provided to the environmental monitors and construction crews prior to construction activities. As part of the environmental training, contractors and heavy equipment operators will be provided with literature and photographs or illustrations of potentially occurring special-status plant and/ or wildlife species so they will be able to identify and avoid harming them during construction.
- The applicant will ensure that a readily available copy of the Biological Opinion from the USFWS and any related approvals by the CDFG are maintained by the foreman/manager on the Project site whenever construction or other Project-related activities are taking place. The name and telephone number of the construction foreman/manager will be provided to the USFWS and CDFG prior to Project groundbreaking.

- New light sources will be minimized, and lighting will be designed (e.g., using downcast lights) to limit the lighted area to the minimum necessary.
- Vehicles and equipment will be parked on pavement, existing roads, and previously disturbed areas to the extent practicable.
- Vehicles will not exceed a speed limit of 15 mph while on the Project site. Speed limit signs will be installed in the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry portions of the Project site prior to initiation of site disturbance and/or construction. To minimize disturbance of areas outside of the construction zone, all Project-related vehicle traffic will be restricted to established roads, construction areas, and other designated areas. These areas will be included in preconstruction surveys and to the extent possible, should be established in locations disturbed by previous activities to prevent further impacts. Off-road traffic outside of designated project areas will be prohibited.
- No vehicles or equipment will be refueled within 100 ft of an ephemeral drainage or wetland unless a bermed and lined refueling area is constructed. Any vehicles driven and/or operated within or adjacent to drainages or wetlands will be checked and maintained daily to prevent leaks of materials.
- Development on the Project site will maintain existing hydrologic patterns with respect to runoff supporting seasonal wetlands.
- Dust suppression will occur during all construction activities as needed.
- No firearms will be allowed on the Project site, unless otherwise approved for security personnel.
- To prevent harassment or mortality of special-status animals, or destruction of their habitats by dogs or cats, no pets will be permitted on the CVSR site, including 50-unit temporary construction trailer park where Project personnel will use as temporary housing.
- All food-related trash items including wrappers, cans, bottles, and food scraps, will be disposed of in tightly covered and secured trash containers, the contents of which will be removed from the site on a regular basis. Food items may attract coyotes and domestic dogs consequently exposing special-status animals to increased risk of predation. No deliberate feeding of wildlife will be allowed.
- Use of chemicals, fuels, lubricants, or biocides will be in compliance with all local, state and federal regulations. This is necessary to minimize the possibility of contamination of habitat or poisoning of wildlife. All uses of such compounds will observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other state and federal legislation, as well as additional project-related restrictions deemed necessary by the USFWS and CDFG.

- No rodenticides will be used on the Project site to avoid the potential for poisoning of giant kangaroo rats and San Joaquin antelope squirrels and to avoid the secondary poisoning of San Joaquin kit foxes, California condors (*Gymnogyps californianus*), and other predators and scavengers. The rodenticide ban will also be applied to temporary residential facilities in the temporary construction trailer park.
- No rodent trapping (live or lethal) will be permitted on the CVSR site, including within the residential facilities or the utility building associated with the temporary construction trailer park.
- Information about the ban of rodenticides and rodent traps, and their potential effects on sensitive wildlife species in the region, will be provided to occupants of the temporary construction trailer park. This information will be posted in the Operations and Maintenance facility as well.
- Signs prohibiting the recreational use of on-site conservation lands by trailer park occupants and other CVSR personnel will be installed at all potential public entrances to these lands and at quarter-mile intervals along existing and future roads adjacent to on-site conservation land borders. Sign maintenance will be part of the ongoing maintenance activities.
- A Project representative will be appointed as the contact for any employee or contractor who inadvertently kills or injures a threatened or endangered animal species, or finds a dead, injured or entrapped individual. The representative will be identified during the employee education program. The representative's name and telephone number will be provided to the USFWS and CDFG. Any contractor or employee who inadvertently kills or injures a threatened or endangered animal, or finds one either dead, injured, or entrapped, will report the incident to the representative immediately. The representative will contact the USFWS and/or CDFG (depending on whether the species is listed under the FESA, CESA or both), by telephone by the end of the day, or at the beginning of the next working day if the agency office is closed. In addition, formal notification will be provided in writing within 3 working days of the incident or finding. Notification will include the date, time, location and circumstances of the incident. Any threatened or endangered species found dead or injured will be turned over immediately to CDFG for care, analysis, or disposition.
- During the site disturbance and/or construction phase, grading and construction activities after dusk will be prohibited unless coordinated through the USFWS and CDFG. If such activity is necessary, one or more on-site monitors will be on-site to ensure special-status species active at night are avoided.
- All steep-walled holes or trenches in excess of 6 inches (for giant kangaroo rats) and 24 inches (for San Joaquin kit fox) in depth will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of dirt fill or wooden planks. Excavations will also be inspected for entrapped individuals of these species each morning prior to onset of field activities and

immediately prior to covering with plywood at the end of each working day. Before such holes or trenches are filled, they will be thoroughly inspected for entrapped individuals of these species. Any individuals discovered will be allowed to escape before field activities resume, or removed from the trench or hole by a qualified biologist; kit fox will be allowed to escape unimpeded, while giant kangaroo rats will be relocated to a safe area in suitable habitat outside the Project's impact areas.

- Because San Joaquin kit foxes and giant kangaroo rats are attracted to cavities and dens, these animals could potentially enter objects such as pipes and could become trapped, or could be injured when the pipes are moved. All construction pipes, culverts, or similar structures that are stored at a construction site for one or more overnight periods will be either securely capped prior to storage or thoroughly inspected by the on-site biologist for these animals before the pipe is subsequently moved, buried, capped, or otherwise used. If an individual of a listed species is discovered inside a pipe by the on-site biologist or anyone else, that section of pipe should not be moved until the USFWS and/or CDFG has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction activity, and left alone until the animal has escaped.

San Joaquin Kit Fox Avoidance and Minimization Measures

- The array layouts, and the design of array foundations and supporting structures, are intended to minimize impacts to habitat supporting the giant kangaroo rat, an important prey species of the San Joaquin kit fox. For example, the areas supporting the majority of giant kangaroo rat precincts on the site (see Figure 11) will not be impacted by the Project, but rather will be preserved and managed for kangaroo rats and kit fox.
- Preconstruction surveys will be conducted no less than 14 days and no more than 30 days prior to ground disturbance in any given area to ensure new San Joaquin kit fox dens are established in areas of disturbance. Surveys will be conducted by a qualified, USFWS-approved biologist.
- To prevent take of San Joaquin kit foxes during construction, all the construction requirements described in the *USFWS Standardized Recommendations for the Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* (USFWS 1999c) will be followed during Project implementation.
- Disturbance to all San Joaquin kit fox dens will be avoided to the maximum extent practicable. Protection provided by San Joaquin kit fox dens for use as shelter, escape, cover, and reproduction is vital to the survival of San Joaquin kit foxes. For kit foxes, the ecological value of potential, known, and natal/pupping dens differs, and therefore each den type requires the appropriate level of protection. Limited destruction of San Joaquin kit fox dens may occur, if avoidance is not practicable, provided the following procedures are observed.

- Potential Dens: Potential dens will be monitored as if they were known dens. If any den is considered to be a potential den but is later determined during monitoring or destruction to be in use by San Joaquin kit fox (e.g., if San Joaquin kit fox sign is found inside), then the USFWS and CDFG will be notified immediately, and further activities involving such dens will occur as described below for known dens.
- Known Dens: Known dens occurring within the footprint of the activity will be monitored for 3 days with tracking medium or an infrared beam camera to determine the current use. If no San Joaquin kit fox activity is observed during this period, the den will be destroyed immediately to preclude subsequent use. If San Joaquin kit fox activity is observed at the den during this period, the den will be monitored for at least 5 consecutive days from the time of the observation to allow any resident animal to move to another den during its normal activity. Use of the den can be discouraged during this period by partially plugging its entrance(s) with soil in such a manner that any resident animal can escape easily. Only when the den is determined to be unoccupied may the den be excavated under the direction of a qualified biologist. If the animal is still present after 5 or more consecutive days of plugging and monitoring, the den may have to be excavated when, in the judgment of a qualified biologist, it is temporarily vacant (i.e., during the animal's normal foraging activities). The USFWS and CDFG encourage hand excavation, but realize that soil conditions may necessitate the use of excavating equipment. However, extreme caution will be exercised under these circumstances.
- Destruction of the den will be accomplished by careful excavation until it is certain that no San Joaquin kit fox are present. The den will be fully excavated, filled with dirt and compacted to ensure that kit foxes cannot reenter or use the den during the construction period. If at any point during excavation a San Joaquin kit fox is discovered inside the den, the excavation activity will cease immediately and monitoring of the den as described above will be resumed. Destruction of the den may be completed when, in the judgment of a qualified biologist, the animal has escaped from the partially destroyed den.
- Natal/pupping dens: Natal or pupping dens that are occupied will not be destroyed until the pups and adults have vacated and then only after consultation with the USFWS and CDFG. Project activities at these den sites will be postponed if deemed necessary to avoid disturbance.
- Construction and other project activities will be prohibited or greatly restricted within these exclusion zones, to the extent practicable. The configuration of exclusion zones around San Joaquin kit fox dens will have a radius measured outward from the entrance or cluster of entrances. The following radii are minimums, and if they cannot be followed, the USFWS, CDFG, and County must be contacted:
 - Potential den – 50 ft
 - Known den – 100 ft

- Natal/pupping den – USFWS must be contacted
- Atypical den – 50 ft (occupied and unoccupied)

Known den: To ensure protection, the exclusion zone will be demarcated by exclusion fencing that encircles each den at the appropriate distance and does not prevent access to the den by San Joaquin kit fox. Exclusion zone fencing will be maintained until all construction-related or operational disturbances have been terminated. At that time, all fencing will be removed to avoid attracting subsequent attention to the dens.

Potential and Atypical dens: Placement of 4 to 5 flagged stakes 50 ft from the den entrance(s) will suffice to identify the den location; fencing will not be required, but the exclusion zone must be observed.

Only essential vehicle and foot traffic on existing roads within the exclusion zone will be permitted. Otherwise, all construction, vehicle operation, material storage, or any other type of surface-disturbing activity will be prohibited within the exclusion zones.

- Escape dens will be installed in areas between the arrays identified as “less permeable” to facilitate movement of individuals through these areas. The number and placement of these temporary shelters will be determined during consultation with USFWS and CDFG. Depending on local terrain and array layout, typically one escape den is installed every ¼ mi along existing maintenance roads. Escape den entrances will measure 8 inches across with rebar installed to restrict the opening to 6 inches to prevent use by badgers or coyotes. The 8-inch diameter PVC pipe will be at least 25 ft long, placed flat on the ground surface, and covered with soil for thermal protection.

Giant Kangaroo Rat Avoidance and Minimization Measures

- The array layouts, and the design of array foundations and supporting structures, are intended to minimize impacts to habitat supporting the giant kangaroo rat. For example, the areas supporting the majority of giant kangaroo rat precincts on the site (see Figure 11) will not be impacted by the Project, but rather will be preserved and managed for kangaroo rats.
- Occupied giant kangaroo rat precincts that are within the Project footprint will be avoided wherever feasible during construction or other Project-related activities, particularly during placement of ground screws or helical piles, trenching, and operation of heavy equipment or vehicles. Where active precincts cannot be avoided, giant kangaroo rats will be relocated to offsite conservation land. Full details of the relocation and reintroduction program are provided in Appendix C (*Relocation and Reintroduction of Populations of Giant Kangaroo Rat*).

California Jewel-flower and San Joaquin Woollythreads Avoidance and Minimization Measures

- Since 2009-2010 was a wet water-year, supplemental rare plant surveys based on CDFG, California Native Plant Society (CNPS), and USFWS survey guidelines were conducted in spring 2010 on the majority of the Solar Generation Facility, a portion of the proposed switching station, and the Twisselman Quarry and generation tie-line areas to provide updated information on potential rare plant occurrences. Surveys were conducted in March, April, and May, the appropriate period for detecting the California jewel-flower (*Caulanthus californicus*) and San Joaquin woollythreads (*Monolopia congdonii*), and these species were not detected within the survey area.

Two areas were added to the Project site after those surveys were conducted: portions of the potential switching station alternative sites and the newly acquired 320-acre parcel where Array 11 is proposed. Prior to any construction activities in areas that were not surveyed according to protocol for the California jewel-flower and San Joaquin woollythreads in spring 2010, those areas will be surveyed according to the most recent agency protocols. Global positioning system (GPS) coordinates will be recorded for any occurrences of these species. All populations of these species found during surveys will be fully described and mapped.

- If California jewel-flowers or San Joaquin woollythreads are located in the portions of the Project site that have not been surveyed during the flowering periods for these species (i.e., the switching station alternatives and newly acquired 320-acre parcel supporting Array 11), impacts to their populations will be avoided to the extent feasible. In consultation with a plant ecologist, the project will to the extent feasible be redesigned, constructed, and operated to reasonably avoid direct and indirect impacts to these plants. Populations of these species that are located within temporary construction areas (but that will not be directly impacted) will be fenced or flagged for avoidance prior to construction, and a biological monitor will be present to ensure compliance with off-limits areas. Indirect impacts to occurrences that will not be directly impacted will be minimized by the creation of a buffer zone around areas of known occurrence, both during and after construction. The buffer zone will be of sufficient size to eliminate potential disturbance to the plants from human activity and other potential sources of disturbance that may negatively affect the population. The size of the buffer will depend upon the proposed use of the immediately adjacent lands, and will include consideration of the plants' ecological requirements (i.e., sunlight, moisture, shade tolerance, edaphic physical and chemical characteristics) that are identified by a plant ecologist based upon the growth requirements of the species. When necessary, temporary fences will be constructed between populations and Project activities.
- If habitat occupied by the California jewel-flower or San Joaquin woollythreads will be temporarily impacted, the upper 4 inches of topsoil will be stockpiled separately during excavations so that it can be used to re-seed appropriate areas following the completion

of soil disturbance. When this topsoil is replaced, compaction will be minimized to the extent consistent with utility standards to help facilitate recolonization of such areas by these species.

Kern Primrose Sphinx Moth Avoidance and Minimization Measures

- The Project has been designed to avoid and minimize impacts to the areas supporting *Camissonia*, the Kern primrose sphinx moth's larval host plant. With the exception of a single plant within proposed Array 6 and a group of five plants within Array 11, all occurrences of *Camissonia* in the BSA are located outside of proposed arrays, and the majority of such occurrences are north of SR 58 in areas where no Project activities other than habitat management will occur.
- Because *Camissonia* was detected in 14 locations within the BSA, the Project proponent may either assume presence of the Kern primrose sphinx moth in areas containing *Camissonia* (i.e., in the northern extent of the BSA) or conduct focused surveys for the moth. There is no USFWS-approved protocol for conducting surveys for this species. Based on the methods in Jump et al. (2006) and information from the USFWS's 5-year status review of the species, focused surveys would be performed during the flight season for the species, which is during late January to late February (possibly to late March during cooler years). Surveys would be conducted in all sandy washes or other areas where populations of *Camissonia* are located within the Project's impact footprint. A qualified entomologist would survey for sphinx moths in these areas during the day when the temperature exceeds 60° Fahrenheit, and identify such moths to species. If no sphinx moths are detected, then the species will be presumed absent and no further measures are necessary. If presence is assumed, or if surveys detect the Kern primrose sphinx moth, the following measures will be implemented in occupied or presumed occupied areas.
- To the extent feasible, individual *Camissonia* plants, and particularly concentrations of these plants, will be avoided during construction of roads, the tie-line, the switching station, and other infrastructure.
- If any individual *Camissonia* plants cannot be avoided, a qualified biologist will determine if it is occupied by larval Kern primrose sphinx moths. If the plant is not occupied, it will be transplanted to a suitable site (one already supporting *Camissonia*) by the biologist. If the plant is occupied by larvae, no construction activities will occur within 50 ft of the plant until the moth has been allowed to mature and leave on its own volition, at which time the plant will be transplanted to a suitable site.
- Signs will be erected on both sides of the access road to the Twisselman Quarry, north and south of the *Camissonia* stands adjacent to the road, to increase awareness of the potential presence of the Kern primrose sphinx moth and to enforce the 15 mph speed limit.

- The habitat management plan developed for the on-site conservation areas will include measures to avoid adverse effects of grazing management (such as grazing or trampling) on *Camissonia*.

Blunt-nosed Leopard Lizard Avoidance and Minimization Measures

- No blunt-nosed leopard lizards (*Gambelia sila*) were detected during protocol-level surveys in 2009 and 2010 covering the majority of the impact areas for the Solar Generation Facility, generation tie-line, and Twisselman Quarry (Figure 17). However, some areas, such as arrays 9 and 10, the Sunrise Overlook and Visitor Overlook sites, and portions of the potential switching station locations, were not included in either the 2009 or 2010 surveys. Therefore, in 2011, HPR II will have qualified biologists conduct protocol-level surveys in any areas within the project's impact footprint that were not surveyed according to protocol in 2009 or 2010. The survey area will also include a 1,500-foot-wide buffer around the construction footprint, as long as the Applicant has authorization from adjacent landowners to do so.
- Within impact areas that have been surveyed according to protocol, a single (i.e., 1-day) preconstruction survey will be conducted by a qualified biologist within 30 days prior to construction or other groundbreaking in any given area. These surveys will entail having one or more qualified biologists walk 30- to 100-foot-interval transects through the area looking for individuals of this species.
- If no individuals are detected during the preconstruction surveys or protocol-level surveys, no further measures will be needed. If the species is detected during the preconstruction surveys or protocol-level surveys, the following avoidance and conservation measures will also be implemented:
 - The geographic coordinates of each BNLL individual detected shall be recorded on, and within 1,500 feet of, the construction footprint of the project site (including offsite parcels where access is granted). The point location data shall be used to delineate buffers designed to encompass the home range of each individual BNLL. A buffer would minimize the risk of direct or indirect take of BNLL individuals in conjunction with avoidance and exclusion criteria. A buffer of any size does not guarantee that take will not occur but provides a high degree of certainty that each individual BNLL will be adequately protected. Each buffer shall cover an area of at least 22 acres, which is the approximate size of the largest BNLL home range size computed by Warrick et al. (1988). Each 22-acre buffer shall be delineated by the biologist using the recorded point location as the approximate center of the buffer area. Using habitat modeling based on the current knowledge base of the most important BNLL habitat parameters, the final boundaries of the buffers shall be determined by the qualified biologist to encompass the 22-acre area of greatest habitat suitability.

- To the extent feasible, the 22-acre buffer around the occupied BNLL habitat will not be impacted, even temporarily, by project activities. No construction activities or vehicular traffic shall be allowed within the identified buffer, and all movement corridors shall be delineated with fencing and signage identifying the buffer as off-limits to construction personnel. The fencing around the buffer shall be elevated 24 inches off the ground surface to allow the passage of San Joaquin kit fox and other small mammals through the area. All fencing will be actively maintained and repaired as directed by biological monitors and removed upon completion of that portion of project construction. If complete avoidance of the occupied habitat and buffer is feasible, then no additional measures need to be implemented. If avoidance of the occupied habitat and buffer is not feasible, then impacts to the occupied habitat will be minimized, and the following measures will be implemented.
- If, in the opinion of the qualified biologist, barrier fencing will help to prevent impacts to BNLL without causing undue impact to this species' habitat, such fencing will be constructed around the worksite to prevent entry by lizards. The area where fencing will be constructed will be inspected prior to installation; then, 36-inch tall silt fencing will be installed around the work area, and buried to a depth of 6 inches. No monofilament plastic will be used for erosion control in the vicinity of this species. Barrier fencing will be removed upon completion of work.
- If blunt-nosed leopard lizards are located during the preconstruction survey, the applicant shall hire a qualified biologist to monitor for this species, which could be harmed during construction. The monitor will be responsible for ensuring that impacts to blunt-nosed leopard lizards will be avoided. The biological monitor will have the authority to stop the work of the construction crews if the monitor believes the work may injure or kill blunt-nosed leopard lizard. If a blunt-nosed leopard lizard is observed during construction activities, work will only be allowed to resume when the lizard has departed the work area of its own volition or when the biologist has moved the lizard out of harm's way (with authorization from the USFWS and CDFG).

California Condor Avoidance and Minimization Measures

- All transmission and sub-transmission towers and poles will be designed to be raptor-safe in accordance with the Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006 (Avian Power Line Interaction Committee [APLIC] 2006).
- All fuels, fluids, and components with hazardous materials/wastes will be handled in accordance with applicable regulations. All such materials will be kept in segregated storage with secondary containment as necessary. Records of storage and inspection will be maintained and will provide for proper offsite disposal. Hazardous materials will be stored in a neat, orderly manner in their appropriate containers in an enclosed and secured location such as portable outdoor hazardous materials storage cabinets equipped with

secondary containment to prevent contact with rainwater. The portable hazardous materials storage cabinets may be moved with each block of development, as deemed necessary.

- Project personnel shall collect all litter, small artificial items, and food waste from the Project area on a regular basis.
- Project personnel will monitor all areas within 1/4-mi around the solar arrays on a regular basis (i.e., several times per week) for any dead animals, including wild animals or grazing animals such as cattle, goats, or sheep that are being used for vegetation management on the site. Any animals found dead will be removed immediately to avoid attracting California condors to the vicinity of the arrays.

Longhorn Fairy Shrimp and Vernal Pool Fairy Shrimp Avoidance and Minimization Measures

- Although neither the longhorn fairy shrimp (*Branchinecta longiantenna*) nor vernal pool fairy shrimp (*Branchinecta lynchi*) was detected during wet-season sampling surveys of potential habitat on the Solar Generation Facility site, Project activities within the Solar Generation Facility have been designed to avoid direct and indirect impacts to on-site and off-site pools that provide potential habitat for these species. In addition, BMPs to protect water quality, prevent contamination or sedimentation of runoff, and control erosion will be implemented as described above, ensuring that any indirect effects of potential habitat for these species are avoided. No suitable habitat for the species is present in the generation tie-line, switchyard, or Twisselman Quarry portions of the Project site.

Site Revegetation and Habitat Management Plans

The applicant will prepare and implement several plans guiding revegetation of the temporary impact areas on the Project site and management of the Solar Generation Facility site, including the on-site conservation areas (Figure 6) and areas that will be subject to more regular disturbance associated with solar energy production. These plans will have the goal of avoiding and minimizing impacts to species covered by this BA and maximizing the potential use of the site by these species following installation of the solar arrays. These plans are as follows:

- The applicant will prepare and implement a Project Revegetation Plan. Upon completion of the project, all areas subject to temporary ground disturbances, including storage and staging areas, temporary roads, pipeline corridors, etc. will be recontoured if necessary, and revegetated to pre-project conditions, according to the Project Revegetation Plan. An area subject to “temporary” disturbance means any area that is disturbed during the project, but that after project completion has the potential to be revegetated.
- The applicant will prepare and implement a Site Management Plan for the portions of the Solar Generation Facility that will be subject to ongoing disturbance by O&M activities,

including the areas occupied by the solar arrays. This plan will focus on management for sensitive biological resources that will occur in these areas following installation of the arrays and other solar generation facilities. This plan will include a description of the process by which managed livestock grazing will be used to maintain low-height grassland vegetation on the site for the benefit of grassland-associated species. For example, cattle grazing similar to that currently occurring on the Solar Generation Facility site will be proposed for management of the conservation areas. This plan will also specify measures that will be implemented during O&M activities to avoid and minimize impacts to species covered by this BA.

- The applicant will prepare and implement an Invasive Species Control Plan for the site to prevent the introduction or spread of nonnative invasive plant species. This Plan will address the entire Project area, and may be integrated with another habitat management plan (e.g., the Site Management Plan). The Invasive Species Control Plan will describe BMPs to avoid the unintentional introduction of invasive species to the site; describe monitoring measures to ensure that any invasions are detected before they become substantial; describe species-specific control measures that will be implemented if invasions occur; and describe the process by which the Plan will be implemented (e.g., the entity responsible for implementing it, funding mechanisms, and reporting procedures).

Compensatory Conservation Measures

Overview. Permanent loss of habitat for listed species as a result of the replacement of habitat with facilities and the presence of solar arrays will be compensated by the preservation, enhancement, and management in perpetuity of suitable lands outside the Project's immediate impact areas. Although some of the species covered by this BA, such as the San Joaquin kit fox and giant kangaroo rat (and possibly others), may continue to use the areas occupied by the solar arrays after installation, these conservation lands will not include habitat within the solar arrays. However, conservation lands within the Solar Generation Facility that are not subject to ongoing O&M activities will be included within compensatory conservation habitat; such areas are shown on Figure 6. In addition, off-site habitat that is suitable for the species in question will be provided.

Compensatory Conservation Guidelines. The conservation habitat that is proposed by the applicant varies among species depending on the quality of habitat on the Solar Generation Facility site and the likelihood of replacement of lost functions and values through the preservation, enhancement, and management of habitat outside the impact areas. The amount of off-site conservation habitat preserved may also vary for a given species depending on the relative value of the impact and conservation sites. Conservation using highly important lands that provide high value for the species in question or that contribute significantly to regional preservation efforts (e.g., lands that augment large areas of contiguous, preserved habitat), or lands that currently provide very low value but that could be enhanced to increase value considerably, will result in the preservation of fewer acres of off-site habitat than lands that are

roughly similar in quality to impacted habitat. As a result, the applicant has not identified set conservation ratios that will be achieved precisely. Rather, the applicant has identified broader conservation ratios to guide compensatory habitat conservation, or in some cases a range of ratios, that have been used as guidelines to determine the extent of compensatory conservation to be provided, recognizing that the maintenance or enhancement of the baseline and replacement of lost functions and values will be the primary focus of compensatory conservation measures. These guiding conservation ratios are as follows:

- Permanent loss of San Joaquin kit fox habitat to facilities and the presence of solar arrays will be compensated at a ratio of not less than 2:1 and not greater than 3:1 for all permanently impacted acreage and for the acreage of habitat under the solar arrays; the final conservation ratio will be determined in consultation with the USFWS and CDFG, based on an analysis of the quality (i.e., biological functions and values) of the conservation land (a lower ratio is appropriate for higher quality conservation land). If monitoring does not detect continued kit fox use of the site following completion of construction, then the total conservation requirement will be increased by 1:1 for the acreage of the solar array footprints not being utilized.
- Permanent loss of giant kangaroo rat habitat to facilities and the presence of solar arrays will be compensated at a ratio of not less than 2:1 and not greater than 3:1 for all permanently impacted acreage and for the acreage of habitat under the solar arrays; the final conservation ratio will be determined in consultation with the USFWS and CDFG, based on an analysis of the quality (i.e., biological functions and values) of the conservation land (a lower ratio is appropriate for higher quality conservation land). If monitoring does not detect continued kangaroo rat use, after completion of construction, of areas equivalent to occupied areas prior to solar array installation, then the total conservation requirement will be increased by 1:1 for the reduction in utilized acreage within the solar array footprint.
- Surveys of the majority of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites in 2009 and 2010 did not detect the California jewel-flower or San Joaquin woollythreads. However, there is some potential for these species to occur in portions of the project that were not surveyed during the floristic period for these species, including portions of the switching station alternative sites and the recently acquired Martin parcel where array 11 would be located. Those previously unsurveyed areas will be surveyed according to protocol in spring 2011. If either species is detected on the site during future surveys, permanent loss of occupied California jewel-flower or San Joaquin woollythreads habitat and individual plants to facilities and the presence of solar arrays will be compensated at a ratio of 1:1 for all occupied habitat that is permanently impacted and for the acreage of occupied habitat under the solar arrays. While plants beneath the arrays would be monitored to determine their response to indirect impacts such as shading and other land use changes, shading impacts are assumed to be great enough to require compensatory conservation if direct and indirect impacts to these plants cannot be avoided. Temporary impacts to the California jewel-

flower and San Joaquin woollythreads will be compensated at a ratio of 0.5:1 (conservation lands: impacted lands) if these species reappear within the impact area within 2 years following revegetation. If under appropriate rainfall conditions, the species impacted do not appear in the impacted area within 2 years following revegetation, conservation shall be increased to 1:1 (conservation lands: impacted lands). The conservation areas must provide habitat supporting the impacted plant species.

- Unless surveys demonstrate that the Kern primrose sphinx moth is absent, permanent loss of *Camissonia* plants to facilities and the presence of solar arrays will be compensated at a ratio of 3:1 (on an individual plant basis) and temporary impacts will be compensated at a ratio of 2:1 (i.e., 1:1 conservation by revegetation in place and 1:1 conservation outside the impact areas). The conservation ratios will be determined on the basis of the abundance of individual plants. The conservation areas must provide habitat with *Camissonia* and must be located within the range of the Kern primrose sphinx moth (or, if presence has not been verified on the Project site but has only been assumed, the conservation areas must be in the vicinity of the Solar Generation Facility or closer to areas of known occupancy than the *Camissonia* impact areas).

The same lands can be used to compensate for habitat impacts to multiple species as long as those lands support all those species.

Compensatory Conservation Strategy. The primary goal of the Project's conservation strategy is to ensure that the Project has no net adverse effect, and preferably has a net benefit, to populations of the federally listed species that will be impacted by the Project. This goal will be accomplished through the following:

- Avoidance and minimization of impacts to individuals of these species (as described in the previous avoidance and minimization sections), both to minimize take of individuals and to retain individuals on and near the Project site as a source of colonists for enhanced on-site and off-site habitats
- Avoidance, preservation, and management of on-site habitat. The Project will preserve approximately 3,272 acres of high-quality habitat within the Solar Generation Facility portion of the site. The majority of this habitat will not be impacted at all during Project construction; rather, measures will be implemented to avoid indirect effects during Project construction and operation. The remainder of the on-site conservation areas consists of land that will be temporarily impacted but will then be restored following the completion of construction. Management of this habitat in perpetuity will target conditions providing high-quality habitat for listed species. In particular, the Project has avoided, and will preserve and enhance, areas containing approximately 91% of the giant kangaroo rat precincts that have been identified in the BSA, and the majority of the on-site conservation areas (approximately 2,810 acres) provide high-quality habitat for the giant kangaroo rat. Preservation and management of these lands for the giant kangaroo

rat will benefit not only this species but also the San Joaquin kit fox (which preys upon the kangaroo rat) and other grassland-associated species, such as the mountain plover (*Charadrius montanus*). Managed grazing of these on-site conservation areas by cattle will ensure the maintenance of high-quality habitat in these areas.

- Preservation and management of off-site habitat. HPR II will acquire, preserve, and manage off-site conservation areas for the listed species covered by this BA. These conservation areas will include habitat that is occupied by the species that are impacted by the Project, to ensure the presence and enhancement (through targeted management) of populations of these species. In addition, these off-site conservation areas will include habitat that is suitable, or that could be made suitable through changes in management, for these listed species but that is currently unoccupied. Through land use changes and targeted management for these species (e.g., by removing active discing or introducing managed grazing), habitat quality for listed species will be improved considerably. For species, such as the San Joaquin kit fox and giant kangaroo rats, we anticipate the natural colonization of these improved and enhanced conservation lands because of their proximity to occupied habitat.

In June 2010, the Project applicant organized a meeting of representatives from the USFWS, CDFG, HPR II, First Solar (which is proposing the development of another large solar power plant on the Carrizo Plain), H. T. Harvey & Associates, Althouse and Meade, BLM, ESRP, and TNC to discuss a regional conservation strategy for the Carrizo Plain. At this meeting, which was held on 21 June 2010, the attendees discussed the preservation and restoration strategies that would be necessary to maintain populations of special-status species within the Carrizo Plain, and habitat connectivity for these species both within the Carrizo Plain and between the Carrizo Plain and adjacent areas. On 20 and 21 October, the Project applicant organized a meeting focused on conservation of the giant kangaroo rat. BLM, CDFG, USFWS, San Luis Obispo County, and Aspen staff along with researchers with San Diego Zoo, U.C. Berkeley, and San Francisco State University participated and assisted in further refining the preservation and restoration strategies for this species. The outcome of these meetings has guided HPR II in identifying off-site compensatory conservation areas, which will not only provide the ability for high-quality habitat enhancement and management in and of themselves, but will also contribute to the regional conservation of these species.

The applicant has been investigating potential conservation areas north of the Carrizo National Monument. Certain privately-held parcels of land proximate to the CVSR project site possess extremely important ecological values for populations of giant kangaroo rats and San Joaquin kit fox. During aerial surveys, California Department of Fish and Game biologist Bob Stafford recently located extant populations of giant kangaroo rats on privately held rangeland to the northwest of the project site, within some of the larger parcels that remain south of the project site, and within the California Valley Subdivision itself (Dave Hacker CDFG, pers. comm). SunPower has also located other

populations of giant kangaroo rats between the Carrizo Plain National Monument and SR 58 in an area that is extremely important for conservation as it contains what is likely to be the northernmost extant population of giant kangaroo rats on the Carrizo Plain. Williams, et al. (1992) reported giant kangaroo rats from locations within the northern Carrizo Plain, and, although giant kangaroo rats may be currently limited by higher precipitation levels in the northern portions of the Plain, they appear to have been more widespread during drier periods.

At present, the northern portion of the Carrizo Plain is, for the most part, isolated from populations of giant kangaroo rats on the Monument by unsuitable habitats and land use. Preserving the few remaining populations on these privately-held sites that could potentially spread into the upper portion of the Carrizo Plain during these drier periods is an important element of the proposed off-site conservation.

Another objective of the off-site conservation strategy addresses a pattern of isolation and fragile connectivity between the large widespread populations of giant kangaroo rats on the Monument and the smaller satellite populations located north of the Monument. This is one of the most important ecological factors likely to affect the long term persistence of the species in areas of the Carrizo Plain outside of the Monument. For example, it is apparent that most of the CVSR project site was farmed as late as the early 1990's, and it is also apparent that giant kangaroo rats have only recolonized the project site in the last few years (Dave Germano, pers. comm.). It also appears that giant kangaroo rats that did finally recolonize the project site, after disking and tilling was ceased, ultimately came from extant populations to the south of the project site.

There is a clear opportunity to identify, enhance, and permanently protect the connectivity that enabled recolonization of the site and to enhance connectivity between the project site and suitable habitats to the north by expanding the amount of suitable habitat in this area and building a series of habitat linkages. Lots within the California Valley Subdivision and a number of large parcels along the eastern edge of the Carrizo Plain contain potentially suitable habitat with conservation potential if managed for giant kangaroo rats. Combined, these areas include several thousand acres of habitat that contain the physical characteristics of habitats throughout the Carrizo Plain that support giant kangaroo rats. The protection and management of a subset of these lands currently being refined based upon suitability and availability, if managed for the benefit of giant kangaroo rats, would provide a significantly enhanced level of connectivity for populations occurring north of the Monument.

- Additional acreage within the subdivision is owned by the California Valley Community Services Department. Most of these parcels are approximately 40 acres in size and comprise native habitat with conservation value.

- SunPower has also identified an area along the eastern edge of the Carrizo Plain where soil type and slope are the same as areas throughout the Monument and project site, which are occupied by giant kangaroo rats.

- The California Valley Subdivision may contain a consolidated group of lots that available for acquisition, and would be suitable for additional preservation. This subdivision, which spans the two- to three-mile-wide gap between the project site and the Carrizo Plain National Monument, is located immediately to the west, southwest, and south of the CVSR project site. The California Valley Subdivision was developed in the 1960s, when land speculators bought an 18,400 acre ranch and subdivided the bulk of the ranch into 2.5-acre parcels, which were quickly sold to several thousand buyers. The water in this portion of the valley contains elevated salt content and is generally not potable. While largely undeveloped, the present management of these undeveloped lands is not aimed at maintaining suitable conditions for giant kangaroo rats. The land is designated for residential development. There are large populations of giant kangaroo rats on the Monument just a few miles from the Solar Generation Facility site and there are also giant kangaroo rat colonies of various sizes distributed throughout the California Valley subdivision. This is, in large part, a result of San Luis Obispo County Public Works' maintenance of most of the roads throughout the subdivision, preserving some open habitat along the road margins. Much of this edge habitat is occupied by giant kangaroo rats in areas with suitable soils and moderate vegetative cover. Habitats in the lot interiors have only been infrequently grazed for several decades and, for the most part, the vegetation has become too dense for giant kangaroo rats. Nonetheless, during reconnaissance of the subdivision, H.T. Harvey & Associates' mammalogists detected a number of locations where there were relatively dense giant kangaroo rat precincts, particularly in areas where there is evidence of some level of disturbance to the vegetation. The County currently holds a large number of these parcels in the vicinity of the project site and the Carrizo Plain National Monument. These lands are located in areas with slope and soil types similar to those occupied by giant kangaroo rats on the project site and the Monument. The availability of these parcels for purchase and their individual conservation value is variable, but the opportunity exists to develop a joint habitat management plan. Some areas within the subdivision support large numbers of giant kangaroo rat precincts within areas that appear to have been disturbed by alluvial deposits in the recent past that created suitable habitat for giant kangaroo rats.

SunPower will explore options to incorporate existing lots and Community Services Department parcels within the California Valley Subdivision into the broader conservation strategy to promote connectivity between the main segment of the population on the project site and colonies within the subdivision and National Monument.

The conservation strategy for this Project would result in permanent protection of high-quality habitat for all of the listed species that occur on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project site, on lands where these habitats are currently vulnerable to conversion to incompatible land uses such as dryland farming or viticulture. On-site and off-site conservation will also involve the restoration of habitat on otherwise physically suitable lands for San Joaquin kit fox and giant kangaroo rats. The preservation and enhancement of degraded, at risk habitat for giant kangaroo would provide a number of substantial benefits. Giant kangaroo rats are a keystone species, and re-establishment or population growth in areas where they have been extirpated or exist in low numbers will benefit numerous other species including the San Joaquin kit fox, American badger (*Taxidea taxus*), and burrowing owl (*Athene cunicularia*), which rely on them as prey, as well as San Joaquin antelope squirrels and potentially blunt-nosed leopard lizards, which rely on giant kangaroo rat burrows for shelter.

Preservation and Management of Conservation Lands. For both on-site and off-site conservation areas, a Habitat Conservation and Monitoring Plan will be developed and implemented for the conservation lands. That plan will include, at a minimum, the following information:

- A summary of habitat impacts and the proposed conservation measures
- A description of the location and boundaries of the conservation site and description of existing site conditions
- A description of measures to be undertaken to enhance (e.g., through focused management) the conservation site for special-status species
- A description of management and maintenance measures (e.g., managed grazing, fencing maintenance, etc.)
- A description of habitat and species monitoring measures on the conservation site, including specific, objective final and performance criteria, monitoring methods, data analysis, reporting requirements, monitoring schedule, etc.
- A contingency plan for conservation elements that do not meet performance or final success criteria within 5 years; this plan will include specific triggers for remediation if performance criteria are not being met and a description of the process by which remediation of problems with the conservation site (e.g., presence of noxious weeds) will occur.

The permanent protection and management of conservation lands shall be ensured through an appropriate mechanism, such as a conservation easement or fee title purchase. The conservation easement could be held by the CDFG or an approved land management entity and shall be recorded within a time frame agreed upon by the USFWS and CDFG.

An endowment will be established for the management of the conservation lands in perpetuity. A Property Analysis Record (PAR) analysis will be conducted to determine the average annualized cost of site management and monitoring, and the endowment will be adequate for the interest on the endowment's principal to pay for annual management and monitoring.

ACTION AREA

Section 7 of the ESA requires that federal agencies consult with the USFWS before they take an action (including issuance of a permit) that may affect listed species or critical habitat. Two federally listed species (San Joaquin kit fox and giant kangaroo rat) and a species proposed for listing (mountain plover) are known to occur on the Project site, and several others may occur on the site as discussed in this BA. Furthermore, a designated critical habitat unit for vernal pool species, including the federally endangered longhorn fairy shrimp and federally threatened vernal pool fairy shrimp extends onto the southwestern portion of the Project site.

On August 27, 2010, the Department of Energy (DOE) Loan Guarantee Program Office (LGPO) selected SunPower's application for due diligence review for a federal loan guarantee for the CVSR, officially commencing a proposed federal action on the CVSR Project. The proposed action under consideration by DOE is whether to issue a federal loan guarantee under Title XVII of the Energy Policy Act of 2005 (EPAct 05), as amended by Section 406 of the American Recovery and Reinvestment Act of 2009, P.S. 111-5 (the "Recovery Act"). As a proposed federal action, all components of the Project are subject to NEPA compliance. This action, as described in this BA, involves DOE providing a loan guarantee to support the construction and start-up of the CVSR Project. Because construction and operation of the proposed CVSR may affect species listed under the federal Endangered Species Act (ESA), DOE is requesting formal consultation of the USFWS under Section 7(a)(2) of the ESA.

The Section 7 consultation must encompass the "action area", which is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." "Effects of the action" is defined as "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action." (50 CFR 402.02). The action area for this Section 7 consultation encompasses all areas that may be directly or indirectly affected as a result of activities both on the Project site and the broader area that, while outside the construction zone, may be directly or indirectly affected by vibrations, noise, dust, or movement associated with Project activities. This includes all areas that will be affected by the construction, maintenance, and/or operations of components that are critical to the CVSR Project. The action area also includes areas that may be affected by the implementation of conservation measures.

CONSULTATION HISTORY

To date, the applicant and its consultants have engaged in meetings and correspondence with the USFWS on several occasions regarding the design and potential effects of the Project. The following is a listing of such correspondence:

- 1 April 2009 – joint HPR II/OptiSolar/Ausra briefing for USFWS
- 22 April 2009 – joint HPR II/OptiSolar/Ausra meeting with the USFWS and CDFG
- 21 May 2009 letter from HPR II and OptiSolar biologists to CDFG and USFWS describing and seeking comments on SJKF survey protocols – follow-up to April 22 meeting
- 24 March 2010 – field review of the Project site with USFWS, HPR II, and H. T. Harvey & Associates representatives
- 8 April 2010 – meeting with HPR II, H. T. Harvey & Associates, USFWS, and CDFG representatives
- 4 May 2010 – meeting with HPR II, H. T. Harvey & Associates, USFWS, USACE, and CDFG representatives
- 19 May 2010 – meeting with HPR II, H. T. Harvey & Associates, and BLM representatives
- 2 June 2010 – meeting with HPR II, H. T. Harvey & Associates, and USFWS representatives
- 21 June 2010 – meeting of representatives from the USFWS, CDFG, HPR II, First Solar, H. T. Harvey & Associates, Althouse and Meade, BLM, ESRP, and TNC to discuss a regional conservation strategy for the Carrizo Plain.
- 7 July 2010 – meeting with HPR II, H. T. Harvey & Associates USFWS, USACE, and CDFG representatives
- 5 August 2010 – meeting with HPR II, H. T. Harvey & Associates, and USFWS representatives
- 15 September 2010 – meeting with HPR II, H. T. Harvey & Associates, and USFWS representatives
- 20-21 October 2010 – site visit and meeting with representatives of HPR II, H. T. Harvey & Associates, USFWS, CDFG, DOE, Bureau of Land Management, Aspen Environmental Group, County of San Luis Obispo, San Diego Zoo, San Francisco State University, and University of California Berkeley to discuss on-site conservation, off-site conservation, and relocation of the giant kangaroo rat, with specific focus on the CVSR Project

FEDERALLY THREATENED AND ENDANGERED SPECIES

Biological surveys were conducted in the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry portions of the Project site by URS biologists, H. T. Harvey & Associates biologists, and others on a number of occasions between 2008 and 2010. These survey efforts are described in greater detail in the species-specific sections below. These surveys, which included the entirety of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry areas unless otherwise indicated below, can be summarized as follows:

- Reconnaissance-level botanical surveys and habitat mapping by URS in 2008 and 2009, and by H. T. Harvey & Associates in 2009 and 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010b).
- Focused surveys for special-status plants by URS in 2009 and by H. T. Harvey & Associates in spring and late summer 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010c, 2010d). Although late summer surveys included the entirety of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry areas, spring surveys did not include portions of the switching station location and the 320-acre “Martin parcel”. Focused surveys for spring-flowering special-status plants will be conducted by H. T. Harvey & Associates in spring of 2011 in these two areas.
- Field surveys for jurisdictional wetlands and other Waters of the U.S. by URS in 2008 and 2009, and by H. T. Harvey & Associates in 2009 and 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010g, 2010 h).
- Habitat assessments and reconnaissance-level field surveys for special-status branchiopods by URS in 2009, branchiopod habitat assessments by H. T. Harvey & Associates in 2009 and 2010, and wet-season branchiopod surveys in potential habitat (the latter being located entirely on the Solar Generation Facility site) by H. T. Harvey & Associates in 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010a).
- Protocol-level surveys for blunt-nosed leopard lizards (allowing for focused surveys for other special-status reptiles) on the majority of the Project site by URS in 2009 and on portions of the revised Project footprint (i.e., new array configuration and tie-line/switching station alternatives) by H. T. Harvey & Associates in 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010f). Some areas, such as arrays 9 and 10, the Sunrise Overlook and Visitor Overlook sites, and portions of the potential switching station locations, were not included in either the 2009 or 2010 surveys. Therefore, in 2011, HPR II will have qualified biologists conduct protocol-level surveys in any areas within the project’s impact footprint that were not surveyed according to protocol in 2009 or 2010. The survey area will also include a

1,500-foot-wide buffer around the construction footprint, as long as the Applicant has authorization from adjacent landowners to do so.

- Habitat assessments and reconnaissance-level field surveys for special-status amphibians by URS in 2009, and habitat assessments for such species by H. T. Harvey & Associates in 2009 (URS Corporation and H. T. Harvey & Associates 2009).
- Wintering bird surveys by URS in 2009 using transects and point count stations and reconnaissance-level surveys for birds in other seasons by URS in 2008 and 2009, on the Project site, and habitat assessments for special-status birds on the Twisselman Quarry and switching station alternative sites by H. T. Harvey & Associates in 2009 and 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010g, 2010 h).
- Small mammal trapping surveys of 16 small mammal live-trap lines in the Solar Generation Facility area by URS in 2008 (URS Corporation and H. T. Harvey & Associates 2009).
- Protocol-level San Joaquin antelope squirrel trapping surveys at seven locations with 100 trap grids each for two non-consecutive 5-day periods, totaling 7,000 trap days, by H. T. Harvey & Associates June through September 2010 (H. T. Harvey & Associates 2010i).
- Focused diurnal surveys for giant kangaroo rat precincts and San Joaquin antelope squirrels by H. T. Harvey & Associates in 2009 and 2010 (H. T. Harvey & Associates 2010e)
- Protocol-level surveys, with modifications that were coordinated with the USFWS and CDFG, for the San Joaquin kit fox by URS in 2009, including camera station surveys and spotlighting surveys (URS Corporation and H. T. Harvey & Associates 2009)
- San Joaquin kit fox den surveys by URS in 2008-2009 and by H. T. Harvey & Associates in 2009 (URS Corporation and H. T. Harvey & Associates 2009)
- San Joaquin kit fox surveys in the revised Project footprint (i.e., new array configuration, new property, and tie-line switching station alternatives) by H. T. Harvey & Associates in fall 2010
- Focused surveys for special-status species, including potential kit fox dens, giant kangaroo rat precincts, blunt-nosed leopard lizards, and rare plants were conducted on the two potential switching station locations and in the 320-acre Martin parcel, by H. T. Harvey & Associates in late spring and summer 2010

In addition, the USFWS species list for San Luis Obispo County and for the Las Yeguas Ranch, Simmler, McKittrick Summit, and La Panza NE U.S.G.S. 7.5-minute quadrangles in which the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry portions of the Project site occur was obtained on 27 January 2010. Based on this list, a review of relevant literature, database searches, and the findings of site surveys, URS and H. T. Harvey &

Associates biologists determined which special-status species were known to occur, or could potentially occur, in these portions of the Project site. A discussion of all special-status species considered for occurrence on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites is included as Appendix A. The USFWS species list for San Luis Obispo County and for the Las Yeguas Ranch, Simmler, McKittrick Summit, and La Panza NE U.S.G.S. 7.5-minute quadrangles is included as Appendix B.

Based on the assessment of biological resources on and in the vicinity of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry areas, it was determined that the San Joaquin kit fox (federally listed endangered and State-listed as threatened) and giant kangaroo rat (federally and State-listed as endangered) are known to occur in these areas. Additionally, it was determined that there was potential for the California jewel-flower (federally and State-listed endangered), San Joaquin woollythreads (federally listed endangered), Kern primrose sphinx moth (federally listed threatened), longhorn fairy shrimp (federally listed endangered), vernal pool fairy shrimp (federally listed threatened), blunt-nosed leopard lizard (federally and State-listed endangered), and California condor (federally and State-listed endangered) to occur in one or more of these areas. Additionally, the mountain plover, which has been proposed for federal listing by the USFWS, has been recorded on the Solar Generation Facility site, and thus this BA represents a request of conference opinion in the event that the species is listed in the future. These 10 species are addressed in detail below.

SAN JOAQUIN KIT FOX

SAN JOAQUIN KIT FOX

Overview/Biology. The kit fox is the smallest canid species in North America, of which the San Joaquin kit fox is the largest subspecies. The San Joaquin kit fox was listed as endangered under the FESA in 1967 and as threatened under the CESA in 1971. Loss of habitat from urban, agricultural, and industrial development is the principal factor in the decline of the San Joaquin kit fox. Critical habitat has not been designated for this species.

Prior to 1930, the range of the San Joaquin kit fox included most of the San Joaquin Valley. On the west side of the valley, the species range extended north from southern Kern County to Tracy in San Joaquin County, and on the west side of the valley its range extended to La Grange in Stanislaus County (Grinnell et al. 1937). However, by 1930, it was believed that the range of the San Joaquin kit fox had been reduced to half of its historic size. Subpopulations of the San Joaquin kit fox appear to be increasingly isolated from one another due to developments such as cities, aqueducts, irrigation canals, surface mining, road networks, petroleum fields, and other industrial projects (USFWS 1998).

The San Joaquin kit fox is primarily nocturnal and typically occurs in annual grassland or mixed shrub/grassland habitats throughout low, rolling hills and in valleys (Morrell 1972). The San Joaquin kit fox will use grazed grassland habitat, as well as grasslands with scattered structures such as power lines and wind turbines. This species also lives adjacent to, and forages in, tilled

and fallow fields and irrigated row crops (Warrick et al. 2007). The diet of the San Joaquin kit fox varies geographically, seasonally, and annually, but throughout most of its range consists primarily of rodents, rabbits, ground-nesting birds, and insects (Scrivner et al. 1987, Spiegel et al. 1996). Giant kangaroo rats are a favored prey item (Cypher et al. 2000). The San Joaquin kit fox requires underground dens for temperature regulation, shelter, reproduction, and predator avoidance (Morrell 1972). They commonly modify and use dens constructed by other animals, such as ground squirrels, badgers, and coyotes, and will use human-made structures as well (USFWS 1998). Dens are usually within loose-textured soils on slopes < 40 degrees, but the characteristics of San Joaquin kit fox dens vary across the species' geographic range in regard to the number of openings, shape, and the slope of the ground on which they occur (USFWS 1998). Kit foxes change dens often, typically using numerous dens each year. Koopman et al. (1998) estimated that, on average, a San Joaquin kit fox will use approximately 12 dens over the course of a year, and will often not use the same den(s) the following year.

Kit foxes are subject to predation or competitive exclusion by other species, such as the coyote, domestic dog, bobcat (*Felis rufus*), and non-native red fox (*Vulpes vulpes*), as well as large raptors (Benedict and Forbes 1979, Cypher and Spencer 1998, Clark et al. 2005, Clark et al. 2007). San Joaquin kit fox are primarily nocturnal, and are active throughout the year.

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. The San Joaquin kit fox is a relatively common resident of the Carrizo Plain and portions of the lower San Joaquin Valley, and over 50% of kit foxes occur within this geographic area (Morrell 1975). The 1998 *Recovery Plan for Upland Species of the San Joaquin Valley, California*, identifies the Carrizo Plain Natural Area (Carrizo Plain National Monument) as one of three main core San Joaquin kit fox populations in the San Joaquin Valley area, and this populations is considered to be the largest single population (USFWS 1998); and several records of the species occurrence are within, and around, the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites (Figure 7, CNDDDB 2010). The recovery plan for this species recognizes that continued habitat fragmentation due to the loss and degradation of habitat from agricultural and industrial developments and urbanization is a serious threat to the survival of San Joaquin kit fox populations (USFWS 1998).

The grasslands and scrub provide habitat for giant kangaroo rats, California ground squirrels, and other potential kit fox prey, and no barriers to dispersal are present on the site. Thus, the majority of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites are suitable foraging and dispersal habitat for the San Joaquin kit fox. This species does not typically den within wetlands, so the seasonal wetlands in the southwestern part of the Solar Generation Facility site, the alkali sink on the south side of SR 58 northeast of Array 6, and the seep within the generation tie-line corridor are not suitable denning habitat for this species; however, kit fox likely forage in these wetlands to some extent, at least during the dry season.

Surveys for San Joaquin kit foxes were conducted throughout different portions of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites at different times by URS and H. T. Harvey & Associates biologists between 3 June 2009 and 30 October 2010. Complete details of the survey methodologies are described in the California Valley Solar Ranch Project Revised Biological Resources Assessment Report (URS and H. T. Harvey & Associates 2009). Survey methodology generally followed the northern range protocol for San Joaquin kit foxes (USFWS 1999a), with modifications that were coordinated with the USFWS and CDFG (Althouse and Meade, Inc., and URS Corporation 2009, CDFG 2009b). Biologists with demonstrable experience with San Joaquin kit fox biology, identification, and survey techniques conducted ground surveys for San Joaquin kit fox dens throughout the Project area by walking transect lines at 100-m intervals. Four URS surveyors conducted surveys for potential kit fox dens across a 2,963-acre portion of the BSA, which included the majority of the proposed impact areas, in June and July 2009. H. T. Harvey & Associates biologists conducted surveys throughout all areas of Project site except the Martin parcel and the alternative switching station locations, in November and December 2009.

In addition, URS conducted night-time spotlighting surveys and camera station surveys for San Joaquin kit foxes in the Solar Generation Facility and generation tie-line areas. The CDFG did not recommend the use of scent stations (CDFG 2009b); so this survey methodology was not used. The CDFG-approved, modified San Joaquin kit fox spotlighting protocol included 5 nights of spotlighting surveys during June and July 2009. An initial survey was conducted on June 3-4, 2009. During each of the four subsequent surveys, spotlighting was conducted by a total of six people, three people in each of two vehicles, as recommended by CDFG in a letter of concurrence dated 24 June 2009 (CDFG 2009b). The camera station survey protocol included the use of two remote sensor cameras (Cuddeback™ Expert digital cameras) in 2009. Initially, a single camera was stationed at one location for 16 days. Subsequently, two cameras were deployed concurrently at separate locations, and these were moved to new locations on 10 different dates.

The initial surveys confirmed the presence of San Joaquin kit fox on the site (Figure 8). Five natal dens, 3 of which were confirmed to be active, were recorded within the Project site south of SR 58 in 2009, verifying use of the site by family groups, and individuals. Numerous non-natal dens, and “potential dens” (i.e., dens having the appropriate size for use by kit fox) were also found distributed throughout most of the site (Figure 8).

In June 2010, H. T. Harvey & Associates conducted additional surveys of the revised Project footprint, including the newly acquired 320-acre Martin parcel (where array 11 is proposed) and along the two alternative switching station locations and alignments. Surveys consisted of walking transects spaced ~50 m apart to assess habitat suitability for, and look for evidence of, special-status species such as kit fox and their dens. These surveys resulted in finding five potential kit fox dens within the footprint of the alternative switching station areas and one potential den on the 320-acre Martin parcel. Although kit fox activity was not confirmed at any of these dens, all were the appropriate size (approximately 4-5” in diameter) and shape

(“keyhole” shape) for kit fox dens. The identified kit fox dens were too small to be used by coyotes, and there were no California ground squirrels, a species that may make similar sized dens on occasion, in the area. These dens were likely used as escape dens by foraging or dispersing individuals. On 7 July 2010, H. T. Harvey & Associates biologists observed two kit foxes, which appeared to be dispersing juveniles, just east of the natal den complex located north of Array 7.

In September and October 2010 the entire study site was again surveyed and all potential San Joaquin kit fox dens, latrines, scat, or other sign was investigated, identified, and the locations were recorded. During these surveys, 3 active natal dens were again recorded on the Project site south of SR 58 suggesting the continued use of the site by at least 3 family groups. Fifty potential non-natal dens were also found distributed throughout the site (see Figure 8). On 28 September 2010, H. T. Harvey & Associates biologists observed two kit foxes in the area south of Hwy 58 near the San Andreas fault scarp.

The abundance of San Joaquin kit fox within a particular area varies widely depending on a number of physical and biotic factors. Based on documented San Joaquin kit fox abundance at locations east (Naval Petroleum Reserves) and west (Camp Roberts) of the site, the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites (approximately 7.0 mi²) could support between 2-31 San Joaquin kit fox depending on conditions that affect the species’ carrying capacity in the area (Cypher et al. 2000, Berry and Standley 1992, White et al. 1996). Estimates of San Joaquin kit fox densities from the Carrizo Plain during drought conditions have been shown to range from 0.39/mi² to 0.62/mi² (White et al. 1996). At these densities, 3-5 individuals could occur within the Project site during drought conditions.

There are several factors that have been documented through the various surveys that provide insight into the minimum number of San Joaquin kit fox that are resident or utilize habitats within the project site and surrounding areas. Biologists from URS reported that San Joaquin kit fox pups were observed at 3 den sites, suggesting that a minimum of 3 pairs of adults occurred on the project site in 2009; and a total of 5 natal dens located during the 2009 surveys indicates that as many as 10 adults could have been resident in 2009. On average, 9 San Joaquin kit fox were seen during spotlight surveys, with a range of 4 to 13 individuals observed during single surveys. Surveys conducted in 2010, revealed the location of 3 natal dens supporting the conclusion that at least 6 resident adult kit foxes were likely present on the site.

The results of the 2010 surveys substantiate conclusions drawn from the results of earlier surveys and indicate there are 3 resident pairs on the site, and likely additional individuals that may be resident of adjacent lands but include the Project site within their home range. The overall presence of kit fox on the site does not appear to have substantially increased or decreased over the past year, and kit fox use of habitats on the project site appears to have remained relatively consistent between the 2 years.

GIANT KANGAROO RAT

Overview/Biology. The giant kangaroo rat is federally and State-listed as endangered. This species historically occurred along the western edge of the Tulare Basin in southern San Joaquin Valley and within the Carrizo and Elkhorn plains and Cuyama and Panoche valleys in California (Grinnell 1932). As a result of conversion of native valley grassland habitats to agriculture and other developments, the giant kangaroo rat is now restricted to a fraction of its historic range (Williams 1992). The distribution of the population is discontinuous, comprised of six major subpopulations occurring in the Panoche Valley in western Fresno and eastern San Benito counties, along the western edge of Kings and Kern counties, within the Carrizo and Elkhorn plains in western San Luis Obispo County, and the Cuyama Valley in northeastern Santa Barbara County (Williams et al. 1995). Each of the six major subpopulations has been further fragmented and isolated as continued conversion of landscapes has introduced barriers such as cropland, roads, and urban development (USFWS 1998). Giant kangaroo rats occur in grasslands, although they may also utilize alkali or saltbush scrub habitats. They are primarily seed eaters but also eat green plants and insects with an apparent preference for these supplementary foods during lactation (Grinnell 1932). The giant kangaroo rat is nocturnal, spending only a couple of hours each night on the surface (Braun 1985) harvesting and storing large amounts of seed in above ground “pit caches” or “haystacks,” where seeds are cured before being stored underground (Shaw 1934).

Giant kangaroo rats live in colonies that may include from two to 23,000 individuals, representing a range in variation of five orders of magnitude (Williams et al. 1995). Colonies are comprised of distinct burrow precincts typified by an area approximately 20 ft in diameter where vegetation is cropped around a central area in which there are numerous vertical and horizontal entrances. Active burrow precincts are relatively easy to detect, even from a distance (Williams 1980). Individual precincts are usually connected to other precincts by well-worn paths and the above ground portion of the precinct is used for foraging, caching seeds, and sand bathing (Randall et al. 2001).

Home ranges of giant kangaroo rats have been shown to exceed 400 yd² or to be as small as approximately 72 yd², with the precinct located in the center (Braun 1985). Estimates of population density have decreased considerably over time, possibly as a function of sampling methods, but this drop in population density may also be related to habitat quality. Grinnell (1932) estimated that population densities of giant kangaroo rats occurring in high quality habitat ranged from 16 to 28 adults/acre. Braun (1985) estimated population densities on the Carrizo Plain at 25 adults per hectare (approximately 10 adults/acre). Williams et al. (1993) found a wide range of densities at the Carrizo Plain Natural Area, from 4 to 23 individuals/acre, with differences evident between years and seasons.

Giant kangaroo rats may breed during their first year and a single female can have 2-3 litters per year, with each litter comprised of 2-4 young. This extraordinary potential reproductive rate enables populations to rapidly expand when plant productivity is high and food is abundant (Williams & Kilburn 1992).

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. The nearest publicly documented location of a giant kangaroo rat to the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites recorded in the California Natural Diversity Database (CNDDDB; 2010) was reported in 1985 from an area just east of the southeast corner of the Solar Generation Facility (Figure 9). Sign of giant kangaroo rat activity (including pit caches, burrows, footprints, and tail drag marks) was observed by URS biologists in July 2008 at a reference site located approximately 2 mi southeast of the Solar Generation Facility site, at the Wallace Creek Trailhead within the Carrizo Plain National Monument.

Small mammal trapping surveys were conducted by URS during the period of July 20–25, 2008 to determine the assemblage of small mammal species in the Solar Generation Facility area. Ten URS biologists assisted in the July 2008 small mammal trapping effort overseen by two subcontracting biologists with over 25 years of small mammal trapping experience: Paul Collins (CDFG Scientific Collecting Permit #SC-000493) and Tom Olson (CDFG Scientific Collecting Permit #SC-002048). The small mammal trapping survey consisted of 16 small mammal live-trap lines established at locations within the Solar Generation Facility area that had been determined in consultation with CDFG biologists (Figure 10). Lines of live-traps were established on the Solar Generation Facility site within Annual Grassland, Interior Coast Range Scrub, Tamarisk Scrub, and Desert Sink Scrub habitats. Each trap line consisted of 10 stations with two Sherman live-traps at each station. The total number of traps was 320 (16 trap lines, 10 stations/line, 2 traps/station). Most were long Sherman live-traps (12 inches by 4 inches by 3 inches). The traps also included some standard-sized live-traps (9 inches by 3.5 inches by 3 inches) and extra long live-traps (15 inches by 4 inches by 3 inches). The longer traps helped to avoid tail damage to large kangaroo rat species. Trap stations were established approximately 10 meters apart along each trap line, for a total distance of 100 meters per trap line. Where possible, traps were placed under shrubs because many burrows were located at the base of shrubs. Traps were baited with a combination of sweet horse feed (corn, barley, and oats), bird seed, whole oats, and crushed walnuts. Traps were opened and baited during the late afternoon/early evening on July 20–24, 2008. Traps were checked the following mornings (July 21–25, 2008), beginning at sunrise, and were then closed until baiting occurred again in the late afternoon/early evening. The total number of trap nights for the 5-day trapping period was 1,560.

This trapping effort resulted in the capture of seven McKittrick pocket mice (*Perognathus inornatus neglectus*), 27 California pocket mice (*Chaetodipus californicus ochrus*), five Heermann's kangaroo rats (*Dipodomys heermanni swarthi*), one deer mouse (*Peromyscus maniculatus gambeli*), and two California ground squirrels (*Spermophilus beecheyi*), but no giant

kangaroo rats were captured. However, giant kangaroo rat presence was confirmed when one was observed by URS biologists during kit fox spotlighting surveys on 4 June 2009.

H. T. Harvey & Associates biologists conducted focused diurnal surveys of giant kangaroo rat burrow precincts on the Solar Generation Facility, generation tie-line, and Twisselman Quarry sites in November and December 2009. High-resolution aerial photographs served as a base map, which was overlain with a north-south oriented grid comprised of cells measuring 2500 meter². The 50 x 50 meter grid squares were visually searched for important habitat types, topographic features, and active kangaroo rat precincts that were identified and mapped. These field surveys were conducted by two observers traveling parallel on ATVs at 1-2 mi/hour along the east-west grid lines. Each surveyor searched the area extending 50 m on either side of the transect line with 10x binoculars. Surveyors walked to features that could not be readily identified from the ATV and investigated these at close range. Active burrow precincts were avoided by several feet, and large areas containing multiple burrow precincts were bypassed and the locations of the complexes were determined by bracketing with coordinates on the west side and east side of the occupied area to avoid impacts to burrows.

When giant kangaroo rat sign was observed, data were recorded indicating presence within the identified 50 x 50 m grid square. Burrow precincts were considered occupied based on presence of scat, tracks, tail drags, pit caches, and cropped plants around a series of vertical and horizontal burrow openings. Precincts that did not appear to be occupied were also identified and mapped. Precincts were considered unoccupied when characteristic horizontal and vertical burrow openings were not accompanied by fresh scat, tracks, fresh digging, or cropped vegetation; the presence of debris in the burrow openings was also considered as evidence that precincts were unoccupied by giant kangaroo rats.

These surveys collectively covered 5,346 acres, which includes the entire BSA. Of the acreage surveyed, 1,077 grid squares, or 665 acres (15%), contained evidence of giant kangaroo rat occupancy. Of the 1,077 grid squares, 871 grid squares (equivalent to 538 acres) contained active burrow precincts as evident by the presence of maintained and clear lateral and vertical burrow openings, seed caches, tracks, tail drags, scat, and recently cropped vegetation on and around the precincts. Based on direct counts of active precincts within a subset of active grids ($n = 554$), the average total number of precincts per grid square was 1.36, with a modal value of one precinct per grid square. Thus, based on a 99% confidence interval, the total number of precincts on the CVSR site is estimated to be between 1,389 and 1,540 precincts, and the total number of active precincts on the site ranges between 1,124 and 1,246. The remaining 206 grid squares, or 127 acres, contained giant kangaroo rat precincts that were considered to have been abandoned as they lacked signs of activity such as burrow opening maintained free of debris and/or lack of cropped vegetation around the burrow openings. The total number of inactive precincts on the CVSR site is estimated to be between 266 and 295, based on the 99% confidence interval.

In September 2010, H. T. Harvey & Associates again surveyed the entire footprint of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites,

including the Martin parcel and the two potential switching station locations (H. T. Harvey & Associates 2010e). Surveys conducted in 2010 followed the method used in the 2009 survey. The results of the 2010 survey indicate the population within the area of the Solar Generation Facility had increased to 1,876 individuals since the November 2009 survey, with a mean density of precincts within the 50-m by 50-m grid squares where giant kangaroo rats were detected of 2.59. The 2009 focused survey for giant kangaroo rats did not include the Martin property as this parcel was not part of the project at that time. In 2010, 92 of the 1,876 precincts located were on the Martin parcel.

In 2010, although the population within the area of the Solar Generation Facility had increased substantially, the acreage occupied decreased to 426.1 acres. The Solar Generation Facility site had not been grazed during the late spring and summer of 2010, and as a result the boundaries of individual precincts were much more readily demarcated by the contrast created by cropped plants around the precinct and the relatively tall dense grassland vegetation. Many of the precincts identified as inactive in 2009 were either occupied in 2010 or, if they remained inactive, were not readily detectable due to the tall dense grass.

Active giant kangaroo rat precincts were distributed unevenly across the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites (Figure 11). The majority of the precincts were concentrated in a wide, gently-sloped area south of SR 58, between Arrays 2 and 4 (which were subsequently re-configured to avoid impacts to this concentration). Although active precincts were found throughout much of the rest of the Solar Generation Facility site, they were sparse throughout the relatively steep slopes of the hilly area north of Array 8, and in the flats between the slopes in that area. Likewise, there were no active precincts in the hummocky area in the extreme southwest corner of the Solar Generation Facility site, and giant kangaroo rat precincts were absent from the gypsum quarries and alkali sinks at the northeast corner of the Solar Generation Facility site. In 2009 there were numerous inactive precincts north of SR 58, yet few were located in 2010. Giant kangaroo rats were absent from the hills along the north edge of the Solar Generation Facility site and from most of the generation tie-line/switching station areas and from the Twisselman Quarry.

The relatively large number of inactive burrow precincts located in 2009 may reflect the impact of drought on the population, which would have reduced the abundance and restricted the distribution of giant kangaroo rats on the site. This indicates that although these areas are not currently occupied, they comprise suitable habitat that could be occupied during consecutive productive years of normal or above-normal rainfall.

Rainfall during the winter of 2009-2010 was substantially higher than the typical annual rainfall for the Carrizo Plain. In the past, giant kangaroo rat populations have fluctuated substantially during wet periods and subsequent years (Cypher 2001, Williams et al. 1995), and the difference in rainfall between 2009 and 2010 likely influenced the increase in abundance of giant kangaroo rat precincts from 2009 to 2010.

Even though the present distribution of giant kangaroo rats over the site is uneven, 4,285 acres of the BSA consists of flat or gently sloping terrain (<11% slope), consisting mostly of annual grasslands which provide suitable habitat for giant kangaroo rats (USFWS 2010c). Areas of the BSA that are unsuitable for the species include 48 acres of slopes greater than 22% (USFWS 2010c). Also, the highly disturbed former gypsum mines in the southwestern and south-central portions of the BSA (192.5 acres), the currently active portions of the Twisselman Quarry, portions of SR 58 that pass through the site (11.7 acres), and 58.2 acres of alkali sink in the northeastern part of the BSA are unsuitable for this species as well (Figure 11). In addition, 152 acres of the site has slopes ranging 11 to 22%; these areas may be utilized by giant kangaroo rats, although slopes this steep are considered suboptimal habitat for giant kangaroo rats (USFWS 2010c).

Current and Historic Distribution/Habitat Conditions on the Carrizo Plain. In the recently completed 5-year review of the status of giant kangaroo rats in California, the USFWS (2010c) reported that there are 78,000 acres of suitable and occupied habitat on the Carrizo Plain, of which 68,000 acres is protected within the Carrizo Plain National Monument or by private conservation easements; the remaining 10,000 acres was identified as suitable but unprotected habitat (USFWS 2010c). H. T. Harvey & Associates' preliminary analysis of aerial imagery, geomorphology, soil types, and vegetation indicates there are several thousand acres of suitable and densely occupied habitat on private lands adjacent to the eastern edge of the Carrizo Plain National Monument, which encompass portions of the Carrizo and Elkhorn valley. The BSA encompasses an additional 4,285 acres of suitable habitat, some of which is occupied and some of which is not occupied or is occupied by relatively few giant kangaroo rats (Figure 11). There is also occupied habitat within the California Valley Subdivision and within larger pieces of private land in the central portion of the plain, which comprise suitable, occupied, and unprotected habitat USFWS (2010c).

The distribution of giant kangaroo rats on the Carrizo Plain is currently concentrated within the southern portion of the plain, predominantly within the Carrizo Plain National Monument. Reasons for the relatively scarcity or absence of giant kangaroo rats in the northern portion of the plain are unresolved but likely hinge on a number of factors. The expansion of agriculture in the San Joaquin Valley is widely recognized as a critical factor in the decline of giant kangaroo rats throughout most of their former range (USFWS 2010c) and dryland farming throughout much of the northern portion of the Carrizo Plain would have had the same effect. There is also some evidence that precipitation in the northern part of the range may be a limiting factor for giant kangaroo rats. Grinnell (1932), Shaw (1934), and Hawbecker (1951) concluded that giant kangaroo rats occurred in areas with less than ~5 inches of annual precipitation. However giant kangaroo rats that currently exist within the central portion of the Carrizo Plain occur in areas which appear to have much higher precipitation levels. For example, the CVSR site falls within an area where the 60-year average rainfall may have exceeded 11 inches. Likewise, an extant colony of giant kangaroo rats located near Soda Lake Road, south of SR 58, falls within an area where the 60-year mean annual rainfall may have exceeded 13 inches (Note: these rainfall estimates are based on isohyet curves which are interpolations of rainfall between points where

rainfall is measured; these data are available at http://projects.atlas.ca.gov/frs/?group_id=16 Taelle Precipitation, downloaded November 2010).

Williams (1992), reported giant kangaroo rats from locations within the far northern portion of the Carrizo Plain, which included historic records from 1947 but also included observations by USFWS biologists; which although not dated were apparently from the early 1990s. Although the distribution of giant kangaroo rats in the northern portion of the Carrizo Plain could be limited during periods of high precipitation rates, the species appears to at least occupy the northern portions of the plain during what may be drier spells. The genus *Dipodomys* has been extant in the western portion of North America since the middle Miocene (~14 million years ago; Alexander and Riddle 2005) and historic records from the early part of the 1900's show that giant kangaroo rats occurred throughout the southern portion of the San Joaquin Valley (Grinnell 1932). The distribution of a species with this geologic and geographic range would not be expected to be exclusively restricted geographically from nearby areas of similar habitat, latitude, and topography; but would more likely utilize these areas when conditions were suitable and would be infrequent in these areas when conditions were not suitable.

Ground disturbance associated with agricultural operations is widely recognized as an important factor limiting the distribution of giant kangaroo rats throughout most of the historic range in the San Joaquin Valley (USFWS 2010c) and this appears to have been an important limiting factor affecting the distribution of giant kangaroo rats on the Carrizo Plain. Good et al. (1997) estimated, based on previous studies, that grain farming reduced giant kangaroo habitat in the Carrizo Plain by 20-40% and much of this reduction appears to have taken place in the northern portion of the plain. Current and historical aerial photographs of the Carrizo Plain north of the Monument reveal evidence of extensive cultivation and much of this is focused on the valley floor in areas of potentially suitable giant kangaroo rat habitat.

Giant kangaroo rats have occupied northern portions of the Carrizo Plain in the past (Williams 1992) and currently occupy portions of the central Carrizo Plain well north of the widespread populations that now occur throughout the southern portion of the plain. In the past this species appears to have occupied portions of the northern Carrizo Plain and whether their apparent current absence from these areas is an artifact of sampling, or is in fact the result of climate or incompatible land use is undetermined. It is however evident that land use and habitat changes resulting from changing land use may have created a significant barrier limiting expansion of extant populations in the southern portion of the plain into the northern regions.

Large areas of the valley floor to the west and east of Soda Lake Road, and north and south of SR 58 are currently or were recently tilled for dry-land agriculture. In addition, during the late 1960s, developers subdivided approximately 18,400 acres of ranchlands located between the CVSR site and the Monument, extending across the valley floor creating the California Valley Subdivision. Although they successfully installed roads and sold all of the 2.5-acre parcels, little development of the parcels followed, largely due to poor water quality in the region of the valley east of Soda Lake Road. Nonetheless, livestock grazing on these lands has been limited for

nearly 50 years, as there are several thousand absentee owners of small parcels, and as a result the vegetative community has matured and most of the 18,400 acres are now dominated by dense scrub habitat which is typically avoided by giant kangaroo rats. Only remnant populations of giant kangaroo rats persist within the California Valley Subdivision, primarily along the dry west side of the valley and along the graded roads where grasses still dominate apparently as a result of disturbance associated with ongoing road maintenance.

A lack of connectivity between the large populations in the southern portion of the Carrizo plain and the northern portions of the plain may also have been a factor in the continued exclusion of giant kangaroo rats from previously occupied habitats north of Soda Lake. For example, it appears that at least portions of the CVSR site were also farmed as recently as the early 1990's. Aerial imagery (GoogleEarth™) from 1994 reveals evidence that the central area of the Solar Generation Facility site had been recently tilled, and there appear to be few giant kangaroo rat precincts present. Dr. David Germano, who visited the site in August 2009, also concluded that the site had been farmed and then subsequently re-colonized by giant kangaroo rats in recent years based on the lack of mounded soils around the existing precincts. It appears that even with the proximity of the CVSR site to extant giant kangaroo rat populations on the Monument, it took more than a decade for giant kangaroo rats to recolonize the site.

It is very likely that the history and pattern of land use on the CVSR site reflects the history and pattern of land use on the large privately held parcels in the northern portion of the valley, as the longtime owner of the CVSR site also owns several parcels of land in the northern portion of the valley that are currently farmed or have been farmed in the recent past. It also appears likely that, following cessation of ground disturbance associated with agricultural operations, the CVSR site was re-colonized by giant kangaroo rats emigrating from large populations of giant kangaroo rats on the Carrizo Plain National Monument along patches and corridors of suitable habitat that provided a connection between extant populations and the CVSR site.

Suitable habitats in the northern portion of the valley, where giant kangaroo rats may have been extirpated, lack this connectivity and are isolated from populations in the southern region of the valley by a wide barrier of incompatible land use and unsuitable habitat. Along the western edge of the valley (west of Soda Lake Road) there is some potential for connectivity between extant giant kangaroo populations on the Monument and areas to the north, but there is a far higher density of houses in this area than in other regions of the valley. The extent to which human activities (e.g., use of biocides and traps around houses, predation by domestic pets, and removal of livestock) may limit the suitability of the habitat for giant kangaroo rats is unknown, but these factors likely limit giant kangaroo rat's utilization of these habitats. Alternatively, along the eastern edge of the valley, extending north from the Monument, there are relatively few houses, and most of the habitat consists of annual grasslands continuously grazed by cattle. However the corridor of habitat suitable for giant kangaroo rats is constrained by the steep slopes of the Tembladero Mountains and sections of land that are currently or were recently farmed.

The center of the valley extending from the Monument to Soda Lake Road near SR 58 is also likely a significant barrier as well as it is considerably lower in elevation than the edges of the valley and throughout much of this area there is evidence that the ground is periodically saturated, at least during the winter months. Soils are heavy and cracked when dry, vegetation is much denser than in the surrounding uplands, and there is ample evidence of vernal pools. Although giant kangaroo rats could potentially disperse through this area during dry times of the year, they would not be expected to persist through winter as their burrows would likely be flooded. This low center of the valley immediately north of the Monument may function as a population sink if giant kangaroo rats occupy these lowlands during dry months.

In summary, the present distribution of giant kangaroo rats in the Carrizo Plain is concentrated towards the southern end of the valley, with most of the population occurring on the Monument and other BLM lands, and on some privately held lands. Relatively small populations extend north along the eastern side of the valley to some extent, but connectivity to the northwestern portion of the valley appears to be limited by topography, habitat, and incompatible land use. This lack of habitat connectivity appears to have prevented or substantially limited recolonization of suitable habitats in the north end of the valley, as lands that were formerly tilled return to native and rangeland vegetation. Finally, giant kangaroo rats apparently have been extirpated from large areas within the northern portion of the valley, yet there is a substantial amount of habitat and significant potential for restoring giant kangaroo rat populations to formerly farmed areas.

CALIFORNIA JEWEL-FLOWER

Overview/Biology. The California jewel-flower is a federally and State endangered annual herb in the mustard family (Brassicaceae). It is also included on the CDFG list as S1.1 rank and on the CNPS's List 1B. It is concentrated in the valley regions, and is found in Fresno, Kern, Santa Barbara, and San Luis Obispo counties; it is considered extirpated from Kings and Tulare counties. California jewel-flower is known from 47 occurrences in Southern to Central California, many of which are considered extirpated (CNDDDB 2010, CNPS 2009).

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. Within San Luis Obispo County, there have been 26 documented occurrences, 22 of which are considered extant (CNDDDB 2010). Thirty-one specimens collected within the county have been officially accessioned in California herbaria (Consortium of California Herbaria [CCH] 2009). The nearest occurrence was recorded 10 mi south of the Solar Generation Facility site in 1952 (Figure 12; CNDDDB 2010), and a specimen was collected from that location. Other occurrences from the Carrizo Plain have been collected as recently as 1988 (CCH 2009), suggesting that the species is extant in the region. California jewel-flower typically blooms from February to May and occurs in chenopod scrub, valley and foothill grassland, and pinyon-juniper woodland from 200 to 3,300 ft elevation above mean sea level (CNPS 2009).

After reviewing information regarding the special-status plants potentially occurring on and in the vicinity of the Solar Generation Facility site, URS biologists conducted focused surveys for special-status plants throughout the Solar Generation Facility and generation tie-line sites in 2009 (URS Corporation and H. T. Harvey & Associates 2009). URS biologists conducted seasonally-timed, focused botanical surveys in the solar array footprint and the initially proposed transmission line routes (i.e., the entire Solar Generation Facility and generation tie-line footprints) on the following dates: March 18 to 20, April 8 to 9, and April 22 to 23, 2009. The botanical survey involved pedestrian transects walked by at least three biologists approximately 30 to 60 ft apart depending on topography. These surveys were conducted in accordance with USFWS, CDFG, and CNPS guidelines by URS biologists familiar with special-status plant species that occur in the Carrizo Plain. In addition, URS biologists surveyed reference sites within the vicinity of the Solar Generation Facility site on April 16, 2009. The purpose of the reference site surveys was to determine whether special-status plants were detectable in areas of known occurrence, and confirm that conditions (e.g., recent precipitation) were suitable on-site for detecting these species, if present.

In addition, URS biologists conducting blunt-nosed leopard lizard surveys in June, July, and August 2009 also surveyed for special-status plants that flower in the summer. However, the entire area surveyed for the original focused botanical surveys was not resurveyed in the summer, nor was the later survey effort primarily focused on rare plant detection and identification.

Potentially suitable habitat for the California jewel-flower was identified within the study area in the Annual Grassland, Wildflower Field, Inner Coast Range Saltbush Scrub, and Desert Sink Scrub vegetation communities. California jewel-flower was not observed during URS's focused floristic surveys, which were conducted within its blooming period. The reference population located 5 mi south of Soda Lake was visited on April 16, 2009, and no plants were found; however, since it is an annual species, it may only be observed in certain years when annual precipitation levels are appropriate, and rainfall was below average in 2009 when surveys were conducted.

Because rainfall totals during the 2009-2010 wet season were conducive to providing suitable conditions for germination and detection of this species, if present, H. T. Harvey & Associates (2010c, 2010d) conducted special-status plant surveys on the majority of the Solar Generation Facility, generation tie-line, and Twisselman Quarry sites (and a portion of the potential switching station location) on March 15 to April 13, April 22, and May 3 to May 7, 2010. These surveys were conducted according to the most recent CDFG, CNPS, and USFWS protocols (USFWS 1996c, revised 2002; CDFG 1983, revised 2000; CDFG 2009c; CNPS 1983, revised 2001) and were conducted by seven trained botanists familiar with special-status plant species that occur in the Carrizo Plain. On 29 March 2010, botanists corresponded with the BLM botanist of the Carrizo National Monument, Denis Kearns, regarding the state of extant populations of California jewel-flower, and were informed that the reference populations for this species had flowered during spring 2010 and were at that time beginning to set fruit. Chris

Winchell and Colin Wilkinson of H. T. Harvey & Associates then visited the BLM population on 3 April to verify the detectability of this population (which was detectable on that date).

All areas within the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites with the exception of portions of the potential switching station locations and the 320-acre Martin parcel were walked on foot by the survey team, using 50-ft transects arranged by pre-set survey blocks. The transect locations were also pre-set and loaded onto hand-held submeter Trimble GPS units (Geo-XH and similar models) so that the surveyors were aware of which transects they were covering while in the field. At least one GPS unit was used per survey team if multiple teams were surveying at the same time. As each transect was completed, the transect data was updated in the GIS data library for the project as such, to carefully track location of the survey team(s) by day and also to provide a record of survey completion. Comprehensive, floristic plant lists were maintained for each block, and each team also documented where revisits were needed. Survey dates for the initial transect survey of the entire site (which began after the 3-day orientation described above) included 18 and 19 March, 22-26 March, 29-31 March, 1-3 April, and 5-12 April 2010. These sites were revisited by Brian Cleary and Colin Wilkinson again on 22 April 2010. Colin Wilkinson again visited these sites on 29 April 2010 to track the continuing bloom.

The same areas (again, except for portions of the potential switching station locations and the 320-acre Martin parcel) was revisited on 3–7 May 2010. During these revisits, plants not yet in bloom during the initial survey or needing additional structures for identification were revisited, and an added area leading to the northern quarry site and encompassing a new design of one of the proposed switchyard alternatives were surveyed. While the entire area that had been previously surveyed was reviewed again, areas intensively surveyed on foot for this revisit were either targeted by earlier GPS data or were intuitively controlled based on habitat suitability and prior knowledge of the site.

No California jewel-flowers were located on the site during URS's survey in 2009 or H. T. Harvey & Associates' survey in 2010, and thus, the species is likely absent from the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. Nevertheless, there is at least a low probability that the species occurs in either of the two general areas that were not surveyed during the appropriate season (portions of the potential switching station locations and the 320-acre Martin parcel), and thus surveys of these two areas will be conducted in spring 2011.

SAN JOAQUIN WOOLLYTHREADS

Overview/Biology. The San Joaquin woollythreads is a federally endangered annual herb in the aster family (Asteraceae) and is included on the CDFG list as rank S3.2 and on the CNPS List 1B. Populations are found in Fresno, Kings, Kern, Santa Barbara, San Benito, San Luis Obispo, and Tulare counties (CNPS 2009), with 87 known occurrences (CNDDDB 2010). It is known from 15 occurrences in San Luis Obispo County (CNDDDB 2010).

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. Sixteen specimens collected within San Luis Obispo County have been officially accessioned in California herbaria (CCH 2009). Several occurrences are located within the vicinity of the Solar Generation Facility site, with the nearest occurrence located approximately 10 mi northeast of the Solar Generation Facility, recorded in 2008 (Figure 12; CNDDDB 2010), and other occurrences located in the south-central portion of the Carrizo Plain (CalFlora 2009). San Joaquin woollythreads typically blooms from April to June and occurs in chenopod scrub and valley or foothill grassland in alkaline, sandy or loamy plains from 197 to 2,625 ft elevation above msl (CNPS 2009).

Focused surveys for special-status plants, including the San Joaquin woollythreads, were conducted by URS biologists in the Solar Generation Facility and generation tie-line areas as described above for the California jewel-flower (URS Corporation and H. T. Harvey & Associates 2009). Suitable habitat is found on-site in the Annual Grassland, Wildflower Field, Desert Sink Scrub, and Interior Coast Range Scrub vegetation communities. San Joaquin woollythreads was not observed during URS's focused floristic surveys, which were conducted within its blooming period. However, because it is an annual species and may only be observed in certain years when annual precipitation levels are appropriate, H. T. Harvey & Associates (2010c, 2010d) conducted rare plant surveys on the CVSR in 2010, as described above for the California jewel-flower. On 16 and 17 March, nearby reference populations of San Joaquin woollythreads were found to be in flower in similar habitats to those on-site and were documented.

No San Joaquin woollythreads were located in the Solar Generation Facility and generation tie-line areas during URS's survey in 2009 or in the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites during H. T. Harvey & Associates' survey in 2010, and the species is thus likely absent from the site. Nevertheless, there is at least a low probability that the species occurs in either of the two general areas that were not surveyed during the appropriate season (portions of the potential switching station locations and the 320-acre Martin parcel), and thus surveys of these two areas will be conducted in spring 2011.

LONGHORN FAIRY SHRIMP

Overview/Biology. The longhorn fairy shrimp is a federally listed freshwater invertebrate endemic to California vernal pools. This species is in the aquatic crustacean Order Anostraca. All listed vernal pool branchiopods are short lived (<150 days) and fast reproducers (20–60 days), and can complete their life cycle in 20 days under optimal conditions to 40 days under less favorable conditions, depending on the species. During the dry season, fairy shrimp embryos are contained in a protective impenetrable shell called a cyst. Cysts may remain viable in the soil for 15 years and often for much longer. Following winter and spring rains and the inundation of vernal pools, embryos hatch from the cysts and enter the water column, to mature and reproduce and complete their life cycle (Eriksen and Belk 1999). Longhorn fairy shrimp are endemic to vernal pools in the Central Valley, northern and southern Coast Ranges, southwestern coastal

California, extreme northwestern Baja California, and a limited number of sites in the Transverse Range and Santa Rosa Plateau of California (USFWS 1994, 2003, 2005a, 2006a, Eriksen and Belk 1999, CNDDDB 2010). They are also found in sandstone or basalt-flow depression basins to small swale and earth slump, with a grassy or, occasionally, muddy bottoms in grassland habitats (Eriksen and Belk 1999). Despite occurring in clear, neutral pools with low TDS elsewhere in their range, longhorn fairy shrimp have been observed to occur in turbid, alkaline pools in the Carrizo Plain vernal pool region (Helm 1998). Eriksen and Belk (1999) indicate this species may occur in pools that do not predictably fill every year.

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. Longhorn fairy shrimp have been recorded from areas very close to the Solar Generation Facility site (Figure 13). The CNDDDB (2010) does not map records of this species precisely, but as indicated on Figure 13, there are a number of records from areas within several miles outside the southwestern part of the Solar Generation Facility site.

A habitat assessment for fairy shrimp following USFWS survey guidelines (1996b and 2005a) was completed for the Solar Generation Facility and generation tie-line on March 11 and 12, 2009 by URS senior biologist John H. Davis IV¹ (URS Corporation and H. T. Harvey & Associates 2009). H. T. Harvey & Associates senior wetlands/plant ecologist Kelly Hardwicke, Ph.D.² also assessed habitat suitability for branchiopods on the Solar Generation Facility, generation tie-line, and Twisselman Quarry sites (except for the 320-acre Martin parcel) on October 12, November 17, and December 1, 2009 (H. T. Harvey & Associates 2010). During the assessments, a reconnaissance-level survey of these areas was conducted to identify and map areas that had the potential to support seasonal pools based on soil type and topography (Figure 14). Particular attention was paid to designated critical habitat for vernal pool species in the southwestern part of the site, as well as other flat or depression areas of the site that could potentially support seasonal pools. No areas of ponding were detected during those habitat assessments.

Dr. Kelly Hardwicke and Darren Newman of H. T. Harvey & Associates conducted wet-season surveys for vernal pool branchiopods on February 2 and 12, and March 10, 2010 (H. T. Harvey & Associates 2010a). These surveys were authorized via e-mail received from David Kelly (USFWS) to Dr. Hardwicke on January 28, 2010. Surveys were conducted within the southwestern portion of the Solar Generation Facility, where waterbodies containing potentially suitable habitat for listed crustaceans were identified during branchiopod habitat suitability surveys and wetland delineation field work performed during October-December 2009. The playa pool located in the alkali sink in the northeastern part of the Solar Generation Facility site was observed to be free of surface water on all 3 days of the survey.

¹ USFWS Permit #TE-110095-0

² USFWS Permit #TE-797267-14

These waterbodies were sampled using dip nets that were swept throughout the water column in order to capture bottom-dwelling notostracans (e.g., *Triops* and *Lepidurus*) as well as free-swimming anostracans (e.g., *Branchinecta* and *Lindleriella*). For each pool, we mapped the perimeter of the ponded area using a Trimble[®] GPS unit, estimated pool depth, completed a vernal pool wet-season sampling datasheet, and collected water samples for later identification of all specimens utilizing a dissecting microscope. A number of samples of *Branchinecta* sp. were fixed in the field by placing captured individuals into vials containing 95% ethanol.

Specimen samples were identified using a dissecting microscope in the lab within a week after collection, following Eriksen and Belk (1999). Living samples were checked daily in the event that previously undetected species matured from nauplii.

During the month of January 2010, rainfall totaled 4.2 inches, according to a private weather station located in California Valley approximately 4 mi west of the Solar Generation Facility site (Weather Underground 2010). H. T. Harvey & Associates biologists were on site during the month of January and closely monitored the seasonal wetlands in the southwest corner of the site for the first signs of ponding water. By the end of January, ponding started to occur, and subsequently the first branchiopod survey was conducted on February 2, 2010. During the first survey conducted on February 2, 2010, most pools were inundated but shallow, turbid, and alkaline, with a few characterized as grassy-bottomed and having a fairly neutral pH. In general, non-reproductive branchiopods ranging from 10s to 1000s per pool were detected in 12 waterbodies. Reproductive or otherwise identifiable adults were keyed-out to versatile fairy shrimp (*Branchinecta lindahli*). Unidentified nauplii were also noted in the collected samples. Copepods, cladocerans, and mosquito larvae (Family Cucilidae) were also observed, but no other species of vernal pool crustaceans were observed.

Prior to the second survey conducted on February 12, 2010, it rained another 1.24 inches (Weather Underground 2010). Versatile fairy shrimp were again detected in several pools, but fewer nauplii were seen. Most copepods and cladocerans were absent, but branchiopods were still observed and collected. Branchiopods ranging from 10s to 1000s per pool were detected in 14 waterbodies.

On February 23, 2010, between the second and third branchiopod surveys, an H. T. Harvey & Associates plant ecologist observed unidentified invertebrates in several small, shallow pools in the southwestern part of the Solar Generation Facility site while he was on-site mapping rare plants. Although these pool locations were mapped with a Garmin GPS, no other characteristics were recorded, and the identity of the branchiopods was not confirmed. These pools no longer contained water by the following (March 10) branchiopod survey, and thus did not pond long enough to provide suitable habitat for listed fairy shrimp.

Between the second and third survey dates (February 12 to March 10, 2010) it rained another 1.87 inches. Versatile fairy shrimp were again detected in most (13) pools and it was noted that two distinct-sized branchiopods were collected during sweep sampling. This suggested that a

second hatch had occurred, however, no additional species of pool crustaceans were observed or collected. Larval beetles belonging to either the Family Histeridae (clown beetles) or Chrysomelidae (leaf beetles) were seen. During this last survey, many pools had dried down and others were algae-laden. A large number (1000s to 10,000s) of branchiopods were noted dying in shallow pools.

None of the federally listed fairy shrimp, including vernal pool fairy shrimp or longhorn fairy shrimp, were detected in any of the pools sampled. Although these surveys did not include the dry-season component of the protocol, and thus absence from the Solar Generation Facility site cannot be determined conclusively, there is a low probability of occurrence on the Solar Generation Facility site based on the negative results of wet-season surveys.

Suitable habitat for the longhorn fairy shrimp is absent from other portions of the site. Surveys of the Martin parcel, the potential switching station locations, and the generation tie-line revealed no features that could support this species.

VERNAL POOL FAIRY SHRIMP

Biology/Overview. The vernal pool fairy shrimp, which is listed as federally threatened by the USFWS, has been observed in a variety of vernal pools in the Central Valley of California, and in the central and southern Coast Ranges from Solano County to Ventura County, California (USFWS 1994). This species is also found in disjunct populations in the South Coast Mountains Region in a wide variety of habitats. Habitats include type-locality sandstone outcrops in Contra Costa and Santa Barbara counties, but the more typical habitat is small swales, earth slumps, or basalt-flow depression basins with a grassy or muddy bottom (Eriksen and Belk 1999). In San Luis Obispo County, vernal pool fairy shrimp have been found in vernal and seasonal pools within Camp Roberts and in the Creston/Paso Robles area in northern San Luis Obispo County. They are also found in seasonal alkali pools in the California Valley in eastern San Luis Obispo County to cattle-grazed seasonal pools in the City of San Luis Obispo (CNDDDB 2010). Potential habitat is also located in southern San Luis Obispo County on the Nipomo Mesa.

Vernal pool fairy shrimp inhabit vernal pools that vary in size from 1.84 ft² to over 24.7 acres and have low to moderate total dissolved solids (TDS), and low to moderate alkalinity with an upper pH of 8.5 (Eriksen and Belk 1999). They mature rapidly and can reach reproductive age in 18 days under optimal conditions; however, 41 days is more common. Vernal pool fairy shrimp are the shortest-lived fairy shrimp, with a maximum lifespan of 139 days (mean = 90 days) (Eriksen and Belk 1999). Eriksen and Belk (1999) indicate this species may occur in pools that do not predictably fill every year. The CNDDDB (2010) does not map records of this species precisely, but as indicated on Figure 13, there is a record of this species from an area not far west/southwest of the Solar Generation Facility site, confirming that the species occurs in the general vicinity of the Project.

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. As discussed for the longhorn fairy shrimp above,

habitat assessments for the vernal pool fairy shrimp were conducted by qualified URS and H. T. Harvey & Associates biologists on the Solar Generation Facility, generation tie-line, and Twisselman Quarry sites (except for the 320-acre Martin parcel) in 2009 (URS Corporation and H. T. Harvey & Associates 2009). H. T. Harvey & Associates biologist Kelly Hardwicke also conducted wet-season surveys on February 2 and 12 and March 10, 2010 (H. T. Harvey & Associates 2010a). The only features on the Solar Generation Facility, generation tie-line, Twisselman Quarry, and potential switching station sites that could potentially support suitable habitat for the vernal pool fairy shrimp are the seasonal wetlands in the southwestern part of the Solar Generation Facility site and the playa pool located in the alkali sink in the northeastern part of the Solar Generation Facility site (Figure 14). As discussed for the longhorn fairy shrimp, the seasonal wetlands in the southwestern part of the Solar Generation Facility site did not show evidence of ponding during the habitat assessment conducted in March of 2009, but they supported ponding on February 2 and 12 and March 10, 2010. Versatile fairy shrimp was the only branchiopod detected in these pools during these sampling events, and none of the federally listed fairy shrimp, including vernal pool fairy shrimp or longhorn fairy shrimp were detected in any of the pools sampled. Although these surveys did not include the dry-season component of the protocol, and thus absence from the Project site cannot be determined conclusively, there is a low probability of occurrence on the site based on the negative results of wet-season surveys. The playa pool located in the alkali sink in the northeastern part of the Solar Generation Facility site was observed to be free of surface water during the wet-season surveys. Suitable habitat for the vernal pool fairy shrimp is absent from other portions of the site. Surveys of the Martin parcel, the potential switching station locations, and the generation tie-line revealed no features that could support this species.

KERN PRIMROSE SPHINX MOTH

Overview/Biology. The Kern primrose sphinx moth is listed as a threatened species by the USFWS. It is endemic to a 40-100 square mi range within California and is known to occur in Ventura, Santa Barbara, Kern, and San Luis Obispo counties (Natureserve 2009).

The sphinx moth is a medium-sized, day-flying moth that has been found in cropland, hedge rows, grassland, herbaceous areas, shrubland, chaparral, and open weedy areas in desert scrub. In some areas, such as the southeastern portions of the Carrizo Plain, sandy washes seem to be the preferred habitat (Jump et al. 2006). The most important habitat component is the presence of the larval foodplant, which consists of various species of evening primrose (*Camissonia* sp.) commonly found in disturbed areas (Natureserve 2009). Since the genus *Camissonia* was revised in 1969, the taxonomic status of the sphinx moth's host plant is uncertain; this moth may be able to feed on multiple evening primrose species (Fish and Wildlife Information Exchange 1996). Adult females lay their eggs on evening primrose plants, and the eggs hatch shortly thereafter. The larvae feed on the evening primrose plant for several weeks then enter the ground to pupate. Typically, in the following spring, adults emerge from the ground and begin to consume nectar and mate. However, in unfavorable climatic conditions, the pupating moths can remain underground for several years (Xerces Society 2009). Females have also been

observed laying eggs on filaree (*Erodium cicutarium*); hatched larvae that attempt to eat this plant cannot survive because filaree does not provide a sufficient source of sustenance (Xerces Society 2009). However, larvae have been observed moving about in search of food, and thus the presence of filaree as a potential oviposition site does not necessarily indicate that successful breeding cannot occur as long as evening primrose is present nearby (Jump et al. 2006).

Adults are nectarivorous and can feed from at least 4 plant species that occur on the Project site, including filaree, California goldfields (*Lasthenia californica*), baby blue-eyes (*Nemophila menziesii*), and bicolor lupine (*Lupinus bicolor*) (Xerces Society 2009). Many of these plants are distributed widely across the Project site in California grassland, scrub, and wildflower habitats. These vegetation communities also occur in the foothills of the Temblor range north of SR 58. Adults are diurnal while immature larvae hibernate and aestivate when not active. Adults are active in late February through early April and larvae appear later in the spring. Pupae remain dormant through years with unfavorable environmental conditions such as drought (Natureserve 2009). The CNDDDB (2010) does not map any records of this species in the vicinity of the Project site (Figure 13).

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. No surveys for the Kern primrose sphinx moth were conducted anywhere on the Project site, and it is not known with certainty whether or not it occurs on or even near any part of the site. The sphinx moth has been recorded in the Carrizo Plain National Monument in the northern Elkhorn Scarp region and in sandy washes trending northward from the Caliente Range (Tuskes and Emmel 1981, Jump et al. 2006). Jump et al. (2006) mapped several moderately extensive areas of habitat in these two locations, both of which are located southeast of Soda Lake (and thus well southeast of the site). However, these authors indicated that they had not surveyed locations farther northwest, in the direction of the Project site, and thus it is unknown whether it occurs on or in the immediate vicinity of the site. The moths live in and around sandy washes with sandy alluvial soil using plant-free areas to bask (Tuskes and Emmel 1981). The Solar Generation Facility and generation tie-line portions of the Project site contains potential sphinx moth habitat such as grassland, herbaceous areas, shrubland, desert scrub habitat with sandy soils, and sandy alluvial washes with bare ground.

No evening primrose specimens were identified during floristic surveys on the Project site by URS in the spring of 2009. However, during protocol-level plant surveys conducted throughout the Solar Generation Facility, generation tie-line, Twisselman Quarry, and portions of the potential switching station sites in the spring of 2010 (H. T. Harvey & Associates 2010c, 2010d), as described above for the California jewel-flower and San Joaquin woollythreads, as well as summer surveys that included those areas as well as the Martin parcel and the entirety of the potential switching station locations, botanists searched for and mapped all occurrences of *Camissonia*. Individual *Camissonia* were detected in 14 locations (Figure 15). The only occurrences located within proposed arrays, and the only occurrences south of SR 58, consisted of a single plant in Array 6 and a group of five plants in Array 11. Of the 12 occurrences north of SR 58, 10 were located in the northeastern section of the BSA, outside the Project footprint

(Figure 15). These included five occurrences consisting of one plant each, and five other occurrences consisting of two, six, 30, 50, and approximately 2000 individuals each. These plants were primarily located on rocky terrain that will not be impacted by the Project. Two other *Camissonia* occurrences consisting of five individuals and approximately 2000 individuals were located near the northern extent of the BSA, in areas west of the Twisselman Quarry access road.

The field evening primrose (*C. campestris* ssp. *campestris*) was the only *Camissonia* detected that is a known host plant of the Kern primrose sphinx moth. However, small, isolated populations of three other related *Camissonia* species, Booth's evening primrose (*C. boothii*), hill sun cups (*C. graciliflora*), and hairy sun cups (*C. hirtella*) were also detected. The latter species are not known to serve as host plants for the Kern sphinx moth but perhaps could support the species.

Similar to the host plant, large, observable populations of desert moths often occur only during years of above-average rainfall (Xerces Society 2009). No focused surveys for the moth were conducted, and it is possible that the species occupies the site. If the species is present on the Project site, it would most likely occur in portions of the site outside the impact areas, where its larval host plant is located. Therefore, there is a low probability that this species occurs within impact areas on the Project site, since only six individual *Camissonia* specimens were located in the impact area (in Arrays 6 and 11).

BLUNT-NOSED LEOPARD LIZARD

Overview/Biology. The blunt-nosed leopard lizard is federally and State-listed as endangered and is listed as fully protected under Section 5050 of the California Fish and Game Code. This relatively large (3.5 to 5 inches snout to vent length), carnivorous lizard is typically found in sparsely vegetated plains, alkali flats, washes, arroyos, canyon floors, and low foothills in areas of gentle topography and generally does not utilize areas of greater than 30-40% slope (Williams and Germano 1992). High-quality habitat is open with scattered shrubs, and contains little grass cover and abundant rodent burrows, which the lizard uses as escape cover, thermal cover, and resting areas (Snow 1972). The blunt-nosed leopard lizard will also use shrubs as hiding and thermal cover. The historical range of the blunt-nosed leopard lizard extended from the San Joaquin Valley and adjacent foothills from Stanislaus County southward to Kern County and the extreme northeast tip of Santa Barbara County (Williams and Germano 1992). Due to the expansion of agriculture and grazing, oil extraction, and urban development within its historical range, the blunt-nosed leopard lizard is now excluded from 94% of its former habitat (Jennings 1995). The current range is primarily the foothills of the western San Joaquin Valley from Merced County, southward to Kern County, the Carrizo Plain and California Valley areas of San Luis Obispo County, and a small portion of the foothills of the eastern San Joaquin Valley within Kern County (Jennings 1995).

The blunt-nosed leopard lizard is a diurnal, opportunistic carnivore, capturing and consuming grasshoppers and other insects, small mice, and other lizards (notably the side-blotched lizard). Adults will also cannibalize juvenile blunt-nosed leopard lizards (Williams and Germano 1994). The adult peak activity period ends around July, when adults go underground to enter a period of torpor. Hatchlings emerge around the end of July and are active until early November (Williams and Germano 1994). Thus, there is a temporal separation between the adult and the juvenile peak activity periods. During the active period, blunt-nosed leopard lizards are most active on the surface when temperatures are between 77°F to 95°F (Tollestrup 1976), though they have been observed above ground at temperatures as high as 106°F (CDFG and CIWTG 2008). Known predators of the blunt-nosed leopard lizard include birds of prey, roadrunners, skunks, and snakes (CDFG and CIWTG 2008b).

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. The closest documented occurrence of the blunt-nosed leopard lizard to the Solar Generation Facility site is approximately 3 mi south of the site, within the Carrizo Plain National Monument (Figure 16; CNDDDB 2010). The majority of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites provides habitat that is of marginal suitability for this species at best, owing to the absence of shrubs and, in at least some areas, the high density of grass cover. However, rodent burrows (which provide potential refugia) are abundant in at least some areas, and grass cover and height in many areas is low due to the combination of drought, cattle grazing and trampling, and vegetation browsing by small mammals. The majority of saltbush scrub habitat that is most similar to occupied blunt-nosed leopard lizard habitat occurs north of SR 58, outside of the proposed solar array complexes, though some scrub is mapped within Array 7 and in the northern part of the generation tie-line area. However, the topography north of SR 58 in the areas occupied by saltbush scrub becomes very steep in places, featuring hills and incised drainage channels. These steep areas are not suitable blunt-nosed leopard lizard habitat. In the southwestern corner of the Solar Generation Facility site, the presence of low-permeability soils leads to the formation of seasonal wetlands in some areas. These locations are not suitable for the blunt-nosed leopard lizard, as seasonal saturation would preclude underground overwintering by this species. There are also far fewer rodent burrows in the site's southwestern corner compared to the portions of the site dominated by annual grasslands.

Field surveys for the blunt-nosed leopard lizard and other special-status reptiles comprised 17 full-coverage, pedestrian transect surveys conducted by URS between May and September 2009 (URS Corporation and H. T. Harvey & Associates 2009), performed in strict accordance with the CDFG's survey protocol for the blunt-nosed leopard lizard (CDFG 2004). Surveys were conducted by staff from URS and Rincon Consultants. Approximately 2,963 acres of the Solar Generation Facility, generation site-line, and Twisselman Quarry sites were surveyed by the pedestrian transects (see Figure 17); most of the remaining areas of the site are located outside the Project footprint and were not surveyed for blunt-nosed leopard lizards in 2009 because no impacts were anticipated in those areas.

In 2010, H. T. Harvey & Associates (2010f) conducted protocol-level surveys in some of the new array locations that were not surveyed in 2009, including the northeastern portions of Arrays 5, 6, and 7, one of the potential switchyard locations, additional portions of the generation tie-line, the access road to the Twisselman Quarry, and the Twisselman Quarry expansion area.

Prior to initiating the surveys, and on 9 days during the survey period in 2009 and 9 days in 2010, biologists conducting blunt-nosed leopard lizard surveys on the Project site also surveyed the known population within the Elkhorn Plain Ecological Reserve, approximately 20 mi southeast of the Project site, to confirm that blunt-nosed leopard lizards were above ground and active. Active blunt-nosed leopard lizards were detected at the reference site during most visits, indicating that the species, if present would be detectable in the Project region during the surveys.

No blunt-nosed leopard lizards were detected in the Solar Generation Facility, generation tie-line, Twisselman Quarry, and switching station locations during any of the surveys in 2009 and 2010, or during any of the other biological surveys conducted on the site. Collectively, these results indicate blunt-nosed leopard lizards are likely absent from the Project site. However, some proposed impact areas, such as arrays 9 and 10, the Sunrise Overlook and Visitor Overlook sites, and portions of the potential switching station locations, were not included in either the 2009 or 2010 surveys. Therefore, in 2011, HPR II will have qualified biologists conduct protocol-level surveys in any areas within the project's impact footprint that were not surveyed according to protocol in 2009 or 2010.

CALIFORNIA CONDOR

Overview/Biology. The California condor is one of the most highly endangered birds in the world and the largest of the North American vultures (Snyder and Schmitt 2002). A clutch size of 1 egg and a minimum of 6 years to reach sexual maturity in the wild make the California condor dependent on low mortality rates for population sustainability (Wilbur 1973). Its endangerment has been due primarily to excessive mortality, caused mainly by poisoning, shooting, and lead exposure (Fry 2004, Pattee et al. 1990, Snyder and Schmitt 2002).

The California condor is a permanent resident of the semi-arid, rugged mountain ranges surrounding the southern San Joaquin Valley, including the Coast Ranges from San Benito County south to Los Angeles County, the Transverse Ranges, Tehachapi Mountains, and southern Sierra Nevada (Polite 2005). The California condor is not a habitat specialist. Nesting habitats have ranged from scrubby chaparral to forested montane regions subject to winter snowfalls. Typically, the California condor forages in relatively open grassland regions, where primary foraging areas are separated from the primary nesting areas, necessitating substantial traveling distances between nests and food supplies (Meretsky and Snyder 1992). The most important habitat requirements are: adequate food supplies, open or semi-open habitat where food can be readily found and accessed, and reliable air movements allowing extended soaring

flight. California condors do not build substantial nests of twigs and branches; instead, they nest in natural cavities, such as caves in cliffs (Snyder and Schmitt 2002).

The California condor almost exclusively feeds on mammalian carrion, and in recent years, primarily feeds on the carrion of domestic animals, hunter-shot mule deer (*Odocoileus hemionus*), shot or poisoned coyotes (*Canis latrans*), and ground squirrels (*Spermophilus* spp.; Snyder and Schmitt 2002). Most observations of condors feeding have occurred in open grassland habitats, where carcasses of grazing mammals are most abundant and visible (Snyder and Schmitt 2002). California condors commonly feed in groups, and an individual normally fills its empty crop in about 20 minutes (Snyder and Schmitt 2002).

In the 1980s, all remaining condors were brought into captivity and captive breeding populations were established, with the ultimate goal of restoring wild populations (Woods et al. 2007). On 19 April 1987, AC9, the last wild California condor, was trapped on the Hudson Ranch in Kern County, California and transported to the San Diego Wild Animal Park where it joined the remaining members of its species. Reintroduction attempts began in 1992, when two condors were released at the Sespe Condor Sanctuary in southern California (Woods et al. 2007). There are currently 184 wild California condors in North America: 90 in California, 19 in Baja California, and 75 in Arizona (CDFG 2009a).

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. The Carrizo Plain was part of the California condor's foraging range prior to initiation of the captive breeding program, and condors returned to the Carrizo Plain after releases began. However, as of April 2009 there had been no recent California condor records on the Carrizo Plain (Jesse Grantham *vide* CDFG 2008a, 2008b). No California condors have been observed during any biological surveys conducted by URS or H. T. Harvey & Associates biologists on the Project site or elsewhere in the Carrizo Plain.

Though the CVSR Project site may not currently receive much if any use by foraging California condors, there is potential for condors to return as the population within the state grows. The Project site has the potential to provide suitable foraging habitat for California condors due to the presence of cattle operations, tule elk, and pronghorn (and thus the potential for large carrion to occur on the site). However, there is no suitable nesting or roosting habitat for California condors within any portion of the Project site.

MOUNTAIN PLOVER

Biology/Overview. The mountain plover, currently a California species of special concern, was proposed for listing as federally threatened throughout its range on 29 June 2010, and the final listing determination for the species is expected to be made no later than 1 May 2011 (USFWS 2010a). The mountain plover winters in California, from October through March, in the Central Valley from Sutter and Yuba Counties southward, in foothill valleys west of the San Joaquin Valley, and in the Imperial Valley, the western Mojave Desert, and the central Colorado River Valley. Wintering habitat is described as nearly barren or very sparse native grassland, alkali

playas, burned or heavily grazed sites, and plowed or disced agricultural lands for foraging and roosting. Ongoing loss of sparse grasslands in both breeding and wintering grounds has resulted in fragmented distribution of the species. In California, mountain plovers use presumably sub-optimal agricultural lands as a result of loss of native grasslands and natural fire regimes (Knopf and Rupert 1995). Mountain plovers are relatively tolerant of human disturbance, and human intrusion and disturbance have not been identified as a major conservation threat. They are described as extremely tolerant of machinery, such as off-road vehicles, tractors, and military aircraft (Knopf and Wunder 2006).

On their wintering grounds, mountain plovers are gregarious, often forming loose foraging and roosting flocks ranging in size from 4 to 1,128 individuals (Hunting and Fitton 1999). Flock sizes and locations are relatively constant, although individuals move between flocks (Knopf and Rupert 1995). Wintering locations are used in successive years, especially in the Imperial and central and southern California coastal valleys (Edson and Hunting 1999, Hunting and Fitton 1999).

Occurrence on and near the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. Wintering mountain plovers have been recorded on the Carrizo Plain (Figure 18), including in the Carrizo Plain National Monument in 2004-2005 and 2005-2006, with 237 birds observed in January 2006; these birds were associated with annual grasslands that were heavily grazed by kangaroo rats (CNDDDB 2010). Surveys conducted in the winters of 1971-1973 also detected flocks of 1-115 individuals in grassland and agricultural areas in the southeastern portion of the Carrizo Plain, where the plovers appeared to be attracted to actively disturbed areas (CNDDDB 2010). Median numbers recorded on the Carrizo Plain Christmas Bird Count were 148 during the period 1970-1977 but declined to 39, with a maximum number of only 142, during the period 1982-2004 (Hunting and Edson 2008). Although two flocks containing a total of 381 individuals were recorded during a survey of the Carrizo Plain in January 2006 (Hunting and Edson 2008), this likely represents the highest count on the Carrizo Plain since the 1970s.

A group of 139 mountain plovers were observed on the Solar Generation Facility site on January 24, 1998 (T. Edell, email communication, April 2, 2009). No mountain plovers were observed during the wintering bird surveys or during any biological surveys conducted in March 2009, although this species was reported in large numbers on the Carrizo Plain as late as March 10, 2009 (182 on Panorama Road; Kathy Sharum, San Luis Obispo County Birding post #7241). However, three were observed on the Solar Generation Facility site, south of the proposed water tank, on October 12, 2009, during a site visit by URS, H. T. Harvey and Associates, and Aspen Environmental Group.

Habitat in the footprint of the proposed solar arrays is likely most suitable for this species in fall, and perhaps early winter, when vegetation height is low before the onset of winter rains. In areas north of SR 58 and in areas between Array 2 and Array 8, the terrain is hillier and less suitable for this species. Despite the occurrence of 139 individuals in 1998, the species was unrecorded

on the site between then and the October 2009 sighting, and it likely occurs sporadically and/or in low numbers on the site.

CRITICAL HABITAT

CRITICAL HABITAT INTRODUCTION

Critical habitat is defined in Section 3(5)(A) of the ESA as “(i) the specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species, and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species upon a determination by the Secretary of Commerce or the Secretary of the Interior (Secretary) that such areas are essential for the conservation of the species.” The effects analyses for designated critical habitat in this assessment consider the role of the critical habitat in both the continued survival and the eventual recovery (i.e., the conservation) of the species in question, consistent with the recent Ninth Circuit judicial opinion, *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*.

Of those species covered in this BA, critical habitat has not been designated or proposed for the California jewel-flower, San Joaquin woollythreads, Kern primrose sphinx moth, San Joaquin kit fox, giant kangaroo rat, blunt-nosed leopard lizard, or mountain plover.

Primary Constituent Elements

Primary Constituent Elements (PCEs) are those physical and biological features of designated or proposed critical habitat essential to the conservation of the species, including, but not limited to: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and (5) habitats that are protected from disturbance or are representative of the historic geographic and ecological distributions of a species (ESA §3(5)(A)(i), 50 CFR §424.12(b)). Details of critical habitat and primary constituent elements for those species that require or possess those elements are given in the species accounts.

SUMMARY FOR THE LONGHORN FAIRY SHRIMP AND VERNAL POOL FAIRY SHRIMP

Critical habitat for vernal pool and longhorn fairy shrimp was proposed on September 24, 2002 (*Federal Register* vol. 67 p. 60033). The final rule to designate critical habitat for these species was published on August 6, 2003 (*Federal Register* vol. 68 p. 46684). A re-evaluation of non-economic exclusions from the August 2003 final designation was published on March 8, 2005 (*Federal Register* vol. 70 p. 11140). An evaluation of economic exclusions from the August 2003 final designation was published on August 11, 2005 (*Federal Register* vol. 70 p. 46924). Administrative revisions were published on February 10, 2006 (*Federal Register* vol. 71 p. 7117). Clarifications on the economic and non-economic exclusions for the final designation of critical habitat were published on May 31, 2007 (*Federal Register* vol. 72 p. 30269).

Critical habitat Unit 30 (Figure 13) for vernal pool fairy shrimp and longhorn fairy shrimp extends northward into the southwestern part of the Solar Generation Facility (USFWS 2006a).

SUMMARY FOR THE CALIFORNIA CONDOR

The USFWS first proposed critical habitat for the California condor in 1975 (*Federal Register* vol. 40 p. 58308), and the final designation was made in 1977 (*Federal Register* vol. 42 p. 47840). No critical habitat for the California condor is present on or very close to the Project site. The nearest designated critical habitat for the species is the East Unit of the Hi Mountain-Beartrap Condor Area, 13 miles west of the Solar Generation Facility site, where captive-raised condors were formerly released.

EFFECTS

POTENTIAL SHADING EFFECTS OF ARRAYS

Overview. The purpose of the CVSR Project will be to capture and convert solar energy directly to electricity through up to 88,000 solar PV panels on SunPower T0 Tracker units (HTH 2010). The tracker units are linked together and attached to a drive motor in long rows. These tracker rows are laid out north-south and parallel to one another to create an array, with space in-between each row to avoid one row shading the next. Their single-axis allows them to tilt ± 45 degrees and track the sun as it arcs east to west across the sky (SunPower 2010a). In the morning and evening hours when the sun is low, the panels rotate to a horizontal position in order to avoid the eastern or western-most panels casting shadows across the array. Then as the sun rises above the array's plane, the panels tilt and track the sun until sunset. This process known as "backtracking" allows the panels to change direction to avoid shading other panels and maximizes solar input (Chris Baker, pers. comm.).

Although it is currently unknown exactly how much shade will be created, preliminary calculations suggest that approximately 60-80% of the array footprint will be shaded, but all areas will receive some sun during parts of the day. The solar panels, facing upward at noon, will shade approximately 40% of the array area with maximum shading occurring in the early morning and late evening hours (Chris Baker, pers. comm.).

Concerns have been raised regarding potential impacts that the shading could have on the composition and structure of the annual grassland and how these impacts may affect wildlife. Studies have shown that shading can enhance the production of herbaceous vegetation (Frost and McDougald 1989), cause a shift from small to large seeded grasses and legume species (Amatangelo et al. 2008), and suppress native perennial grasses (Dyer and Rice 1999). Other research indicates that light availability is not as important in structuring grassland communities as other factors such as litter input (Lamb 2008) and precipitation (St. Clair et al. 2009).

Predicted Changes to Annual Grassland. Several factors influence plant community composition including climate, biotic interactions (e.g., competition, herbivory), resource availability (e.g., light, nutrients), and disturbance. One or more of these factors may have a greater influence on community composition and structure than others. By understanding current site conditions, we can predict which factors are most important in determining the composition of the annual grasslands at the proposed site and thus, how the community might be altered if one or more of these conditions change.

Many abiotic factors have a significant influence on the existing grassland's composition and structure. The Solar Generation Facility site receives limited precipitation with 8 to 10 inches of annual rainfall on average (Natural Resource Conservation Service [NRCS] 2003) and extreme year-to-year variability. In addition, the soils at the site are low in nutrients, have very low water holding capacity, are compacted from livestock grazing and agricultural practices, and in many

places, saline. The potential evaporation rate of the grassland is likely very high, in excess of 100 inches per year; the soil reflectance value is high, and the wind is almost constant. The annual grassland even in the deepest drainages with relatively shaded north-facing slopes are dominated by annual grassland species such as ripgut grass, yellow star thistle, and fescue just as they are in areas of full sun. Thus, our observations suggest that the Solar Generation Facility site experiences a wide range of environmental conditions and significant abiotic stressors that are likely the predominant factors that influence the grassland species composition and structure with light/shade only being a single factor.

Germination of plant species is driven more by changes in light quality (i.e., ratio of red to infrared) than it is by quantity, and we do not anticipate changes in light quality. Light scatter is relatively high at the site due to its high soil reflectance and abundance of suspended particulates in the air. Even if a plant is situated beneath a panel, solar input should be sufficient to drive photosynthesis. The minor drop in soil surface temperatures during the winter and spring months will likely have minimal impacts since the majority of the plant species only grow for a few months, germinating with the first rains and then completing their life cycle by late April. The density of non-native weeds may increase slightly; however, the shading will probably only cause a shift in plant stature, chlorophyll concentration, leaf size and very minor related etiolation. Reduced evapotranspiration and water stress from partial shading and water input from panel washing (1 gallon per panel per year) would likely result in increased dominance (taller and denser stands) of non-native grasses, but the composition of annual grassland species is not likely to experience significant change. It is reasonable to assume, however, that the species composition will shift slightly to a larger percentage of shade-tolerant species. As a result, we would expect an increase in the abundance of wild oats, ripgut grass and clovers and less mustard, bindweed, and soft brome in response to increased shade, but the overall composition and structure should be similar to that of existing conditions.

Thus, in our opinion, we expect a modest shift in composition to a greater percentage of shade-tolerant plants even though the numerous abiotic factors present have a greater influence on species composition within the grasslands on-site than light. From solely a vegetation perspective, the grassland community on the Solar Generation Facility site should remain suitable for the wildlife species of concern, such as San Joaquin kit fox (*Vulpes macrotis mutica*) and giant kangaroo rat (*Dipodomys ingens*).

Proposed Grassland Revegetation Approach. It is our understanding that the area of the Solar Generation Facility site that will be disturbed by construction will be revegetated and this revegetation approach will take into account the post-construction site conditions (i.e., shadier). Although the revegetation approach has not yet been fully developed, we understand that the species mix will be composed of native species that occur in the vicinity of the Solar Generation Facility site and will also be compatible with the special-status wildlife species of concern. Accordingly, we suggest that two native perennial grasses, nodding needlegrass (*Nassella cernua*) and one-sided blue grass (*Poa secunda*) be heavily utilized for the revegetation. A number of wildflower species found on the Carrizo Plain could also be appropriate for the seed

mix. Wildflower species for consideration could include, among others: yarrow (*Achillea millefolium*), horseweed (*Conyza coulteri*), tarplant (*Hemizonia fitchii*), goldfields (*Lasthenia californica*), tidy tips (*Layia platyglossa*), common madia (*Madia elegans*), western wallflower (*Erysimum capitatum*), miniature lupine (*Lupinus bicolor*), sky lupine (*Lupinus nanus*), baby blue-eyes (*Nemophila menziesii*), California poppy (*Eschscholzia californica*), red maids (*Calandrinia ciliate*), owl's clover (*Castilleja brevistyla*), blue dicks (*Dichelostemma capitatum*). The precise species mix would be developed based upon a more in-depth analysis of the revegetation approach.

Conclusions. The increased ground shading caused by the installed solar panels should not substantially change the species composition or structure of the annual grassland vegetation at the Solar Generation Facility site; however we anticipate the composition will shift slightly towards the more shade-tolerant species that are already present in the annual grasslands. Since these changes to the grassland habitat will not substantially change the habitat structure and potential food sources of the species-status-species of concern, we predict, from a vegetation perspective, that the grassland habitat will remain suitable for special-status species.

POTENTIAL EFFECTS OF ARRAYS ON LOCAL TEMPERATURES

SunPower (2010b) evaluated the potential effects of the presence of solar arrays on local temperatures to address concerns that the presence of these arrays might substantially alter temperatures, thus altering microclimates and affecting vegetation and wildlife species.

The term *solar energy* refers to all radiation from the sun, including both visible and non-visible light (such as ultra-violet radiation and infra-red heat). The term *albedo* is a property of a material or surface which is defined as the total amount of energy reflected divided by the total amount of energy impacting the material or surface. Albedo is expressed as a fraction or a percentage, and ranges from 0 (very dark, such as coal) to 1 (very bright, such as snow).

For a region with no PV system, solar energy impacting the ground is either reflected or absorbed. The amount of energy reflected from an area is equal to the solar energy impacting that area multiplied by the albedo of the terrain. The remainder of the solar energy is absorbed and stored as heat, and then dissipated within a day. In the California Valley, the amount of solar energy impacting the ground is 21.0 MWh/acre/day. The average albedo in this area is 29%, the amount of energy converted to heat and dissipated is equal to 14.9 MWh/acre/day.

For a region with a tracking PV system, there is a question if there is a change in the albedo of the overall plant. To evaluate the amount of heat generated in a large field PV arrays, we define the term *effective albedo*, which is the average albedo over the entire Solar Generation Facility site.

$$\text{Effective Albedo} = (\text{fraction of solar energy on ground}) \cdot A_N + (\text{fraction of solar energy on PV}) \cdot (A_P)$$

where A_N = natural albedo of the ground, and A_P = albedo of panels

In a tracking array, at most 40% of the total solar energy will impact the ground, while the remaining 60%+ will impact the panels. For a SunPower 305W panel, approximately 74% of solar energy impacting the panel is converted to heat, while the remainder is either reflected or converted to electrical energy. In the context of heat generation, the PV panel is similar to a material with an albedo 26%. Using the equation above, the effective albedo of a PV array in the Central Valley is 27%.

With the introduction of a tracking PV system, the albedo of the area in question has decreased from 29% to 27%. This increases the amount of solar energy absorbed as heat from 14.9 MWh/acre/day to 15.3 MWh/acre/day. Such a small change is not expected to have a substantial effect on vegetation or wildlife use of the Solar Generation Facility site as a result of temperature change.

In addition to albedo, there are other factors which should be considered to determine whether the Project will change the temperature of the site. One analytical approach is to look at the phenomenon of the Urban Heat Island, described by Bornstein (1968). The Urban Heat Island is a phenomenon whereby a developed area is significantly warmer than the surrounding rural area. Bornstein showed that the Urban Heat Island is caused by three factors: (1) use of materials which absorb more solar radiation, (2) use of massive materials which store more heat and dissipate heat slowly, and (3) waste heat from energy usage, such as appliances, engines, and HVAC, which run on electricity, natural gas, and oil.

With regard to factor (1), the above description of effective albedo shows that the PV array will absorb slightly more heat than a field with no PV. To evaluate the magnitude of this effect, the rate at which that heat is dissipated must be considered. In the below discussion of factor (2), it is shown that PV panels dissipate heat quickly while earth and concrete dissipate heat slowly. The fact that this increased heat is being absorbed by the PV panels and not the earth means that there will be no net gain in heat caused by the albedo change.

With regard to factor (2), the amount of heat retained by building materials is related to the mass of those materials and the amount of heat absorbed. Typically, heat which is absorbed is dissipated within one day, with a significant amount of that dissipation occurring at night. If the materials are very massive, such as concrete buildings, and paved roads, those materials may not cool to the surrounding air temperature at night. This results in a net temperature increase. While PV modules can reach high operating temperatures, such as 120°F, they are thin and lightweight and therefore do not store a large amount of heat. Panels are able to cool to air temperature shortly after the sun sets. A study of module temperature on utility scale PV plants confirms that panels always cool to ambient temperature overnight.

With regard to factor (3), energy loads from equipment on-site and from the inverters are considered. The waste heat emitted by the inverters and other equipment (tracker motors, for

example) for a tracking PV system in the Central Valley is equivalent to less than 0.21 MWh/acre/day. To put this in context, this is about 1% of total solar energy impacting the plant within a day (regardless of the size of the plant). In comparison, Bornstein (1968) showed that waste heat from energy usage in New York City is about 250% of solar energy throughout the year. Relative to the energy loads in an urban area, the energy loads in a PV plant are about 250 times smaller per acre, suggesting that waste heat from energy loads is not a significant source of heating in a PV array.

Considering these three factors, we can conclude that the area under, above, and around the solar field will not experience a net heating impact, or a substantial cooling impact.

POTENTIAL EFFECTS ON THE SAN JOAQUIN KIT FOX

Virtually the entire Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, including both the impact areas and conservation areas on the Project site, is suitable home range and dispersal habitat for the San Joaquin kit fox. Up to five natal dens were determined to be active simultaneously in 2009, (with pups being observed at three), and two natal dens were observed in 2010 providing an indication of the abundance of the species in these areas, and a number of other “potential den sites” and observations of the species were recorded throughout these areas as well. These observations likely represent individuals and pairs whose home ranges are centered within the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, as well as those whose home ranges overlap these areas. These detections also likely included individuals traveling through these portions of the Project site, while dispersing from natal sites.

Direct Effects. Potential direct effects on this species from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites are as follows:

- Construction of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project would result in the direct loss and/or modification of 121 acres of suitable San Joaquin kit fox habitat within the study area in the Annual Grassland, Wildflower Field, Inner Coast Range Saltbush Scrub, and Desert Sink Scrub vegetation communities. An additional 1,418 acres of potential habitat on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites will be temporarily impacted by construction, grading, staging areas, temporary access roads along tracker rows, and trenching, but will be stabilized and re-vegetated following grading.
- Construction traffic will occur on much of the 1,418-acre area that will be temporarily impacted during construction. Vehicular and equipment traffic around the Project site will be substantial, with delivery vehicles and heavy equipment in use. Construction-related traffic effects will last for a period of up to 3 years. Potential mortality, injury,

and harassment of kit foxes by vehicles, heavy equipment, excavation, and grading may occur during CVSR Project construction.

- Direct destruction of the den or disturbance of a den close to construction areas could potentially result in the loss of active kit fox dens. None of the five natal dens previously observed on the site are located within proposed solar arrays, although the array footprint does include other den sites (e.g., shelter dens). Active natal or shelter dens may also be abandoned where dens are covered by solar arrays.
- There is potential for loss of individuals due to vehicle strikes from the increased traffic in the Project area, including offsite traffic, during the construction and operation and maintenance phases of the Project. Potential for vehicle strikes would be increased, particularly during nighttime activities such as security patrols.
- Crews washing the panels will be active during daytime hours throughout the year, and will be present at all locations within the arrays during at some time during the year. Crews will likely encounter and potentially disturb den sites, or pups. Given that this activity is year-round, there is a substantial likelihood of disturbing kit foxes during all stages of the breeding season.

Indirect Effects. Potential indirect effects on this species from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites are as follows:

- Whether or not the array structures will result in the exclusion of San Joaquin kit fox or the giant kangaroo rat, one of its primary prey items, is unknown. The solar arrays would be installed in areas of the Project site that are characteristic and occupied kit fox and giant kangaroo rat habitat: open with low relief. If the presence of the array structures alters the habitat to the extent that these species' use of the footprints of the arrays is reduced, this would constitute loss of suitable habitat for the San Joaquin kit fox and its prey. Based on the acreage of the array footprints, up to 1,368 acres of kit fox habitat could be lost. However, kit foxes are known to frequent areas with existing structures, such as orchards, active oil field operations, and even urban fringes in portions of the southern San Joaquin Valley. Based on the amount of light that will still penetrate the solar arrays, the ground is expected to continue to be vegetated, and small mammal prey (possibly including the giant kangaroo rat) is likely to remain within the solar arrays. As a result, there is a strong possibility that kit fox presence in and around the solar arrays will persist at some level after the arrays are installed.
- Under the current land use at the Project site, vegetation height, density, and composition is constrained by intensive livestock grazing. Changing grazing regimes could potentially affect the occurrence and abundance of San Joaquin kit fox or their prey species. Vegetation changes resulting from changing land use may benefit rodents, particularly kangaroo rats, or may result in their exclusion from some areas, which would

constitute a substantial loss of San Joaquin kit fox prey base. Fluctuations in prey populations have been shown to directly affect densities of kit foxes (White and Ralls 1993, White et al. 1996). However, while the area within the array footprints will be grazed by sheep or goats, the on-site conservation areas will continue to be grazed by cattle and will be managed specifically for species such as giant kangaroo rats and San Joaquin kit fox. Therefore, the effects of changing grazing regimes on these species should be low.

- Noise generated by the rotary drill and other heavy equipment is expected to reach 90 dBA at 10 ft and would be expected to result in temporary threshold shifts in hearing sensitivity. Threshold shifts could last for an extended period (potentially as long as 30 days). Even a temporary loss or reduction of hearing ability could negatively affect foraging success as this nocturnal species relies primarily on hearing to detect predators or other threats. Noise, human activity, and ground vibrations from the use of heavy equipment during Project construction may cause kit foxes to permanently emigrate from the Project site, possibly entering areas where they would be more susceptible to injury or mortality from predation, vehicular traffic, or other activities.
- Noise, human activity, and ground vibrations from the use of heavy equipment during Project implementation may cause kit fox to permanently emigrate from impact areas, possibly entering areas where they would be more susceptible to injury or mortality from predation, vehicular traffic, or other activities.
- Kit foxes displaced from impact areas due to disturbance-related to construction or operation of the Project may increase competition for food and living space with kit foxes in other areas.
- There is a potential for loss of individuals due to predation by or competition with species such as the red fox, coyote, or domestic dogs that might be attracted to the CVSR Project site by trash discarded by construction, operation and maintenance, or security personnel, or whose abundance may increase as a result of Project-related increases in prey.
- There is a potential for loss of individuals due to predation or harassment by domestic pets associated with the temporary construction trailer park residents.
- There is potential loss of, or disturbance to, individuals due to the recreational use of on-site or offsite conservation lands by CVSR personnel, particularly residents of the temporary construction trailer park.
- The use of pesticides or rodenticides could result in secondary poisoning of kit foxes.
- Spillage or leakage of industrial chemicals, fuels, and lubricants could result in poisoning of kit foxes and contamination of their habitat. Rodent species poisoned by industrial chemicals and ingested by kit foxes may result in secondary poisoning.

- Linear post formations supporting solar arrays will potentially influence the scent marking behavior of kit foxes already present at the Project site, potentially disrupting territorial boundaries.

The Project's potential indirect effects on San Joaquin kit fox movements were also assessed. The Carrizo Plain National Monument is inhabited by a "core" kit fox population, which is one of three core populations identified in the recovery plan for this species (USFWS 1998). A "core population" is an appreciable population of kit foxes residing on a large block of natural to semi-natural habitats within the historic range that is robust enough to maintain maximal genetic diversity and has the ability to respond to varying environmental conditions. These core populations are connected to smaller satellite populations by means of habitat linkages creating a range-wide metapopulation (USFWS 1998). The San Joaquin kit fox population that occurs at the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites is likely a continuum of the Carrizo Plain National Monument core population, given the proximity of the National Monument to the Project site (< 5 mi).

The other two core populations occur in western Kern County, approximately 30-50 mi to the east of Carrizo Plain National Monument, and in the region of the Ciervo-Panoche Natural Area in western Fresno and eastern San Benito counties approximately 100 mi to the north. These core populations in turn essentially anchor smaller satellite populations through dispersal between populations, which maintains genetic viability and subpopulation levels. Movement of animals between the core populations and satellite populations also has the potential for linking the entire San Joaquin kit fox population via gene flow, even though the core populations are separated by substantial geographic and topographic barriers.

A preliminary population viability analysis for the species as a whole suggests that species' recovery increases if a core population is maintained in the Ciervo-Panoche region, and that the Carrizo Plain and western Kern County core populations are both critical to the long term survival of the species. In fact, the analysis indicated that the risk of extinction increases dramatically if either population were eliminated (USFWS 1998).

Viability of these three core populations and the subsequent satellite populations relies on the existence and usability of connecting corridors. Corridors have become an increasingly important tool in conservation biology, with considerable potential benefit for target populations. However, in the two decades since the corridor concept began to appear frequently in the conservation biology literature, there has been much debate over the value of corridors, how they should be implemented, and how they should be defined. In recent years, increasing clarity on the topic has emerged. A number of different disciplines have utilized the term corridor in the context of habitat conservation (Rosenberg et al. 1997, Hess and Fischer 2001). A review called for the clarification of functional versus structural definitions of corridors (Hess and Fischer 2001). A functional approach to corridor design evaluates a corridor in the context of both how it facilitates animal movement and the role that movement plays in the larger population biology of the species. Functional definitions of corridors are utilized by the metapopulation, island

biogeography, and game management literature, and are rooted in the scientific rigor of these disciplines. Structural definitions of corridors arose in the field of landscape ecology, and focus on the physical existence of a linear strip of habitat within the “matrix-patch-corridor” paradigm of landscape structure, with no explicit consideration of the function of that strip of habitat within the population biology of the species. The functional definition of a corridor is strongly grounded in the science of population biology, and the appropriate definition to apply when analyzing the potential affect of the CVSR Project on the Carrizo Plain kit fox population’s connectivity to smaller satellite populations by means of habitat linkages.

There are multiple distinct functions that a corridor can perform, and clarifying which of these general functions a corridor serves is crucial (Hess and Fischer 2001). Distinguishing whether a corridor is to serve as a habitat corridor or a conduit corridor is particularly fundamental for defining a corridor’s function and analyzing impacts to corridor function (Lindenmayer and Nix 1993, Hess and Fischer 2001). The difference between habitat and conduit corridors is defined as follows (Rosenberg et al. 1995, as described in Hess and Fischer 2001): “[A] corridor that provides for movement between habitat patches, but not necessarily reproduction, is performing a conduit function. If a corridor provides resources needed for survivorship, reproduction, and movement, it is performing a habitat function.” If the scale of an animal’s movement is small relative to the width and length of a corridor, it may take several generations for a species to move through the corridor; such species are called “corridor dwellers,” and the habitat within such a corridor would have to perform a “habitat” function and provide resources for reproduction (Beier and Loe 1992). Alternatively, if the length of a corridor is realistically traversable for an animal engaging in natal dispersal, seasonal migration, daily foraging, exploration, or finding a mate, then that species would qualify as a “passage species” with respect to that corridor. In such a situation, the corridor would only have to perform a “conduit” function. When viewed as a corridor linking other populations, the Carrizo Plain clearly functions as a habitat corridor given the relative length and width of the Plain compared to the home range size and dispersal capability of kit fox (Figure 19, South Coast Wildlands Project [SC Wildlands] 2009). It has been suggested that for habitat corridors, the width of the corridor should be approximately the width of the home range of the target species, so as to provide sufficient area within the corridor for a home range (Harrison 1992). The width of the suitable habitat in the Carrizo Plain is many times the width of a kit fox home range and the length of the Carrizo Plain is longer than the average dispersal distance for kit fox.

Habitat corridors and conduit corridors have differing requirements of the habitat contained therein (Hess and Fischer 2001). The most salient difference is that habitat corridors must contain habitat of sufficient quality and quantity to allow for reproduction. In the majority of the original metapopulation studies that showed the benefit of linking subpopulations for the abundance and persistence of the entire population, the quality of the habitat within the links was not explicitly considered (Henein and Merriam 1990). Likewise, the quality of the habitat within a corridor is not always considered to the degree to which it is warranted (Noss 1987, Henein and Merriam 1990, Hess and Fischer 2001).

A draft analysis of habitat suitability of the Carrizo Plain region based upon physical and biotic factors including elevation, slope, presence of and types of roads, dominant vegetation including crops, protected status of the land, and known species occurrences suggests the southern portion is highly suitable habitat for kit fox, while the northern portion (including the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites) is moderately suitable (Figure 19; SC Wildlands 2009). The western and eastern edges of the Carrizo Plain are bordered by steep mountain ranges that are likely to be nearly impermeable barriers for kit fox.

Habitat permeability estimates for San Joaquin kit fox on the Carrizo Plain derived from the habitat suitability modeling commissioned by the California Energy Commission suggests that a permeable habitat corridor extending from the Carrizo Plain northward currently exists and provides connectivity with the Antelope Plain on the eastern edge of the San Joaquin Valley and the Salinas Valley through low relief areas dominated by grasslands (SC Wildlands 2009). Under current conditions, kit foxes are thought to disperse between the Carrizo Plain and western Kern County natural areas through low elevation passes and dry washes at the south end of the Carrizo Plain approximately 35 mi south of the Solar Generation Facility site.

For the purpose of this discussion, corridor quality is best defined by the reproduction and survival rates for the animals living within the corridor because this assessment is aimed at determining whether or not the CVSR Project would substantially reduce the reproduction and survival rate for kit fox living and dispersing through the Carrizo Plain functional corridor. A high quality corridor would have higher reproductive and survival rates for animals within the corridor than a low quality corridor. Henein and Merriam (1990) also defined corridor quality in terms of survival rates in their investigation of the influence of corridor quality on the dynamics of the metapopulation at large.

Field surveys for San Joaquin kit fox conducted to complete the CEQA analysis for the CVSR Project suggest that 6 to 10 resident kit foxes currently occupy the BSA, of which more than half will be preserved and managed as open space (see Project Description and Section 8). This density is consistent with the range and variation of density estimates for kit fox on the Carrizo Plain of 0.39 to 0.62 kit fox per square mile (White et al. 1996). With implementation of measures incorporated into the Project to avoid, minimize, and compensate for impacts to kit fox, the robustness of the kit fox population on the Carrizo Plain would be maintained during and after Project completion. The remaining question is: post-construction, will the Carrizo Plain population remain physically and genetically connected to smaller satellite populations?

Because the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites are located in the central portion of the Carrizo Plain, which is several times the average dispersal distance for kit fox, local movement within the central portion of the Plain is the focus of the connectivity analysis. The Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project site are located at the northeast edge of the area that SC Wildlands (2009) identified as a permeable corridor, with regard to San Joaquin kit fox movement and dispersal (Figure 19). The width of the entire

corridor is approximately 7 mi, within which an area approximately 5.5 mi wide was identified as highly permeable (SC Wildlands 2009). The majority of the kit fox habitat affected by the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project is located within an area that SC Wildlands (2009) identified as less permeable than expansive areas west of the site, which is likely due to steep slopes of the San Andreas fault zone on-site and the proximity to steep slopes that form the edge of the Temblor Range. Only Array 8 and small portions of Arrays 2 and 3 extend into areas identified as highly permeable, with the remaining arrays and developed structures located within areas SC Wildlands (2009) identified as less permeable (Figure 19). Most of the generation tie-line, substation, and switching station are outside of the area identified as suitable corridor (SC Wildlands 2009) and suspended generation tie-lines do not impede kit fox movement.

Kit fox are not expected to completely avoid the areas under the arrays, as they are known to forage within orchards with a denser canopy closure than the proposed solar array (Howard Clark pers. Observation). Because the 10 arrays are not contiguous, opportunities exist for kit fox to move north and south, or east and west through the site during daily movement activities or during dispersal. Both adult and juvenile kit foxes are known to move through a variety of partially disturbed habitats such as farm lands, oil fields, and areas with low density roads and highways (Haight et al. 2002). The installation and maintenance of escape dens along the margins of the arrays will increase the probability of successful movement of kit foxes through the Project site because it should reduce predation risk.

The CVSR Project will maintain the robust nature of the Carrizo Plain kit fox population, even through varied environmental conditions, and maintain the physical and genetic connectivity to other areas of the Carrizo Plain more proximal to smaller satellite populations connected to the Plain by means of habitat linkages.

POTENTIAL EFFECTS ON THE GIANT KANGAROO RAT

The vast majority (4,469 acres) of the BSA provides suitable habitat for the giant kangaroo rat. Most of the site consists of grassland on slopes <11%, which the USFWS (2010c) considers highly suitable for the species. However, giant kangaroo rats currently occur on only a subset of that habitat. During focused surveys in 2009, active giant kangaroo rat precincts occurred within 538 acres of the BSA. The results of the 2010 survey indicate the population in these areas had increased to 1, 876 individuals since the November 2009 survey, but that the acreage occupied decreased to 426.1 acres. Of these, 34.0 acres (approximately 167 precincts) are located within impact areas. Within the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, the greatest concentrations of active precincts are in the conservation area between Arrays 2 and 4; a previous Project layout was modified considerably to reduce impacts to giant kangaroo rat precincts and allow for the preservation and management of the majority (approximately 91%) of precincts currently present in the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites.

Direct Effects: Potential direct effects on this species resulting from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites are as follows:

- Construction of the CVSR Project would result in the direct loss and/or modification of 107 acres of suitable giant kangaroo rat habitat within the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites in the Annual Grassland, Wildflower Field, Inner Coast Range Saltbush Scrub, and Desert Sink Scrub vegetation communities. An additional 1,368 acres of potential habitat in these areas will be temporarily impacted by construction, grading, staging areas, temporary access roads along tracker rows, and trenching, but will be stabilized and re-vegetated following grading. Collectively, these permanent and temporary impact areas include approximately 34.0 acres supporting giant kangaroo rat precincts (or 9% of the precincts detected in these areas).
- Direct effects will include injury or mortality if giant kangaroo rats are hit by moving vehicles. The extent to which giant kangaroo rats are at risk will be dependent on the extent of nighttime construction, as the species is strictly nocturnal. Vehicles and equipment will have a greater effect on habitat. Vehicles driven through burrow precincts will crush burrows and pit-caches or haystacks (above ground seed storage), disrupt paths, and vehicles will compact loose soils used by giant kangaroo rats for sand bathing. Vehicular traffic would also damage vegetation and degrade food resources.
- Ground disturbance resulting from installation of the solar panel support structures would affect currently occupied giant kangaroo rat habitat. Solar panels will be mounted on metal frames anchored with a low-impact penetrating foundation. Anchors are helical piles or ground screws driven directly into the ground. Helical piles or ground screws driven into the ground will disrupt burrows if placed within precincts and may result in mortality or injury through direct contact or as a result of burrows crushed by vehicles or equipment.
- Ground disturbance resulting from trenching required for burial of power and communications cables will directly affect giant kangaroo rats where trenches are excavated through precincts. Open trenches would create impassable barriers that would disrupt movement between burrows and foraging areas. Giant kangaroo rats that inadvertently fall into deep, steep-walled trenches would be vulnerable to predation, starvation, and entombment. Construction of the O&M building/Visitor Center, switchyard, substation, Project entry intersection at SR 58, the Sunrise Overlook, and other facilities will also result in ground disturbing activities that could result in injury or mortality of giant kangaroo rats if any of these facilities overlie active giant kangaroo rat precincts. Construction equipment (e.g., graders, scrapers, bulldozers, trucks, etc.) activities could crush individual kangaroo rats or entomb individuals in burrows as a result of soil compaction.

- Giant kangaroo rats using precincts that will be permanently lost, graded, or otherwise impacted to the extent that mortality of individuals could result will be trapped and translocated. There is some potential for injury or mortality of individuals during this process.

Indirect Effects: Potential indirect effects on this species resulting from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites are as follows:

- Whether or not the array structures will result in the exclusion of giant kangaroo rats, or a reduction in their use of the array footprints, is unknown. The vast majority of the solar arrays would be installed in areas of the Solar Generation Facility site that are characteristic giant kangaroo rat habitat; open, low relief, with a slope of <11%. Within proposed array areas, only 51 acres of array 11, which would be constructed in an area currently occupied by a gypsum mine unsuitable for giant kangaroo rats but that would be filled for solar development, are considered unsuitable for this species. If the array structures alter the habitat to the extent that giant kangaroo rat abundance is reduced in the footprints of the arrays, this would constitute a loss of suitable habitat. Based on the acreage of the array footprints, up to 1,368 acres of giant kangaroo rat habitat could be lost. However, based on the amount of light that will still penetrate the solar arrays, the ground is expected to continue to be vegetated, and there is at least some potential that this species will persist in the areas in and around the solar arrays after the arrays are installed.
- Noise generated by the rotary drill and other heavy equipment is expected to reach 90 dBA at 10 ft, and would be expected to result in temporary threshold shifts in hearing sensitivity. Threshold shifts could last for an extended period (potentially as long as 30 days). Even a temporary loss or reduction of hearing ability could result in increased mortality as this nocturnal species relies primarily on hearing to detect predators or other threats.
- Under the current land use at the Solar Generation Facility site, vegetation height, density, and composition is constrained by intensive livestock grazing. Changing the grazing regime could affect the occurrence and abundance of giant kangaroo rats. Giant kangaroo rats have been shown to have a strong preference for grassy habitat and a strong aversion to areas with dense shrub cover. Areas of the Solar Generation Facility site that are currently occupied by giant kangaroo rats are dominated by a dense but closely cropped cover of annual grasses and forbs. Effects of vegetation changes resulting from changing land use may benefit giant kangaroo rats, or may result in their exclusion from some areas. The extent of the impacts resulting from changes in the vegetation is unknown. While the area within the array footprints will be grazed by sheep or goats, the on-site conservation areas will continue to be grazed by cattle and will be managed

specifically for species such as giant kangaroo rats and San Joaquin kit fox. Therefore, the effects of changing grazing regimes on these species should be low.

- Giant kangaroo rats that are relocated will be released into areas providing suitable refugia, including inactive precincts and/or artificial burrows. However, there is some potential for individuals to attempt to disperse from the relocation area or to show reluctance to using the new burrows. Such individuals could be subject to increased predation rates, or could disperse into unsuitable habitat where survival or reproductive potential would be reduced.
- Spillage or leakage of industrial chemicals, fuels, and lubricants could result in fouling or poisoning of giant kangaroo rats and contamination of their habitat.
- There is a potential for loss of individuals due to predation by species such as the red fox, coyote, or domestic dogs that might be attracted to the CVSR Project site by trash discarded by construction, operation and maintenance, or security personnel. On the other hand, habitat alteration and, in particular, increased human activity might discourage use of the area by coyotes.
- There is a potential for loss of individuals due to predation or harassment by domestic pets associated with the trailer park residents.
- There is potential loss of, or disturbance to, habitats or individuals due to the recreational use of on-site or offsite conservation lands by CVSR personnel, particularly residents of the temporary construction trailer park.
- The use of pesticides, rodenticides, or rodent traps could result in poisoning and/or mortality of giant kangaroo rats.
- Barn owls and great horned owls are present at the Project site, and would be able to perch on new structures, which would enhance foraging on nocturnal giant kangaroo rats along the perimeters of the arrays.
- Permanent lighting, which will be installed at the O&M building/Visitor Center, switchyard, substation, and Project entry intersection at SR 58, could result in increased predation of giant kangaroo rats in illuminated areas as a result of increased visibility to predators.
- Temporary lighting associated with the trailer park may result in increased predation of giant kangaroo rats in illuminated areas as a result of increased visibility to predators.

POTENTIAL EFFECTS ON THE CALIFORNIA JEWEL-FLOWER AND SAN JOAQUIN WOOLLYTHREADS

Neither the California jewel-flower nor San Joaquin woollythreads were located in the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites during rare plant surveys conducted in 2009 and 2010. However, the footprints of the two switchyard alternative locations and the 320-acre Martin parcel supporting Array 11 were not surveyed,

since these areas were not included in the original BSA at the time of spring 2010 plant surveys. To confirm presence or absence in these areas, surveys will be conducted in 2011 during the flowering period of these two species (February – May for California jewel-flower; April – June for San Joaquin woollythreads).

If these species are absent, then Project activities in the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry areas will have no effect on these species. If these species are located in portions of the Project that have not been surveyed, implementation of conservation measures incorporated into the Project description will minimize the potential for take.

Direct Effects. Potential direct effects on the California jewel-flower and San Joaquin woollythreads from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, if these species are present in any of these areas, are as follows:

- Construction of the CVSR Project may result in the direct loss and/or disturbance of up to 36 acres of potentially suitable habitat within the switchyard impact area and 120 acres of the Martin parcel (for Array 11). These are components of the Project site that have not been surveyed during the floristic period for these species. However, these areas will be surveyed in 2011 to determine if these species are present or absent in these locations.
- If individuals of these species are present in impact areas that have not been surveyed during construction, individual California jewel-flower or San Joaquin woollythreads plants could be lost due to trampling or earth-moving.
- Grazing for fire and weed suppression, while being ultimately beneficial to grassland-associated species by inhibiting over-dominance by non-native plants, could result in the loss of individual California jewel-flower and/or San Joaquin woollythreads plants to grazing animals due to trampling, direct consumption, or habitat alteration.
- Project implementation may result in removal or modification of seed banks of the California jewel-flower or San Joaquin woollythreads through clearing and grading.
- Mobilization of dust during construction and due to movement of vehicles on gravel roads during O&M activities could reduce the survivorship and productivity of individual plants close to dust sources by decreasing photosynthetic output, reducing transpiration, and adversely affecting reproductive success.

Indirect Effects. Potential indirect effects on the California jewel-flower and San Joaquin woollythreads from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, if these species are present, are as follows:

- Shading from the solar arrays may alter soil conditions (e.g., temperature and moisture) and reduce the amount of light reaching the ground. Shading may also contribute to changes in the structure and composition of the underlying vegetation community,

causing stunting in some species and allowing more shade-tolerant plants to increase. The reduced evapotranspiration and water stress from partial shading and extra input of water from panel washing would likely result in increased dominance (taller and denser stands) of nonnative grasses. The effect may reduce the ability of the California jewel-flower and San Joaquin woollythreads to germinate and survive in areas under the solar panels in Array 11, the only solar array for which surveys for these species have not been conducted, if these species occur there.

- Soil compaction, erosion, and sedimentation resulting from Project activities may indirectly impact these species by adversely affecting soil conditions.
- Ground disturbance related to Project construction and O&M activities may promote the establishment of noxious weeds, which could reduce the availability of suitable habitat for these species through competition.
- Biannual washing of the solar units (such as Array 11, the only solar array for which surveys for these species have not been conducted) will result in the addition of water to areas under the solar units that, under natural conditions, typically receive water only during the wet season (roughly October through April). Panel washing during the dry season will provide a small amount of extra water to the grassland vegetation beneath the arrays, which could contribute to an increase in or spread of on-site Russian thistle populations and increase the dominance of annual grasses. However, only approximately 1 gallon of water will be used per panel, and washing will be spread out over the year, minimizing the changes in hydrology.

POTENTIAL EFFECTS ON THE KERN PRIMROSE SPHINX MOTH

It is unknown whether the Kern primrose sphinx moth occurs in the Project area at all, let alone in the Project's impact areas, as surveys for the moth have not been conducted and the species has not been detected near the Project site. If the species is absent, then the Project will have no effect on this species. However, focused surveys for the species' larval hostplants, *Camissonia* spp., detected this plant in 14 locations on the site. Of these 14 locations, only two (one of which supported only a single individual plant and the other of which supported a group of five plants) were within a proposed impact area, in Arrays 6 and 11. Ten locations are north of SR 58 in the northeastern part of the Solar Generation Facility site, and are far enough removed from all Project construction activities that they would not be affected by construction or operation of the solar arrays. The remaining two occurrences are west of the Twisselman Quarry access road north of SR 58. Implementation of conservation measures will be incorporated into the Project description to minimize the potential for take of the Kern primrose sphinx moth, and it is expected that direct impacts to most, if not all, of the *Camissonia* plants north of SR 58 can be avoided. Therefore, impacts on the Kern primrose sphinx moth are expected to be minimal or nonexistent.

Direct Effects. Potential direct effects on the Kern primrose sphinx moth from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, if the species is present, are as follows:

- Construction of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry Project components would result in the direct loss of habitat supporting six individual *Camissonia* plants, in Arrays 6 and 11. Implementation of impact minimization measures described previously will prevent impacts to any individual moth larvae that might be present on these plants, and the plants themselves will be transplanted to a portion of the on-site conservation area supporting *Camissonia*, thus avoiding direct destruction of the larval host plants.
- Construction of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry Project components will result in the direct loss and/or modification of 121 acres of suitable habitat within the BSA in the Annual Grassland, Wildflower Field, Inner Coast Range Saltbush Scrub, and Desert Sink Scrub vegetation communities that support food sources for adult Kern primrose sphinx moths.
- An additional 1,418 acres of potential habitat supporting food sources for adult sphinx moths will be temporarily impacted by construction, staging areas, temporary access roads along tracker rows, and trenching, but will be stabilized and re-vegetated following grading. However, these areas of temporary impacts will coincide with the known location of only six *Camissonia* plants, as described above.
- Dispersing individuals of this day-flying species could potentially be injured or killed due to vehicular strikes during construction and operation of the power plant.
- Grazing for fire and weed suppression, or grazing of conservation areas for grassland management, while being ultimately beneficial to grassland-associated species by inhibiting over-dominance by non-native plants, could result in the loss of individual host plants to grazing animals, and possibly trampling or destruction of eggs or larvae due to grazing of host plants or trampling.
- Project implementation may result in removal of seed banks of the moth's host food plants through clearing and grading.
- Mobilization of dust during construction and due to movement of vehicles on gravel roads during O&M activities could reduce the survivorship and productivity of the moth's host food plants close to dust sources by decreasing photosynthetic output, reducing transpiration, and adversely affecting reproductive success. This could affect the two occurrences of *Camissonia* west of the Twisselman Quarry access road.
- There is a low probability that Kern primrose sphinx moth or *Camissonia* individuals could be lost due to the recreational use of on-site or offsite conservation lands by CVSR personnel, particularly residents of the temporary construction trailer park.

Indirect Effects. Potential indirect effects on the Kern primrose sphinx moth from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, if the species is present, are as follows:

- Shading from the solar arrays may alter soil conditions (e.g., temperature and moisture) and reduce the amount of light reaching the ground, which may reduce the ability of the moth's adult food plants to germinate and survive in areas under the solar panels.
- Soil compaction, erosion, and sedimentation resulting from Project activities may indirectly impact the moth's adult food plants by adversely affecting soil conditions.
- Ground disturbance related to Project construction and O&M activities may promote the establishment of noxious weeds, which could reduce the availability of suitable habitat for the moth's larval and adult host food plants through competition.
- Biannual washing of the solar units will result in the addition of a small amount of water to areas under the solar units that, under natural conditions, typically receive water only during the wet season (roughly October through April). The addition of water during the dry season, which will likely occur once per year, will alter the hydrologic regime of areas within and around the solar arrays. However, due to the very small amount of water that is used during such cleaning (approximately 1 gallon per panel), this alteration is unlikely to increase the potential for non-native invasive species that germinate in summer to become established and/or to spread throughout the Project area.

POTENTIAL EFFECTS ON THE LONGHORN FAIRY SHRIMP AND VERNAL POOL FAIRY SHRIMP

Potential habitat for the longhorn and vernal pool fairy shrimp is present on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry Project component sites in two areas: a small complex of seasonal wetlands in the southwestern corner of the Solar Generation Facility and a playa pool in the northeastern part of the Solar Generation Facility site. Both species are known to occur in vernal pools in areas southwest of the Solar Generation Facility site, and a designated critical habitat unit for vernal pool species, including these two fairy shrimp, extends onto the southwestern portion of the Solar Generation Facility site. The on-site seasonal wetlands did not pond in 2009, as rainfall totals were not high enough to result in ponding that year. In contrast, rainfall during the 2009-2010 wet season produced ponding in these wetlands as of February 2 and 12 and March 10, 2010. Sampling of these pools in February and March 2010 revealed the presence of the common, widespread versatile fairy shrimp, but no individuals that were confirmed as longhorn or vernal pool fairy shrimp. Nevertheless, these pools have some potential support longhorn and vernal pool fairy shrimp.

It is unknown whether either of these listed fairy shrimp species occurs on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. However, even if these species are present, they are not expected to be impacted by these Project components due to design components intended to avoid direct and indirect impacts to potential habitat of these

species. The playa pool will not be impacted, either directly or indirectly. No solar arrays or other Project facilities or activities will occur in or near this pool. Due to the presence of a topographic break between this pool and the nearest solar array, no drainage from disturbed areas of the site reaches this pool. Thus, this pool is hydrologically isolated from all areas of Project activities, and the Project will not affect hydrology or water quality in the pool.

No ground disturbance for the Project will occur within 250 ft of the seasonal wetlands in the southwestern part of the Solar Generation Facility site, thus avoiding direct impacts of construction and O&M activities on these wetlands. However, portions of the Solar Generation Facility site do drain into the seasonal wetlands in the southwestern part of the Solar Generation Facility area. Thus, in the absence of conservation measures to protect the quality and quantity of water in these wetlands, there would be some potential for indirect effects on these wetlands, and on any branchiopods that might be present in these wetlands. To protect water quality and hydrology within the seasonal wetlands in the southwestern part of the Solar Generation Facility site, the Project will maintain a 250-ft construction-free buffer around these wetlands and will implement measures incorporated into the Project to prevent indirect effects of sedimentation on water quality within these wetlands and to maintain existing hydrologic conditions in these wetlands.

Following Project installation, long vegetated swales that currently exist between sources of runoff (e.g., off Project roads) and the seasonal wetlands would prevent sediment in runoff from reaching these wetlands. Furthermore, because grading is extremely limited, the Project is expected to have a negligible effect on runoff patterns on the site; rain that falls on solar arrays will still reach the ground, and drainage patterns will carry such surface water along existing pathways. Water used to wash the solar arrays twice per year will infiltrate into the ground long before it reaches the seasonal wetlands in the southwestern part of the site, and thus no dry-season wetting, which could potentially disrupt the life cycles of these species, will occur in potential fairy shrimp habitat as a result of Project activities. Thus, the Project will not alter either the hydrology or water quality in seasonal wetlands that could potentially support listed branchiopods on the Solar Generation Facility site.

In summary, through a combination of site design to avoid impacts to potential fairy shrimp habitat on the Project site and implementation of Applicant-Proposed Measures, no impacts to the longhorn fairy shrimp or vernal pool fairy shrimp will occur as a result of the construction or operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project.

POTENTIAL EFFECTS ON THE BLUNT-NOSED LEOPARD LIZARD

The blunt-nosed leopard lizard was not detected during protocol-level surveys conducted in 2009 on the majority of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project site, and protocol-level surveys conducted in 2010 also had negative results. Therefore, this species is considered absent from the Solar

Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, based not only on negative results of very intensive surveys conducted specifically for this species but also on the lack of detections during other biological surveys on the site and on the lack of any detections within 3 mi of these areas. We do not expect blunt-nosed leopard lizards to occur on these components of the Project site, and no take of the species is expected to result from Project activities in these areas. Nevertheless, because some proposed impact areas, such as arrays 9 and 10, the Sunrise Overlook and Visitor Overlook sites, and portions of the potential switching station locations, were not included in either the 2009 or 2010 surveys, HPR II will have qualified biologists conduct protocol-level surveys in 2011 in any areas within the Project's impact footprint that were not surveyed according to protocol in 2009 or 2010. As a further precautionary measure, preconstruction surveys and, if necessary, other impact avoidance and minimization measures will be implemented, as described previously, to ensure no impacts on this species will occur.

POTENTIAL EFFECTS ON THE CALIFORNIA CONDOR

Although currently California condors are not known to regularly use any portions of the CVSR Project site, suitable foraging habitat is present within the Project site, and there is potential for California condors to eventually use the Project area as foraging habitat as the population recovers. The greatest concern regarding impacts to condors in the Project area is their potential to collide with power lines. Bird collisions with power lines generally occur when a power line or other aerial structure transects a daily flight path used by a concentration of birds and when migrants travel at reduced altitudes and encounter tall structures in their path (Brown 1993).

Collisions and electrocutions with electrical distribution structures were a significant mortality factor for the reintroduced population of California condors during the first several years of release efforts (Snyder and Snyder 2000). Seven condors died due to collisions or electrocutions in California from December 1988 to June 1999 (Meretsky et al. 2000). This threat was thought to have largely resulted from the tendency of young birds to associate with human structures (Snyder and Snyder 2000). This hazard has been greatly reduced by releases of birds that have been trained to avoid perching on mock utility poles fitted with electroshock mechanisms (Snyder and Snyder 2005). All recorded instances of collisions and electrocutions have been with distribution structures, and transmission lines and structures have not represented a collision or electrocution threat to the California condor (J. Burnett, personal communication). Condors have excellent eyesight (Snyder and Snyder 2005) and do not fly during inclement weather, factors which may explain why they readily avoid transmission lines.

Direct Effects: Potential direct effects on the California condor resulting from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, if the species is present, are as follows:

- Installation of the solar panels and associated facilities, including buildings, maintenance roads, and a switchyard, could remove or make unsuitable approximately 1,475 acres of

suitable California condor foraging habitat within the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry portions of the Project site. Carrion resulting from cattle grazing as well as pronghorn and tule elk is less likely to be present within the developed portions of the Project site after installation of solar arrays than is currently the case. Additionally, the solar arrays and its associated buildings would likely inhibit the take-off and landings of foraging condors. This effect is of negligible magnitude at present, since condors are not currently known to forage on the site, but if condor populations recover and condors once again forage on the Carrizo Plain, the Project will have removed some potential foraging habitat for the species. However, this habitat loss represents less than 1% of the availability of natural habitat in the Carrizo Plain ecoregion, and 193,738 acres of such habitat would remain after development of the Project. Because habitat to be lost represents such a low proportion of regionally available habitat, and because it does not possess any resources that make it (relative to most other areas on the Carrizo Plain) particularly valuable as foraging habitat for condors, the loss of habitat on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites would not adversely affect condor populations or inhibit their recovery.

- There is a very low potential for individuals to be injured or killed due to collision with or electrocution by bridging medium voltage wires on Project-associated generation tie-line or transmission lines. Conservation measures incorporated into the Project will minimize the possibility of collision and electrocution.

Indirect Effects: Potential indirect effects on the California condor resulting from the of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, if the species is present, are as follows:

- Project construction and maintenance activities could potentially introduce micro-trash and toxic fluid spills related to vehicle maintenance and repairs. Adverse effects on condors have been documented by the animals' collection of micro-trash (i.e., broken glass, paper and plastic waste, small pieces of metal). This waste is often brought back to nest sites where young birds ingest the material. This can lead to mortality of young birds. Such effects are unlikely to occur, at least to young birds in the nest, as a result of the CVSR Project since the site is not located near potential breeding habitat. However, ethylene glycol, a component in antifreeze and petroleum products, can also be ingested by condors, ultimately leading to death. The potential for such impacts will be avoided or minimized with implementation of conservation measures incorporated into the Project.

POTENTIAL EFFECTS ON THE MOUNTAIN PLOVER

Potential wintering habitat for mountain plovers occurs throughout most of the Solar Generation Facility site in the form of annual grasslands. Mountain plovers have been documented using the

Solar Generation Facility site as recently as October 2009. However, wintering habitat on the Carrizo Plain is not expected to be limiting this species' local wintering population. Since the 1970s, numbers recorded during surveys of the Carrizo Plain have not exceeded the 381 individuals recorded in January 2006 (Hunting and Edson 2008), yet the Carrizo Plain Ecoregion Subsection contains more than 130,000 acres grassland, the primary habitat used by this species. As a result, the loss of habitat resulting from the CVSR Project is not expected to have an adverse effect on mountain plover populations. Also, 3,272 acres (68% of the site acreage) will remain open space and be managed to maintain or enhance conditions supporting special-status species. Habitat management will include cattle grazing, which will enhance habitat quality for this and other special-status species.

Direct Effects: Potential direct effects on the mountain plover resulting from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites are as follows:

- Approximately 107 acres of potential wintering habitat for this species will be permanently lost to the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites.
- Installation of the solar panels and associated facilities, including buildings, maintenance roads, and a switchyard, could remove or make unsuitable 1,368 acres of suitable mountain plover wintering habitat within the BSA. Plovers are expected to avoid areas under and near solar panels or near buildings, as they avoid areas where features block or disrupt their view of the surrounding landscape. Also, loss of annual grassland from this Project represents less than 2% of the available habitat for this species in the Carrizo Plain ecoregion, and winter foraging habitat is not expected to be limiting this species' populations, either in the Carrizo Plain or range-wide, due to the vast extent of suitable foraging habitat relative to this species' low populations. Because habitat to be lost represents such a low proportion of regionally available habitat, and because it does not possess any resources that make it (relative to most other areas on the Carrizo Plain) particularly valuable as foraging habitat for mountain plovers, the loss of habitat on the Project site would not adversely affect mountain plover populations or inhibit recovery of the species.
- There is a low potential for individuals to be injured or killed due to collision with Project-associated generation lines.

Indirect Effects: Potential indirect effects on this species resulting from the development of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, if the species is present, are as follows:

- Noise, human activity, and ground vibrations from the use of heavy equipment during Project implementation may cause mountain plovers to avoid using the site. However,

most use of heavy equipment will only occur during the construction period and this species is generally considered tolerant of human disturbance.

- Permanent lighting, which will be installed at the O&M building/Visitor Center, switchyard, substation, and Project entry intersection at SR 58, may preclude mountain plovers from using illuminated areas. Temporary lighting associated with the temporary construction trailer park may also preclude mountain plovers from using those areas.
- There is a potential for loss of individuals due to predation or harassment by domestic pets associated with the trailer park residents.
- There is potential loss of, or disturbance to, habitats or individuals due to the recreational use of on-site conservation lands by CVSR personnel, particularly residents of the temporary construction trailer park.

PROJECT EFFECTS ON CRITICAL HABITAT

Critical habitat has not been designated or proposed for the California jewel-flower, San Joaquin woollythreads, Kern primrose sphinx moth, San Joaquin kit fox, giant kangaroo rat, blunt-nosed leopard lizard, or mountain plover. Therefore, no adverse effects on primary constituent elements of critical habitat for these species will occur as a result of the Proposed Action.

The nearest designated critical habitat for California condor is the East Unit of the Hi Mountain-Beartrap Condor Area, 13 miles west of the Solar Generation Facility site, where captive-raised condors were formerly released. Therefore, no effect to critical habitat for this species will occur as a result of the Proposed Action.

A designated critical habitat unit (Unit 30) for federally listed vernal pool species, including vernal pool fairy shrimp and longhorn fairy shrimp, is mapped south/southwest of the Solar Generation Facility site and extends onto the southwestern corner of the site. The Proposed Action will therefore affect lands occurring within the boundary of this critical habitat unit. The Proposed Action, however, will not result in adverse modification of critical habitat for vernal pool fairy shrimp or longhorn fairy shrimp.

According to the critical habitat designation (USFWS 2006a), the two Primary Constituent Elements (PCEs) of critical habitat for vernal pool species are:

- Vernal pools, swales, and other ephemeral water features of appropriate sizes and depths that typically become inundated during winter rains and hold water for sufficient lengths of time necessary for the species to complete their life cycle.
- The geographic, topographic, and edaphic features that support aggregations or systems of hydrologically interconnected pools, swales, and other ephemeral wetlands and depressions within a matrix of surrounding uplands that together form hydrologically and ecologically functional units called vernal pool complexes. These features contribute to the filling and drying of the vernal pool, maintain suitable periods of pool inundation, and

maintain water quality and soil moisture to enable the vernal pool species to carry out their lifecycles.

Vernal pool complexes, as described in the second PCE, may be present on the Solar Generation Facility site. Seven slight topographical depressions ranging from 0.26 acres to 0.47 acres in size, and comprising a total of approximately 2.33 acres, occur within the portion of the critical habitat Unit 30 overlapping the boundary of the site. Although no ponding was observed in these features during surveys in 2009, these seasonal wetlands in the southwestern part of the Solar Generation Facility site were observed to pond water on February 2 and 12, 2010. However, vernal pool branchiopod sampling did not detect any listed vernal pool branchiopods in these pools. As a precaution, the wetlands occurring within Unit 30 will be completely avoided through the establishment of an activity-free exclusion zone of at least 250 ft. The area supporting the depressions will comprise an element of a larger open space preserve established for the preservation or enhancement of habitats suitable for special-status species and managed by an USFWS-approved land management plan. Furthermore, upland habitats within Unit 30 beyond the exclusion zone that are proposed for solar array development do not provide any physical and/ or biological features essential to the conservation of vernal pool fairy shrimp or longhorn fairy shrimp within or outside of the Solar Generation Facility site.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, Tribal, local or private actions affecting listed species and their critical habitat that are reasonably certain to occur in the action area considered in this biological assessment. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act.

The proposed CVSR Project, in combination with other Projects in the area and other activities that affect the species that are affected by this Project, could contribute to cumulative effects on vegetation communities, common plant and animal species, and special-status plant and animal species. The geographic extent for the analysis of cumulative impacts related to biological resources includes the Carrizo Plain and the larger Ciervo-Panoche region including areas of western Fresno County, regions of western Kern County in the San Joaquin Valley, eastern San Luis Obispo County, and northern Santa Barbara County. The areas included in this cumulative analysis contain suitable and occupied habitat of species potentially affected by the CVSR Project, including the San Joaquin kit fox, giant kangaroo rat, and mountain plover. Each of these locations may also support core, critical, or unique populations essential to recovery and long-term survival of these species (USFWS 1998; 2010a; 2010b; 2010c).

Currently, one other solar project is proposed for the California Valley area. First Solar is proposing the construction of the Topaz Solar Farm Project, a 550-MW solar PV energy plant on approximately 6,210 acres in Northern California Valley. This Project, in combination with the proposed CVSR project, would impact more than 8,000 acres of habitat in the Carrizo Plain from solar development. Thus, these solar development projects would result in the loss or modification of approximately 4% of the natural lands in the Carrizo Plain ecoregion. To our knowledge, no other large-scale development projects that would result in the loss or conversion of large amounts of habitat in the Carrizo Plain are currently proposed.

The Topaz Solar Farm Project is dominated by lands that are dryland farmed. Although they generally support similar species to the CVSR Project site, burrowing mammals are expected to occur at lower densities on the Topaz site as a result of periodic disturbance from farming. The Topaz site also supports more seasonal wetlands than the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. Roughly, the habitat impacts of these two solar projects are primarily to grassland species. The grassland habitats that dominate the CVSR and Topaz site support a unique and tightly linked ecological community that once occurred throughout the vast grassland habitats of the San Joaquin valley floor. Species central to this community include the San Joaquin kit fox and giant kangaroo rat, and in other areas (though not on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites) the blunt-nosed leopard lizard. These species occur almost exclusively within the very low-slope and low-relief landscapes typical of arid valley floors, and rely solely on underground burrows for protection from low and high temperatures, extended dry periods,

and predation. This ecological community is also comprised of a number of plant and animal species that face significant risk of extinction due to the conversion of vast areas of former habitat to agriculture, urban development, energy development, highways, and canals (USFWS 1998).

The giant kangaroo rat is central to this community and is considered a keystone species within the habitats in which it occurs (Goldingay et al. 1997). Its burrows can be locally abundant, and they provide critical refuge for other species. San Joaquin antelope squirrels are more often found in grasslands occupied by giant kangaroo rats (Harris and Stearns 1991), particularly while dispersing or occupying new habitats during irruptive reproductive periods. Each of these species is in turn preyed upon by San Joaquin kit fox and/or burrowing owls, which occupy these same low-relief open grasslands and which also rely on underground burrows for protection from extreme temperatures and predation.

Because these species are so reliant on open flat grasslands and shallow underground burrows for cover, they are particularly vulnerable to any type of large-scale ground disturbance or large-scale changes in vegetation, particularly the conversion of grasslands to any type of agriculture or the succession of grasslands to habitats dominated by larger shrubs and trees. The scale at which such land use changes are relevant is directly proportional to the amount and condition of the remaining available habitat. Due to the extent of preceding alteration of habitats utilized by these species, relatively minor changes within remaining habitat, particularly when considered cumulatively, may have profound and lasting effects.

Historically, giant kangaroo rats may have occupied more than 1.5 million acres throughout the species' range (Williams 1992), yet currently they are found within less than 5% of the historical range (USFWS 2010c). Habitat modeling suggests there may still be up to 900,000 acres of highly suitable San Joaquin kit fox habitat within the species' range (USFWS 2010b), although it is clear that substantial portions of what is considered suitable habitat are no longer occupied, and there is considerable evidence that this habitat is becoming increasingly fragmented (USFWS 2010b).

Projects permitted by the USFWS between 1988 and 2007 have resulted in permanent alteration of over 118,000 acres of kit fox habitat (with an additional 20,000 acres affected by temporary disturbance) for large-scale water storage and conveyance, urban development, agriculture, oil and gas development, and other developments (USFWS 2010b). Between 1987 and 2008, the USFWS authorized permanent alteration of more than 6,300 acres and temporary disturbance of nearly 3,000 acres of giant kangaroo rat habitat (USFWS 2010c). This loss of habitat is substantial and yet only includes the loss of habitat to large projects that required and received environmental review by federal and State resource agencies.

There is considerable potential for substantial additional loss of important habitats for these species, and large-scale solar developments currently represent a significant potential source of habitat loss. Foreseeable future projects, proposed in just the past few years, include a total of

eight medium to large-scale solar projects that would be sited within the known extant range of giant kangaroo rats and San Joaquin kit fox. Implementation of all of these projects could result in the permanent alteration of more than 21,000 acres of occupied and/or potential habitat for these species (USFWS 2010b; 2010c).

The continued incremental loss of habitat to smaller-scale land conversion is more difficult to quantify, and yet may be as substantial or even more substantial. It is apparent that a significant portion of the remaining occupied habitat for these species is on private land and is highly vulnerable to incompatible land use, which, although typically smaller-scale, collectively may result in significant and often undetermined cumulative effects. For example, over 60% of CNDDDB records of kit fox list the landowner as “unknown”, indicative of sighting locations on private lands or at best on fragments of public land interspersed among privately held land (USFWS 2010b). This suggests a significant portion of remaining occupied San Joaquin kit fox habitat is vulnerable to incompatible land use and increasing fragmentation.

The USFWS (2010c) no longer considers conversion to agriculture a threat to giant kangaroo rat habitat, yet there is evidence that conversion of land from livestock grazing to dryland farming led to the crash of populations that may have resulted in a genetic bottleneck for kit fox in the Panoche Valley (M. Westphal pers. comm., 2010). Cessation of grazing, significant changes in grazing regimes, or conversion of rangelands to other land uses would have devastating effects on local populations of kit fox and blunt-nosed leopard lizard. Other types of development continue to threaten the habitat for these species on private lands.

Substantial land conversion resulting from the sale and subdivision of large tracts of land and changing use of private lands continues to be a serious threat to the integrity of habitats for these species. Furthermore, the environmental impacts associated with many of these types of actions may never be fully reviewed under the existing regulatory framework (e.g., disking of habitats, conversion of grazing lands to agriculture, subdivision of ranches).

The Recovery Plan for the San Joaquin kit fox and giant kangaroo rat emphasizes the need to protect habitat critical to ensuring the survival of these species. The plan identifies specific locations and tracts of land that are of the highest priority, yet few mechanisms have been identified to achieve these recovery goals. Implementation of the proposed large-scale solar development projects would result in significant direct, indirect, and cumulative impacts resulting from permanent alteration and/or degradation of as much as 21,000 acres of occupied and potential habitat within the range of the species described here and numerous additional species. Nonetheless, impacts associated with these projects could be at least partially offset through the permanent protection of between 60,000 and 80,000 acres of habitat as conservation for impacts to habitat affected by the development of these projects.

The highly-focused management of 60,000 to 80,000 acres for these species would offset the cumulative impacts of the solar energy projects and, if managed correctly, could result in a positive net impact. In the case of the giant kangaroo rat at the CVSR site, for example,

compensatory conservation will be provided in the form of habitat preservation, enhancement, and management in perpetuity for all permanent impacts and for the footprints of the solar arrays. The Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the CVSR Project are expected to impact approximately 1,475 acres of potential kangaroo rat habitat, a small portion of which is occupied by giant kangaroo rats. The highest-quality habitats, which are evidenced by occupancy of large numbers of giant kangaroo rats, will be avoided and preserved and managed by the Project.

Based on slope, elevation, and existing land use, there appears to be well over 20,000 acres of suitable habitat and/or physically suitable land on which giant kangaroo rat habitat could be restored in the northern portion of the California Valley, yet most of the suitable habitat appears to be unoccupied at this time. In the absence of significant enhancement of habitat on conservation lands, the degradation of 2,268 of 23,800 acres of suitable or potentially suitable habitat (which apparently exists in the valley north of the California Valley subdivision) could have a significant impact on the viability of giant kangaroo rat populations in the northern Carrizo Plain. However, the impacts to the lower-quality habitat within the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites would be offset through conservation that would permanently protect high-occupancy grasslands on the Project site, and would permanently protect, restore, and enhance a substantial amount of additional habitat within the northern portion of the California Valley. Because nearly all the unoccupied habitat affected by development of the CVSR is potentially suitable for giant kangaroo rats, preserving suitable habitat is a key part of SunPower's conservation strategy for mitigating potential impacts to giant kangaroo rats. The three objectives of SunPower's conservation strategy aim to mitigate potential impacts by permanently preserving habitat lands both on and off the CVSR project site.

The combined preservation and restoration efforts of this conservation strategy will preserve approximately 4,425 acres of habitat for giant kangaroo rats (3:1 ratio) that is known to support more than 10 times the number of animals than the affected acreage. The three objectives of SunPower's conservation strategy achieve this result in the following ways. First, SunPower will preserve existing suitable habitat for giant kangaroo rats at a ratio of 2 acres preserved for each acre of like habitat affected regardless of the affected habitat's current state of occupancy. Second, SunPower will enhance or restore degraded, on-site and off-site habitat with confirmed enhancement or restoration potential based on soil type, slope, and hydrology at a ratio of 1:1 for each acre affected. This will create an amount of enhanced or restored habitat equivalent to the amount of potential habitat impacted by the CVSR.

The potential for restoration of large populations of giant kangaroo rats on restored habitat in a relatively brief period is evidenced by the species' re-colonization of the Project site since the mid-1990s. Aerial photographs from 1994 indicate that the areas that are currently most densely populated by giant kangaroo rats on the Solar Generation Facility site were previously disced, and no kangaroo rat precincts are evident in aerial photos from that period. Currently, those

areas support high densities of the species, which have become established without targeted management (i.e., with only cessation of discing and introduction of grazing by cattle) in only 15 years.

Because the giant kangaroo rat serves as an “umbrella species” for grassland-associated San Joaquin species in general, providing compensatory conservation for Project impacts on grassland-associated species will fully compensate for the Project’s effects on these species, thereby compensating for the Project’s contribution to cumulative impacts to these species.

ANALYSIS OF ALTERNATIVE ACTIONS

As described in the “Project Site Selection” section above, HPR II considered three primary requirements in selecting the best site for this new solar facility: access to electrical transmission lines with available power capacity; suitable land; and high solar resource.

Before settling on the Carrizo Plain as the location for this power plant, HPR II considered alternate locations within California where a solar power plant could be constructed. Some alternate locations with high solar resources are remote and lack adequate transmission infrastructure, such as the Mojave Desert. While efforts are underway to build new transmission corridors to such areas, none will be completed in time to contribute to the state’s 2010 Renewable Portfolio Standard (RPS) which mandates each investor-owned utility (such as PG&E) to deliver 20% of its electricity from renewable energy sources. Looking forward, the State has set an even more challenging 2020 Renewable Portfolio Standard of 33%.

Of the state’s existing transmission lines, few have the available capacity to integrate additional power generation without cost-prohibitive upgrades, which further reduced the range of potential sites for a solar power plant. The transmission line north of the proposed Solar Ranch site – the PG&E-owned Morro Bay–Midway transmission line – does have the available capacity to accept significant additional power generation with minor reconductoring modifications. This line was previously used to connect the natural-gas-fired power plant at Morro Bay to the statewide electrical grid and now operates at only a fraction of its total capacity due to a reduction in the plant’s energy production.

When considering land suitability near the Morro Bay–Midway transmission line, HPR II reviewed the topography, agricultural viability, and current use of potentially available sites. The topography of the Solar Generation Facility site, with its low slope, allows HPR II’s T0 Tracker systems to be placed on the ground with minimal disturbance, following the contours of the land. Also, as discussed previously, the site has low agricultural resource value limited to now-abandoned attempts at dry land farming and limited grazing. Irrigated, productive agricultural land was also excluded from consideration due to its higher value for crop production. Land preserved for agriculture under the Williamson Act was also excluded from siting consideration.

The most important factor HPR II considered in selecting a site for this Project’s Solar Generation Facility was the solar resource available. The solar resource is the percentage of available sunlight that can be converted into electricity. The area around California Valley has the highest solar resource in PG&E’s service territory and is identified by the San Luis Obispo County General Plan’s Energy Element as an area of high solar potential where solar energy development should be encouraged. California Valley’s very nature makes it the ideal location for solar energy production. It is protected from coastal fog by the Coastal and La Panza mountain ranges to the West. The Temblor Range to the East protects it from San Joaquin Valley ground fog. The weather in California Valley is stable, marked by very low rainfall,

moderate temperatures and consistent sunshine. At an elevation near 2,100 ft, this microclimate contains air that is dry and relatively low in particulate matter, boosting the sun's intensity.

Once HPR II determined that the CVSR's Solar Generation Facility site was the ideal location for a solar power plant, it considered the micro-topography of the site and biological resources in designing the site plan and determining where the solar arrays and other facilities would be located. Topographic mapping revealed slopes of 5% or less throughout a majority of the site. Here, HPR II's solar tracker units require no grading prior to installation. They are able to be placed directly on existing ground terrain.

A hydrologic review of the Solar Generation Facility site analyzed both on- and off-site drainage conditions. Based on these hydrologic and topographic maps, a preliminary engineering design was crafted around the following objectives:

- Low-impact development
- Minimal permanent site disturbance
- Minimal temporary site disturbance
- Minimal or no change to existing drainage patterns
- Reclamation and enhancement of the existing gypsum mine
- Storm water quality and drainage infrastructure improvement
- Restoration of areas of temporary disturbance post installation
- Compatibility with existing species and habitat

Based on information on biological and hydrologic resources collected during studies in 2008, 2009, and 2010 and summarized in the Biological Resource Assessment Report and subsequent reports on the results of biological surveys on the site, the layout for the photovoltaic arrays and other facilities on the Solar Generation Facility site was prepared. After a review of this biological resources information, HPR II proposed an array layout using the SunPower T20 tracker that required virtually no grading for installation of the arrays. However, due to constraints on the dimensions of feasible layouts and slopes suitable for the T20 tracker, that array layout would have required the placement of arrays on extensive areas that were found to support dense concentrations of giant kangaroo rat precincts. In order to reduce impacts to that species, HPR II modified its approach by proposing the use of the T0 tracker, which allows for the collection of the same amount of solar energy in a smaller overall footprint, and by relocating several of the proposed arrays to areas supporting low densities of kangaroo rats. HPR II then went through an iterative process of array design and relocation to further reduce impacts to giant kangaroo rats. Making these modifications allowed the Project to reduce impacts to habitat supporting giant kangaroo rat precincts by 82% as compared to the original array layout.

Efforts to avoid and minimize impacts to sensitive biological resources through site design included the following:

- Avoidance to the maximum extent feasible of areas of relatively high sensitivity, including:
 - Areas of high giant kangaroo rat precinct densities
 - Atriplex scrub habitat, Interior Coast Range scrub and Wildflower Field, retired dry-farmed field, (all north of SR 58)
 - Alkalai sink habitat (south of SR 58)
 - Lower-elevation areas that contribute drainage to offsite Northern Claypan Vernal Pool habitat
 - Ephemeral drainages and seasonal wetlands (with a buffer of at least 250 ft between any grading or solar arrays and seasonal wetlands in the southwestern part of the Project site and a buffer of 100 ft between solar arrays and ephemeral streams wherever feasible)
 - Areas supporting evening primrose (*Camissonia* spp.), which could serve as a larval host foodplant for the Kern primrose sphinx moth (*Euroserpinus euterpe*)
 - Possible habitat areas for San Joaquin antelope squirrel
- Retention of land within the HPR II parcels for continued agricultural and conservation purposes, including large contiguous habitat areas supporting the highest densities of giant kangaroo rats.
- Design of the arrays to incorporate movement pathways for San Joaquin kit fox, pronghorn antelope, and other species between the arrays, maintaining connectivity within and through the site.
- Design of a fencing program that allows passage through the fencing by pronghorn antelope and other species (see Figure 5).

By implementing these measures, both direct and indirect impacts to wetlands that could potentially support longhorn fairy shrimp and vernal pool fairy shrimp were avoided. HPR II has minimized the extent of roads and other infrastructure to the degree practicable to further minimize impacts.

HPR II also selected solar units that would avoid the need for grading and minimize all ground disturbance on the site. HPR II's T0 Tracker System uses the most efficient solar cells to produce the most power in the smallest possible footprint. Trackers rest lightly on the land, allowing sun, air and rain to reach the landscape below. The T0 Tracker combines solar technology performance with system durability. By tilting the solar panels at 15-20 degrees to the South and tracking on a single-axis to follow the path of the sun throughout the day, the T0

Tracker generates 30% more energy than a traditional fixed-tilt system. This efficiency allows for increased energy output from a smaller footprint system.

Surface-mounted trackers minimize impact on local species and vegetation. Adjustable tracker legs allow each tracker to adjust to the topography, minimizing the need for grading. The T0 Tracker utilizes a low-impact penetrating (LIP) foundation system based on a combination of ground screws or helical piles. Benefits of this foundation system include the following:

- Limited disturbance to soil and, thereby, limited impact on the environmental and native species
- LIP foundations will not be affected by burrowing rodents
- Simplified dismantling process
- Designed to reduce the projects potential environmental effects including a reduction in permanent ground coverage of approximately 40% over the alternative concrete pedestal option
- Suited to the seismically active location near the San Andreas Fault
- Direct placement of supports in native soils negates the need to re-level foundations and should not be subject to settling

Adjustable, telescoping legs allow tracker positions to follow site terrain. Individual T0 Trackers are hoisted into place while installers adjust the tilt and orientation as needed via the telescoping legs. This allows the system to conform to existing topography, limiting soil disturbance and the need for grading.

In summary, the array of potential sites on which an economically feasible power plant could be constructed was severely constrained by the availability of sites consistently providing high-quality solar resources. HPR II then minimized the extent of environmental impacts by selecting a site very close to an existing transmission line that could be upgraded to carry electricity produced by the solar plant with very limited ground disturbance; designing the layout of solar arrays on the CVSR's Solar Generation Facility site in such a way as to minimize disturbance of sensitive biological resources; and using solar units that require minimal ground disturbance and will not prohibit the growth of vegetation beneath them. Thus, HPR II has reduced the extent and severity of impacts to biological resources, including the listed species addressed in this BA, to the maximum extent practicable.

DETERMINATION AND CONCLUSIONS

The construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the CVSR Project will result in the permanent and temporary loss of habitat that is used by the San Joaquin kit fox and giant kangaroo rat as foraging, denning, and dispersal habitat, and the permanent and temporary loss of foraging habitat that is used occasionally by the mountain plover. The Project will also result in the permanent and temporary loss of habitat that could potentially serve as habitat for the California jewel-flower and San Joaquin woollythreads; as foraging, reproductive, and dispersal habitat for the Kern primrose sphinx moth; and as foraging habitat for the California condor, if these species occur within the Project's action area.

In addition, there is some potential for impacts to individuals of the San Joaquin kit fox, giant kangaroo rat, California jewel-flower, San Joaquin woollythreads, and Kern primrose sphinx moth, during construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project.

Through Project design and implementation of conservation measures (such as measures to avoid impacts to hydrology and water quality in seasonal wetlands), construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project will avoid impacts to habitat and individuals of the longhorn fairy shrimp and vernal pool fairy shrimp. These Project components are also not expected to result in impacts to individual California condors, and they are not expected to result in impacts to individuals or habitat of the blunt-nosed leopard lizard.

The Project includes measures to avoid and minimize impacts to individuals and habitat of these species during construction and operation of the Project, and includes measures to compensate for impacts to listed species and their habitats. After implementation of these measures, the construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project will not have a substantial residual impact on populations of any of these species. Furthermore, with implementation of these measures, the construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project will not contribute to cumulative impacts to these species.

DETERMINATION

The construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project are likely to result in the take of the San Joaquin kit fox and giant kangaroo rat, and could potentially result in the take of the California jewel-flower, San Joaquin woollythreads, and Kern primrose sphinx moth, either through the standard Federal Endangered Species Act definition of take (i.e., "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect") or through the destruction or

modification of habitat resulting in the death or injury of individuals of these species. Therefore, these Project components are likely to adversely affect these species. However, these activities will not jeopardize the continued existence of these species, either considered alone or cumulatively in concert with other projects. Furthermore, with implementation of conservation measures incorporated into the Project, these activities will not inhibit the recovery of these listed species.

The construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project are not likely to adversely affect the mountain plover. These activities will result in the loss of annual grassland that is occasionally used as winter foraging habitat by this species. However, these sites are only used irregularly by this species, the loss of this habitat is not expected to result in a reduction in the species' local or global populations, and the management of conservation lands will increase the availability of high-quality wintering habitat for mountain plovers in the Carrizo Plain, and thus will offset any adverse effects associated with the loss of annual grassland on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites.

The construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project will result in the loss of habitat that could be used in the future as foraging habitat by the California condor, but that does not currently serve that purpose. Given the extent of available foraging habitat for this species, the loss of potential foraging habitat for California condors is not expected to result in the death or injury of individuals of this species. Furthermore, the loss of this habitat is not expected to inhibit the recovery of the California condor due to the extremely limited proportion of available foraging habitat, both in the region and in the range of the species, comprised by the Project's impact areas. Therefore, these Project components are not likely to adversely affect the California condor.

The construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project are not likely to adversely affect the longhorn fairy shrimp, vernal pool fairy shrimp, or blunt-nosed leopard lizard, as these activities will not result in adverse effects on habitat or individuals of these species.

The construction and operation of the Solar Generation Facility will result in impacts to upland areas within designated critical habitat Unit 30 for federally listed vernal pool species, which include the longhorn fairy shrimp and vernal pool fairy shrimp. However, upland habitats within Unit 30 that are proposed for solar array development do not contain any physical and/ or biological features essential to the conservation of vernal pool fairy shrimp or longhorn fairy shrimp within or outside of the Solar Generation Facility site. The on-site area supporting wetland depressions that could serve as habitat for vernal pool species within Unit 30 will be included in a larger open space preserve established for the preservation or enhancement of habitats suitable for special-status species and managed by an USFWS-approved land management plan. In addition, these wetlands will be buffered from Project development

activities by a distance of at least 250 ft, and measures to prevent indirect impacts to these wetlands (e.g., to hydrology or water quality) will be implemented. Therefore, no adverse modification of critical habitat will occur as a result of the construction and operation of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project.

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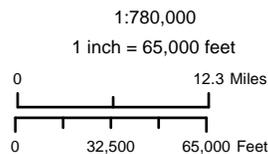
FIGURES



Legend

 Project Site

Scale



California Valley Solar Ranch
Biological Assessment
Figure 1: Project Vicinity Map

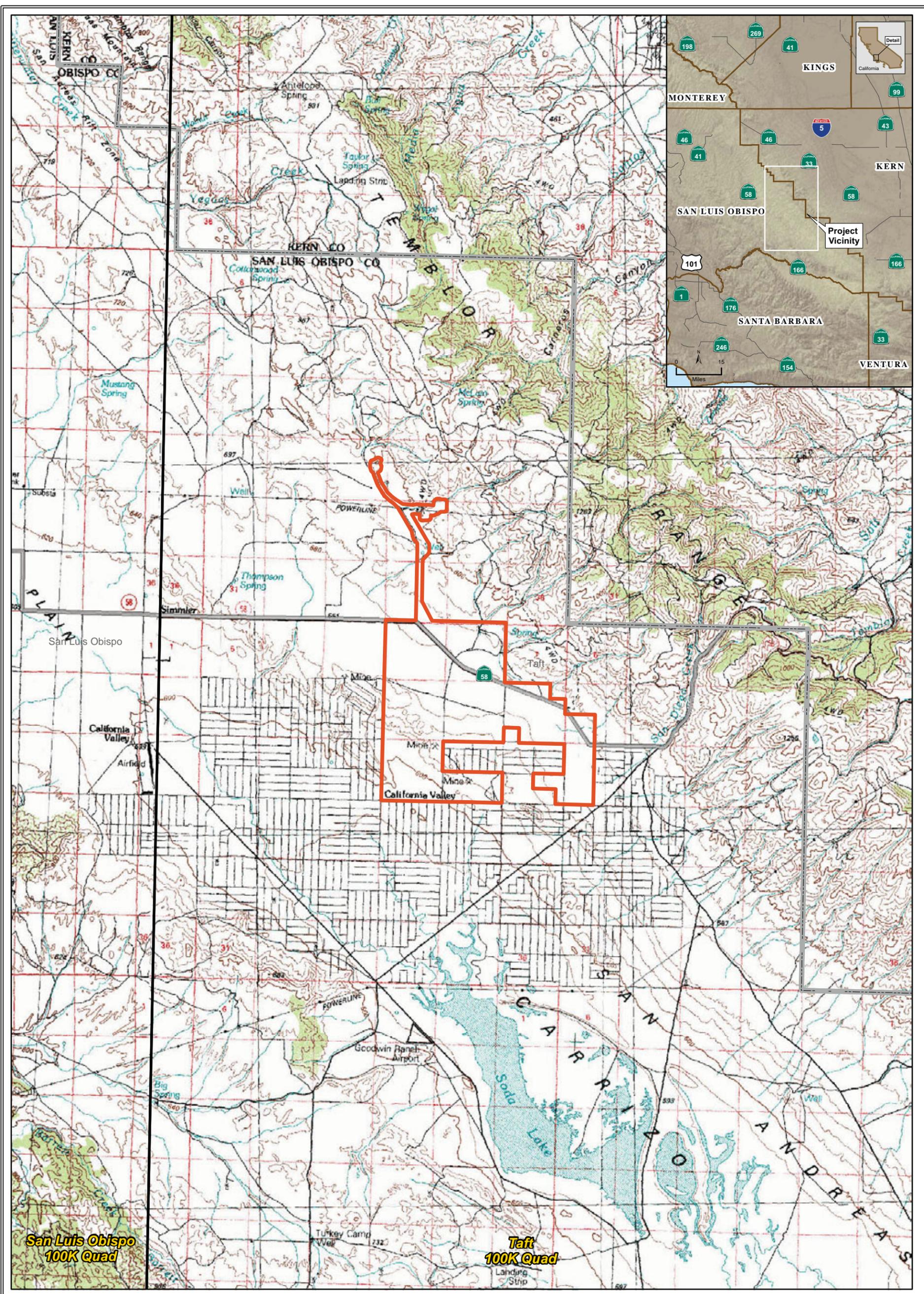
HPR II



Data Sources: [1] California Geospatial Information Library,
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Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North

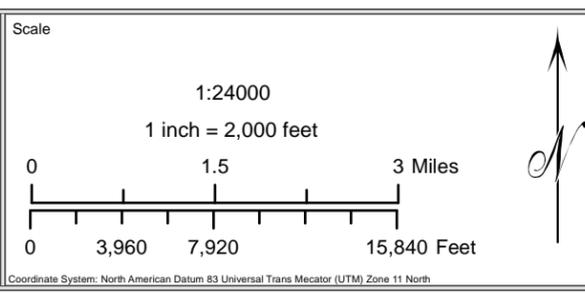
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San Luis Obispo
100K Quad

Taft
100K Quad

Legend
 County Boundary

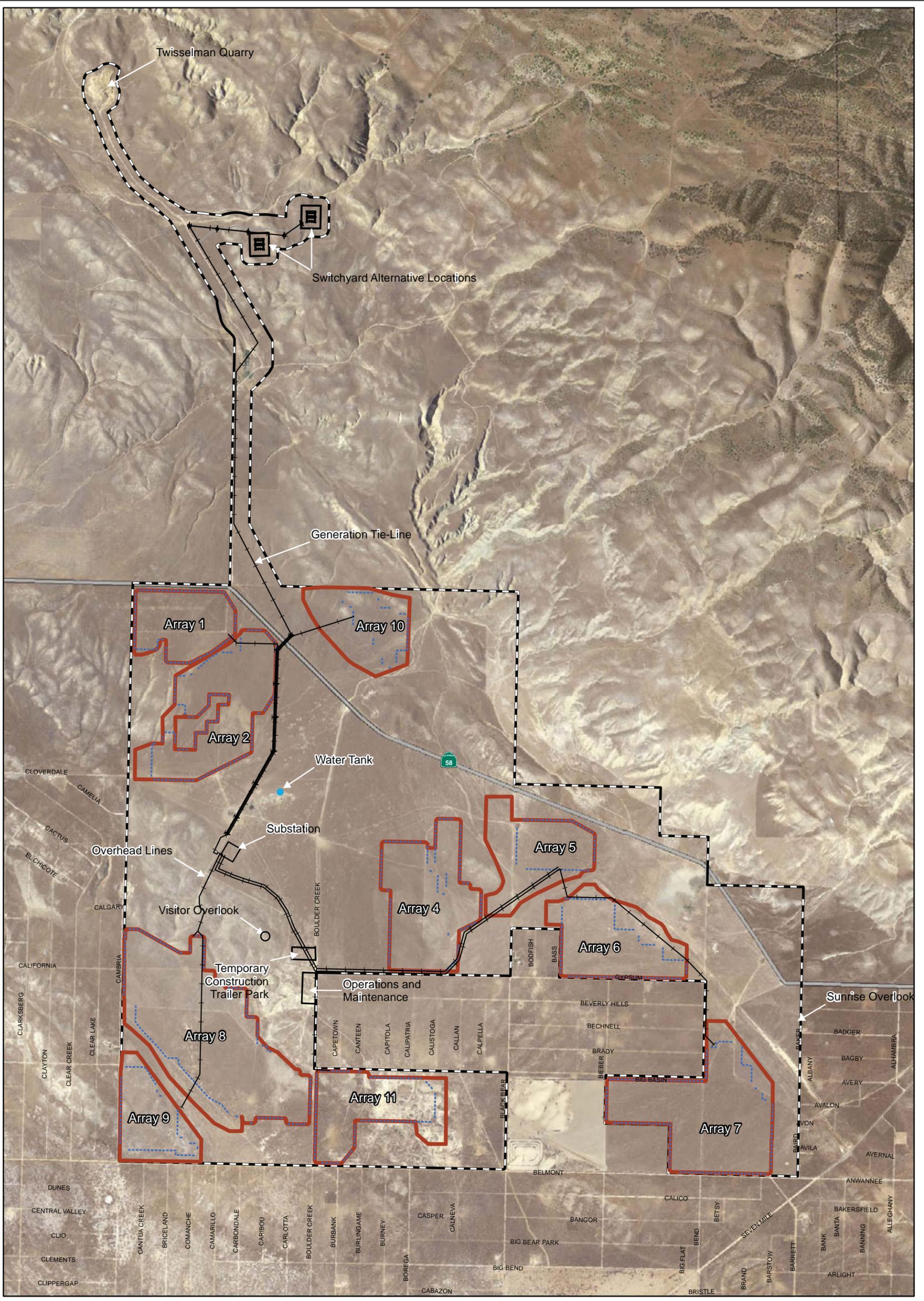


California Valley Solar Ranch
 Biological Assessment
 Figure 2: Project Site Map

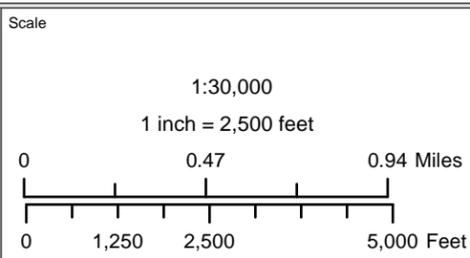


Data Sources: [1] California Geospatial Information Library, [2] ESRI BaseMap USA (2006).

Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North



- Legend**
- Biological Study Area Boundary
 - M3 Alternative Solar Panel Arrays
 - Potential Solar Array Footprints



California Valley Solar Ranch
Biological Assessment
Figure 3: Proposed Project Design

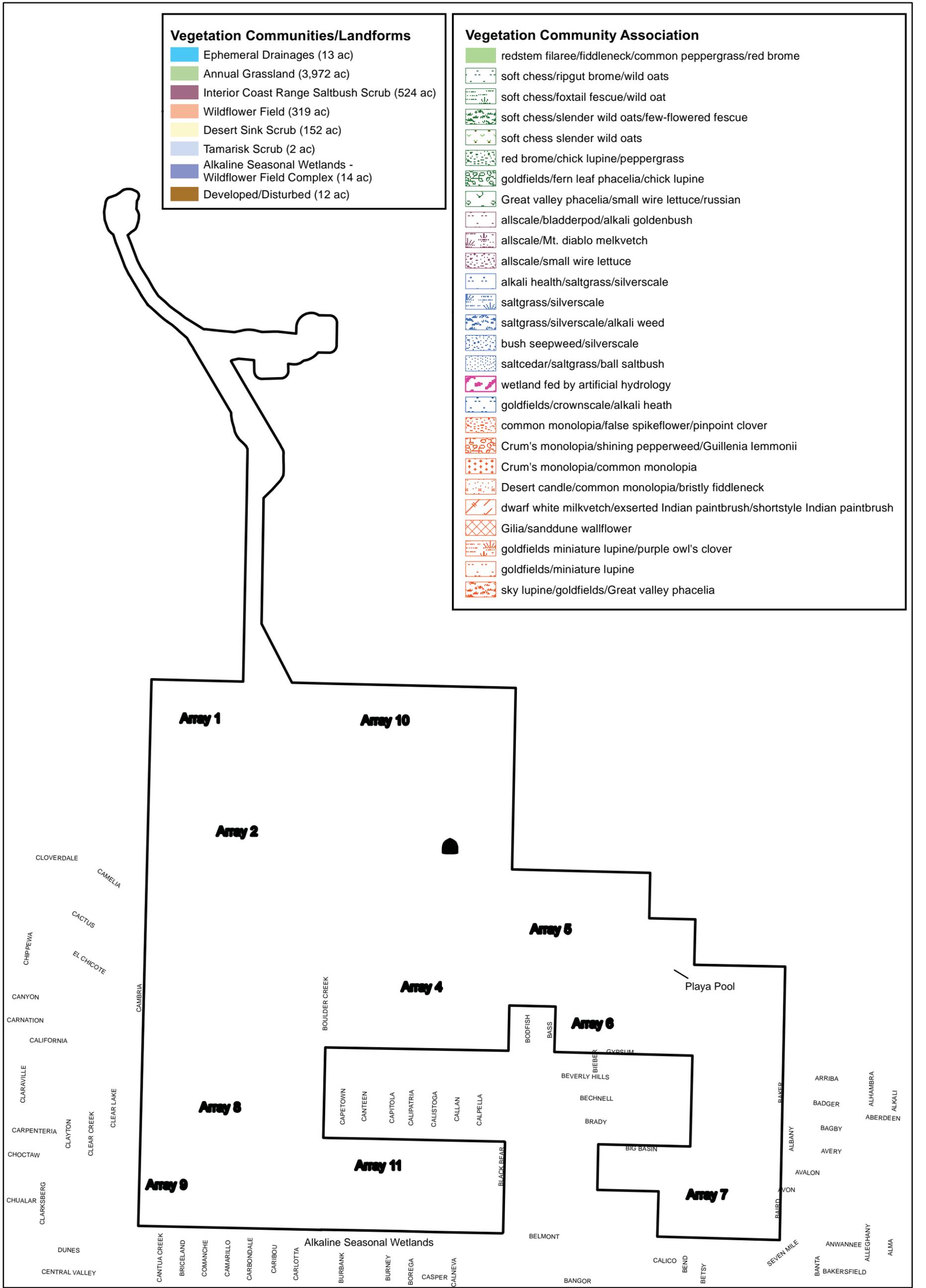
HPR II



Data Sources: [1] San Luis Obispo County Graphic Information Systems (February 2000), [2] ESRI StreetMap USA (2006), [3] 1ft Natural Color SunPower Aerial (2009)

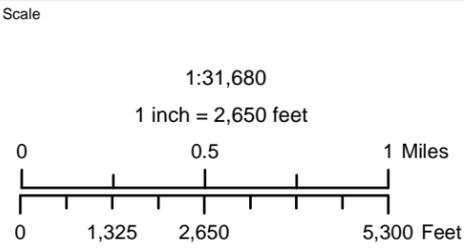
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Legend

Biological Study Area Boundary



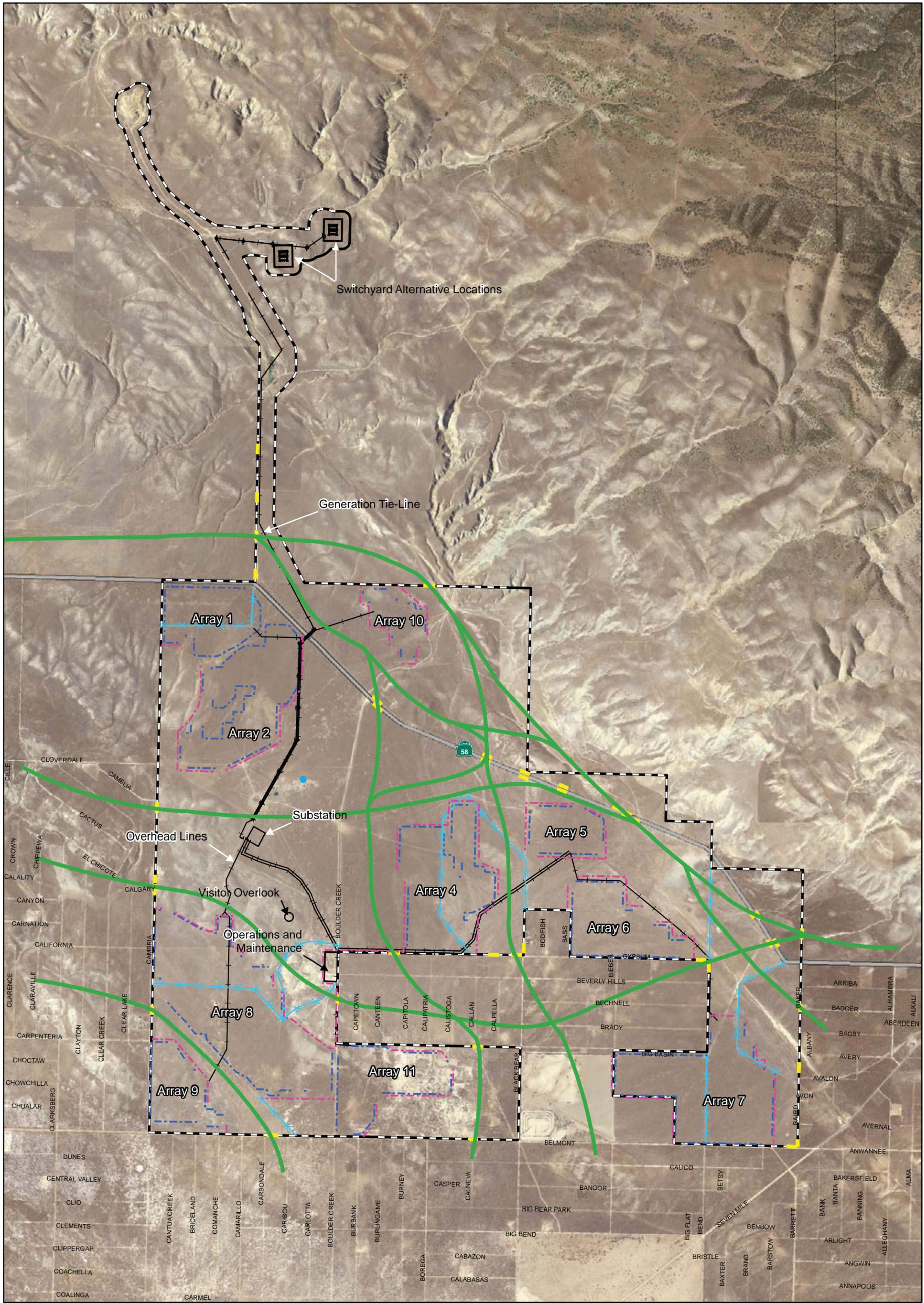
California Valley Solar Ranch
Biological Assessment
Figure 4: Vegetation Community Map

HPR II



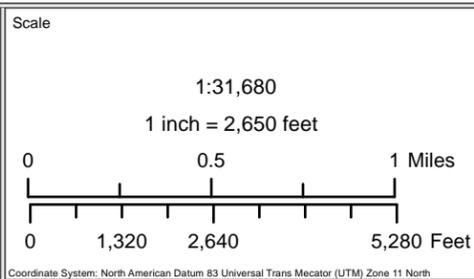
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Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North



- Legend**
- Biological Study Area Boundary
 - Solar Panel Arrays
 - Approximate Movement Pathways
 - Remove Fence
 - Modify Fence
 - New Cattle Fence

Data Sources: [1] San Luis Obispo County Geographic Information Systems (February 2000), [2] ESRI StreetMap USA (2006), [3] 1ft Natural Color SunPower Aerial (2009)



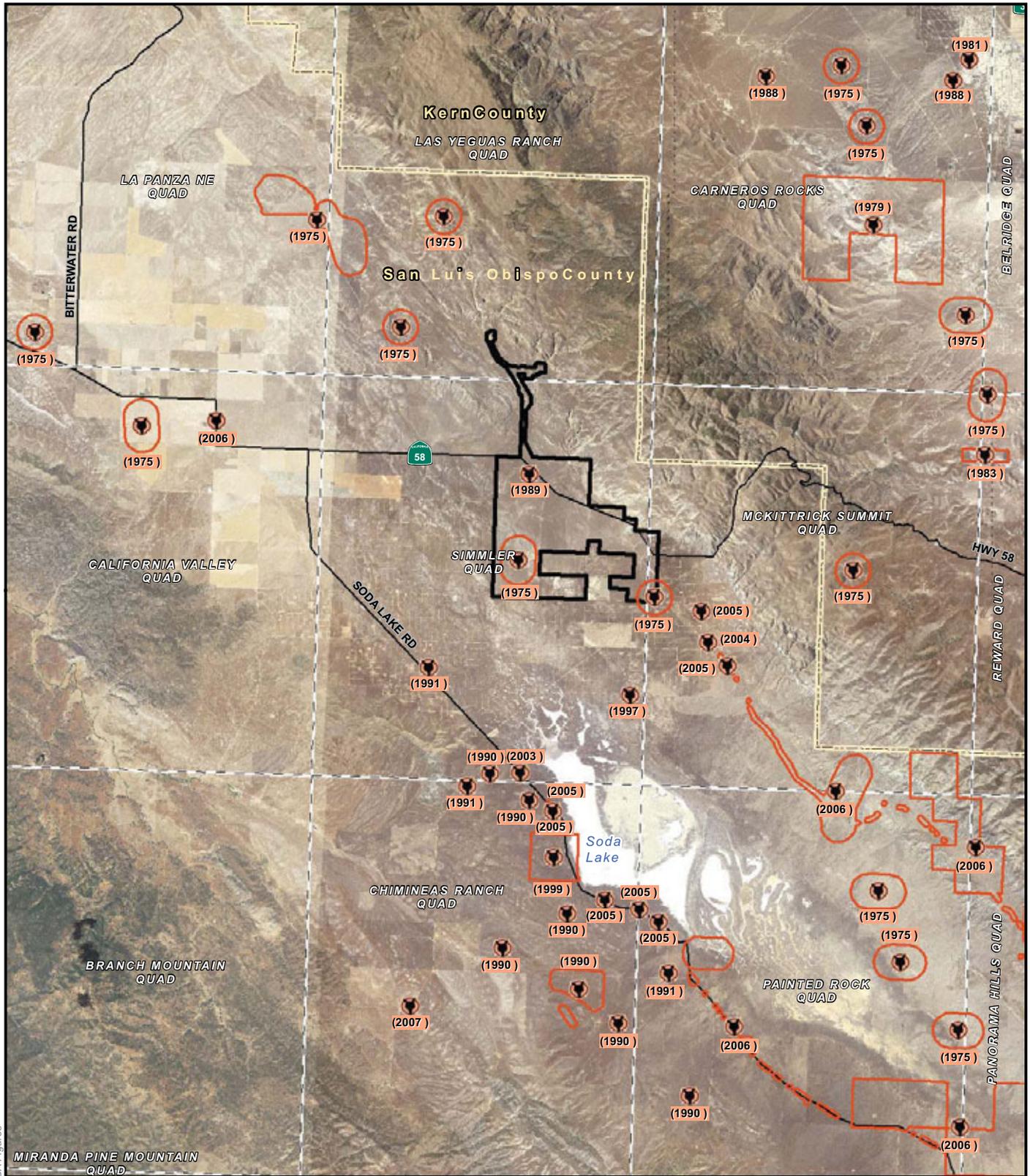
California Valley Solar Ranch
Biological Assessment

Figure 5: Fencing Modifications to Reduce Barriers to Pronghorn Antelope Movement through Project Site

HPR II



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Legend

CNDDB 06-2010
Medium Mammals

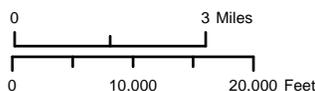
-  San Joaquin Kit Fox
-  7.5 Quad Index
-  County Boundary
-  Biological Study Area Boundary

Data Sources: [1] California Natural Diversity Database (CNDDB, JUN 2010), [2] 1m Natural Color NAIP (2009).

Scale

1:190080

1 inch = 3 miles

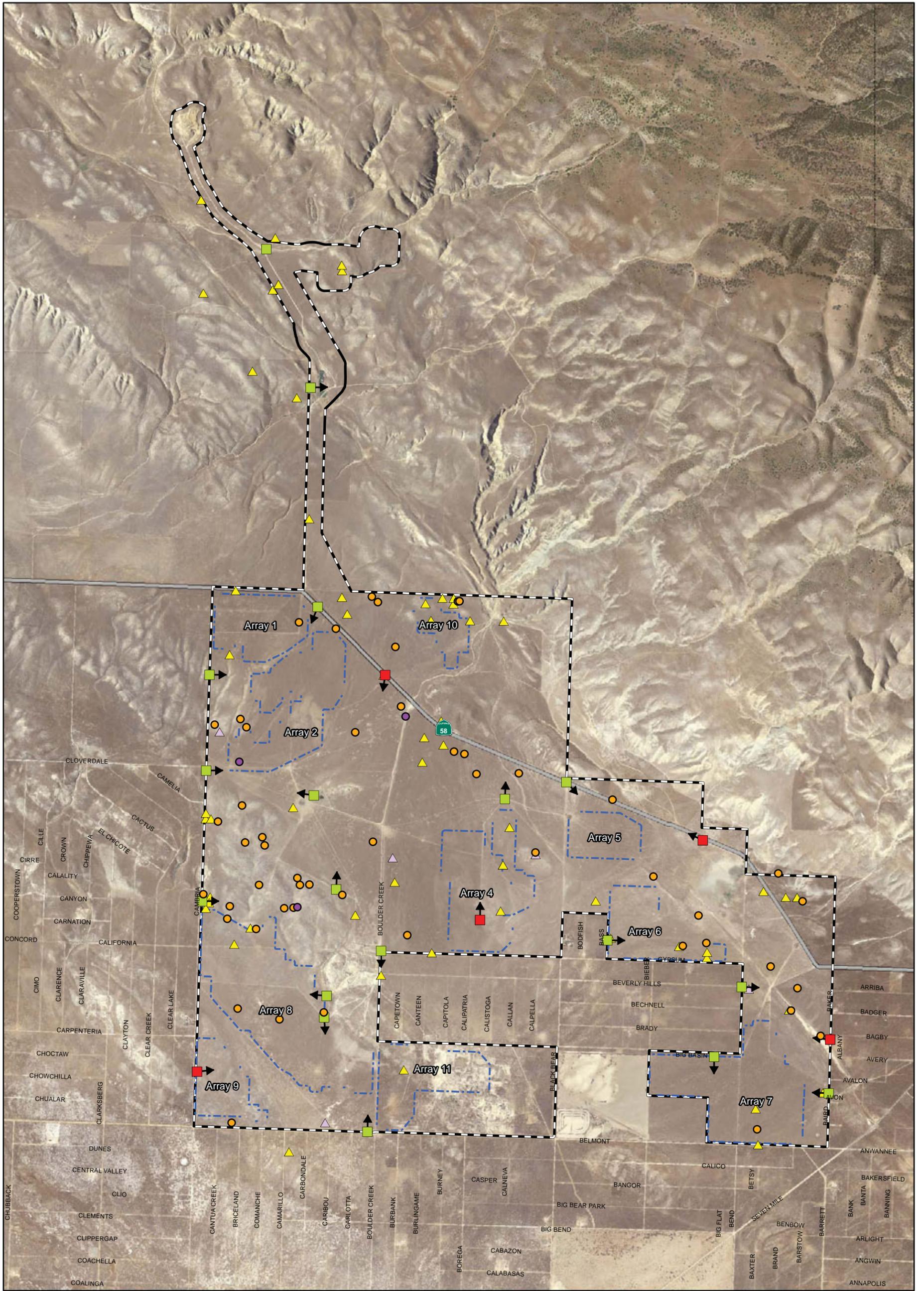


Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North

California Valley Solar Ranch
Biological Assessment
Figure 7: CNDDB Results for San Joaquin Kit Fox

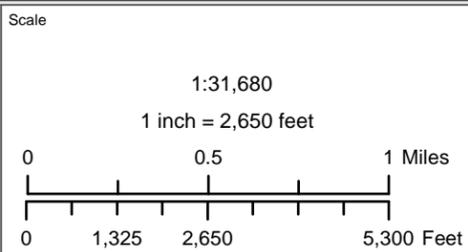
HPR II





- Legend**
- Biological Study Area Boundary
 - Solar Panel Arrays
 - Camera Station Data**
 - Camera SJKF Detections
 - Camera Stations
 - Camera Direction

- 2010 Surveys - Den Data**
- SJKF Active Den
 - SJKF Natal Den
- Previous Surveys - Den Data**
- SJKF Active Den
 - SJKF Natal Den



California Valley Solar Ranch

Biological Assessment

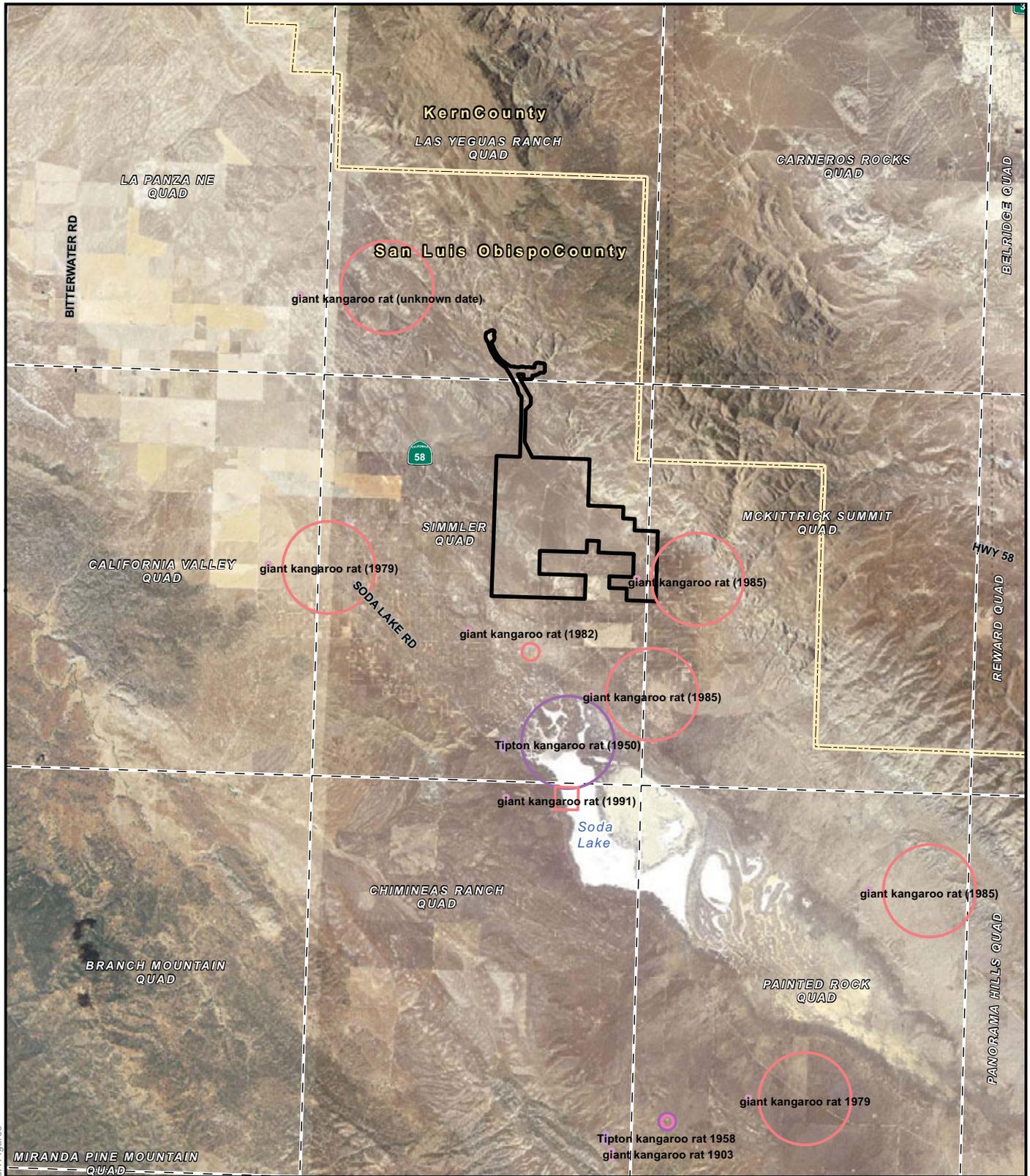
Figure 8: San Joaquin Kit Fox Locations

HPR II



Data Sources: [1] San Luis Obispo County Graphic Information Systems (February 2000), [2] ESRI StreetMap USA (2006), [3] 1ft Natural Color SunPower Aerial (2009)

Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North



Legend

CNDDB 06-2010

Small Mammals

- Tipton kangaroo rat
- giant kangaroo rat
- County Boundary
- 7.5 Quad Index
- Biological Study Area Boundary

Data Sources: [1] California Natural Diversity Database (CNDDB, JUN 2010),
 [2] 1m Natural Color NAIP (2009),

Scale

1:190080

1 inch = 3 miles

0 3 Miles

0 10,000 20,000 Feet

Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North

California Valley Solar Ranch

Biological Assessment

Figure 9: CNDDB Results for Small Mammals

HPR II

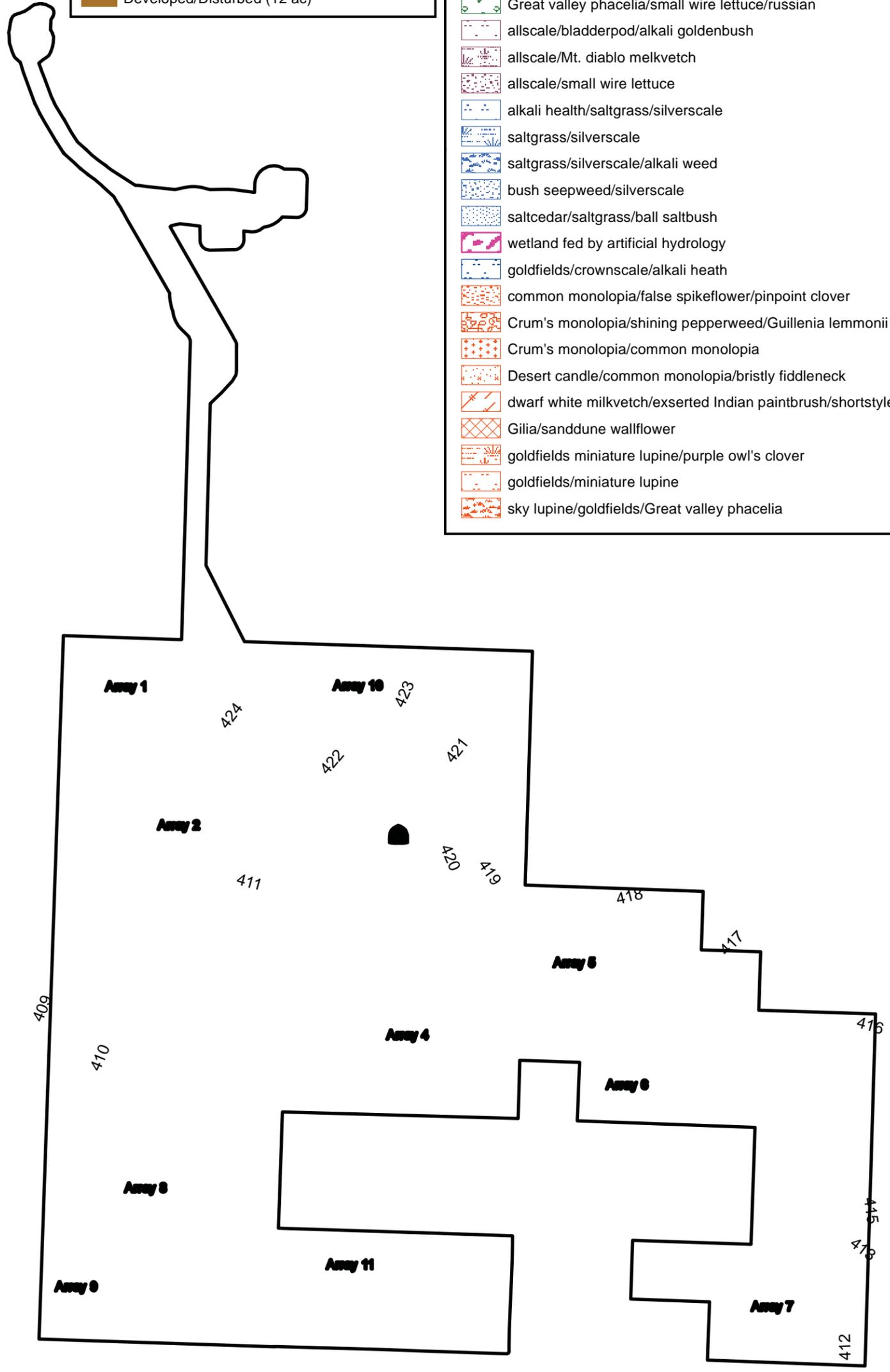


Vegetation Communities/Landforms

	Ephemeral Drainages (13 ac)
	Annual Grassland (3,972 ac)
	Interior Coast Range Saltbush Scrub (524 ac)
	Wildflower Field (319 ac)
	Desert Sink Scrub (152 ac)
	Tamarisk Scrub (2 ac)
	Alkaline Seasonal Wetlands - Wildflower Field Complex (14 ac)
	Developed/Disturbed (12 ac)

Vegetation Community Association

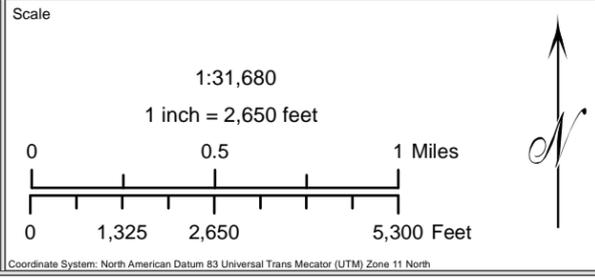
	redstem filaree/fiddleneck/common peppergrass/red brome
	soft chess/rippgut brome/wild oats
	soft chess/foxtail fescue/wild oat
	soft chess/slender wild oats/few-flowered fescue
	soft chess slender wild oats
	red brome/chick lupine/peppergrass
	goldfields/fern leaf phacelia/chick lupine
	Great valley phacelia/small wire lettuce/russian
	allscale/bladderpod/alkali goldenbush
	allscale/Mt. diablo melkvetch
	allscale/small wire lettuce
	alkali health/saltgrass/silverscale
	saltgrass/silverscale
	saltgrass/silverscale/alkali weed
	bush seepweed/silverscale
	saltcedar/saltgrass/ball saltbush
	wetland fed by artificial hydrology
	goldfields/crownscale/alkali heath
	common monolopia/false spikeflower/pinpoint clover
	Crum's monolopia/shining pepperweed/Guillenia lemmonii
	Crum's monolopia/common monolopia
	Desert candle/common monolopia/bristly fiddleneck
	dwarf white milkvetch/exserted Indian paintbrush/shortstyle Indian paintbrush
	Gilia/sanddune wallflower
	goldfields miniature lupine/purple owl's clover
	goldfields/miniature lupine
	sky lupine/goldfields/Great valley phacelia



Legend

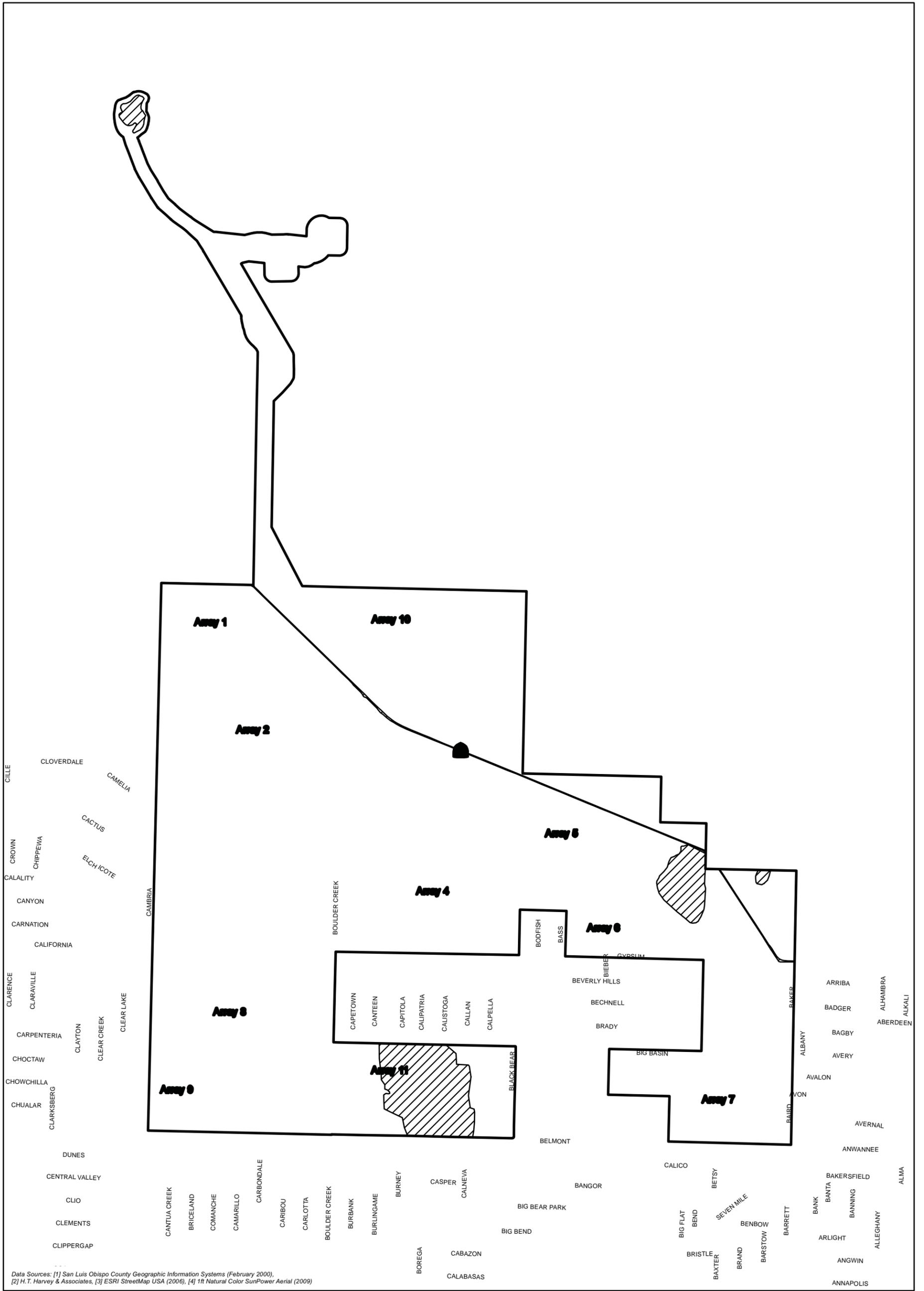
- Biological Study Area Boundary
- Solar Panel Arrays
- Small Mammal Trap Line

Data Sources: [1] San Luis Obispo County Geographic Information Systems (February 2000), [2] ESRI StreetMap USA (2006), [3] 1ft Natural Color SunPower Aerial (2009), [4] USDA 1-m Natural Color NAIP Aerial (2009)

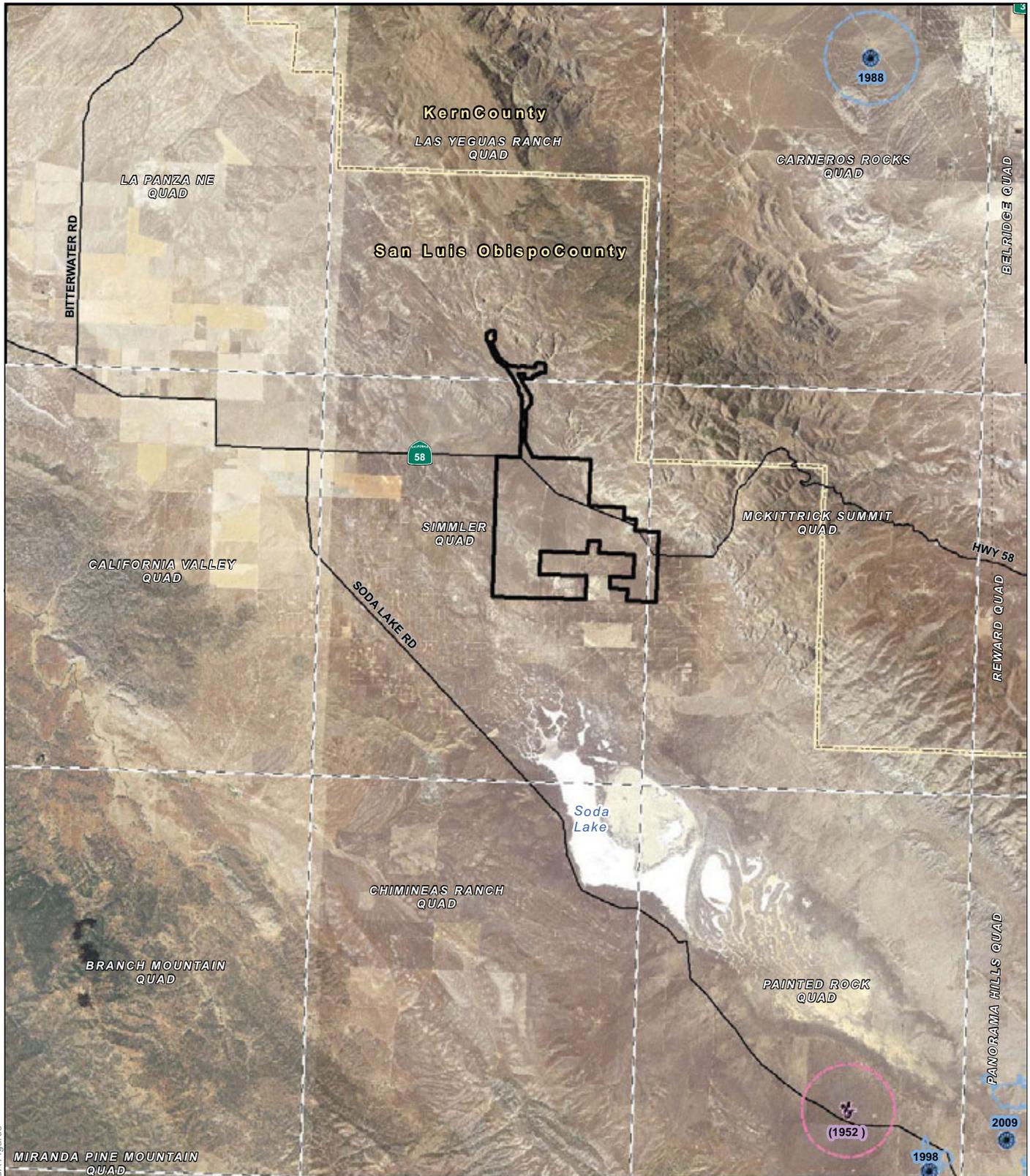


California Valley Solar Ranch
Biological Assessment
Figure 10: Small Mammal Trap Line Locations

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Data Sources: [1] San Luis Obispo County Geographic Information Systems (February 2000), [2] H.T. Harvey & Associates, [3] ESRI StreetMap USA (2006), [4] 1ft Natural Color SunPower Aerial (2009)



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Legend

CNDDB 06-2010

-  California jewel-flower
-  San Joaquin woollythreads
-  County Boundary
-  7.5 Quad Index
-  Biological Study Area Boundary

Data Sources: [1] California Natural Diversity Database (CNDDB, JUN 2010), [2] 1m Natural Color NAIP (2009),

Scale

1:190080

1 inch = 3 miles

0 3 Miles

0 10,000 20,000 Feet

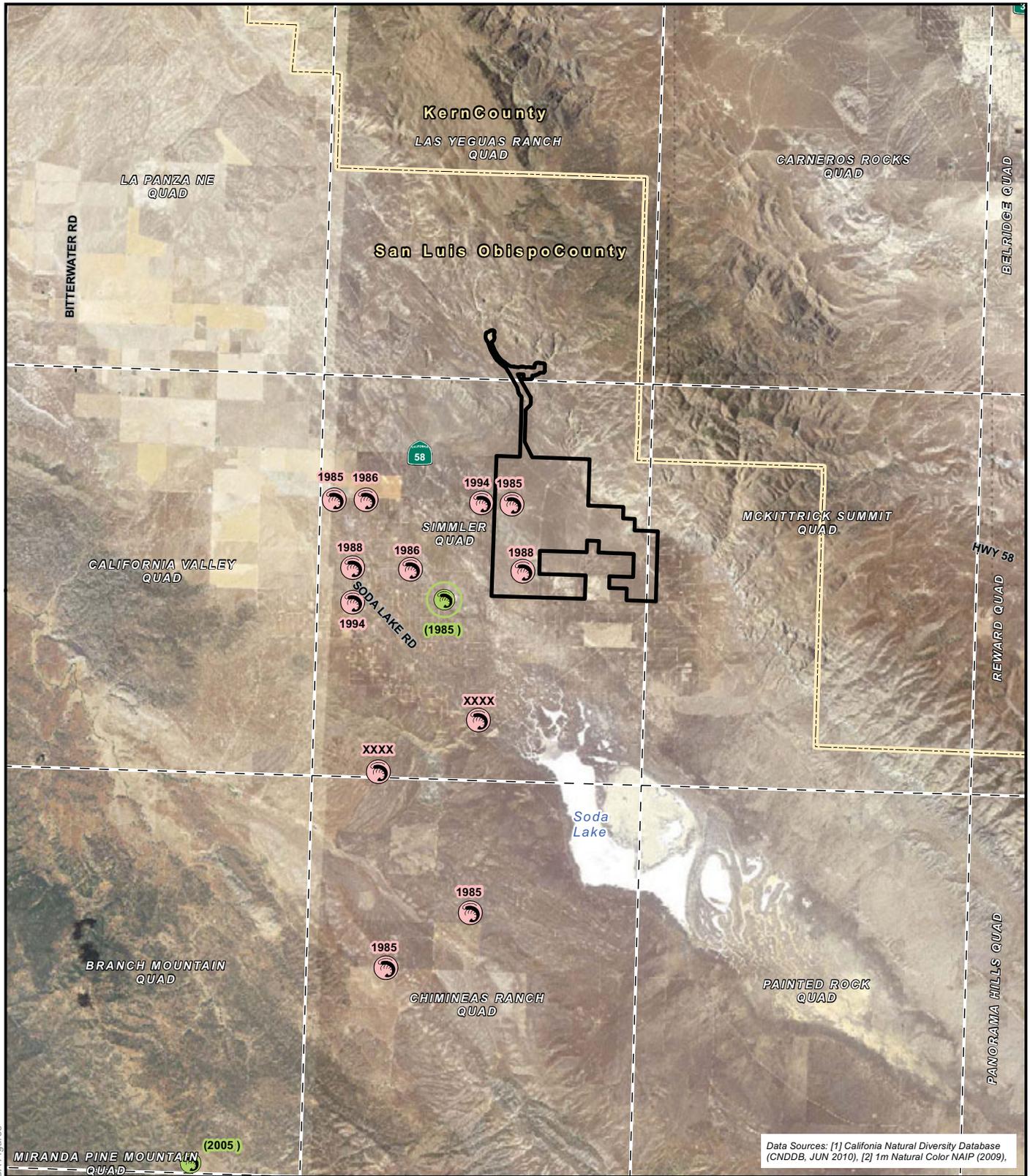
Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North

**California Valley Solar Ranch
Biological Assessment**

Figure 12: CNDDB Results for Special-Status Plants

HPR II





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Legend

CNDDB 06-2010

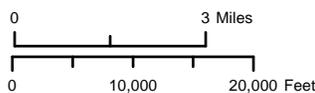
Invertebrates

-  vernal pool fairy shrimp
-  longhorn fairy shrimp
-  County Boundary
-  7.5 Quad Index
-  Biological Study Area Boundary

The long horn fairy shrimp is data sensitive and is not mapped; they occur somewhere within the quad(s) on which the symbol appears

Scale

1:190080
1 inch = 3 miles

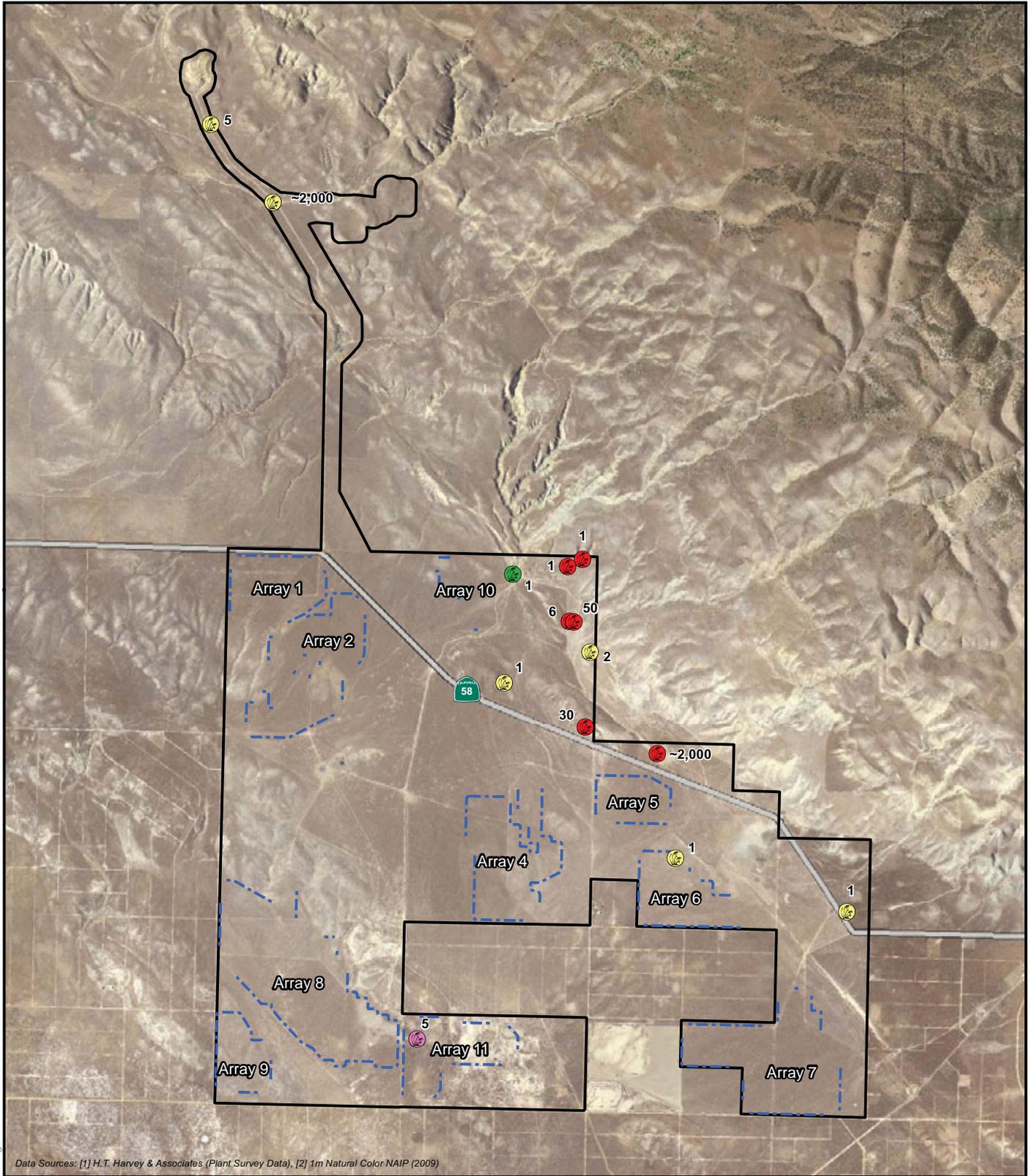


Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North

California Valley Solar Ranch
Biological Assessment
Figure 13: CNDDB Results for Invertebrates

HPR II





Data Sources: [1] H.T. Harvey & Associates (Plant Survey Data), [2] 1m Natural Color NAIP (2009)

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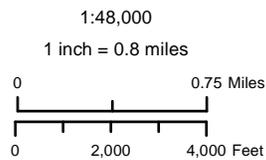
Legend

Camissonia Locations with # of Plants

- *Camissonia boothii*
- *Camissonia campestris ssp. campestris*
- *Camissonia gracilliflora*
- *Camissonia hirtella*

- Biological Study Area Boundary
- Solar Panel Arrays

Scale



Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North

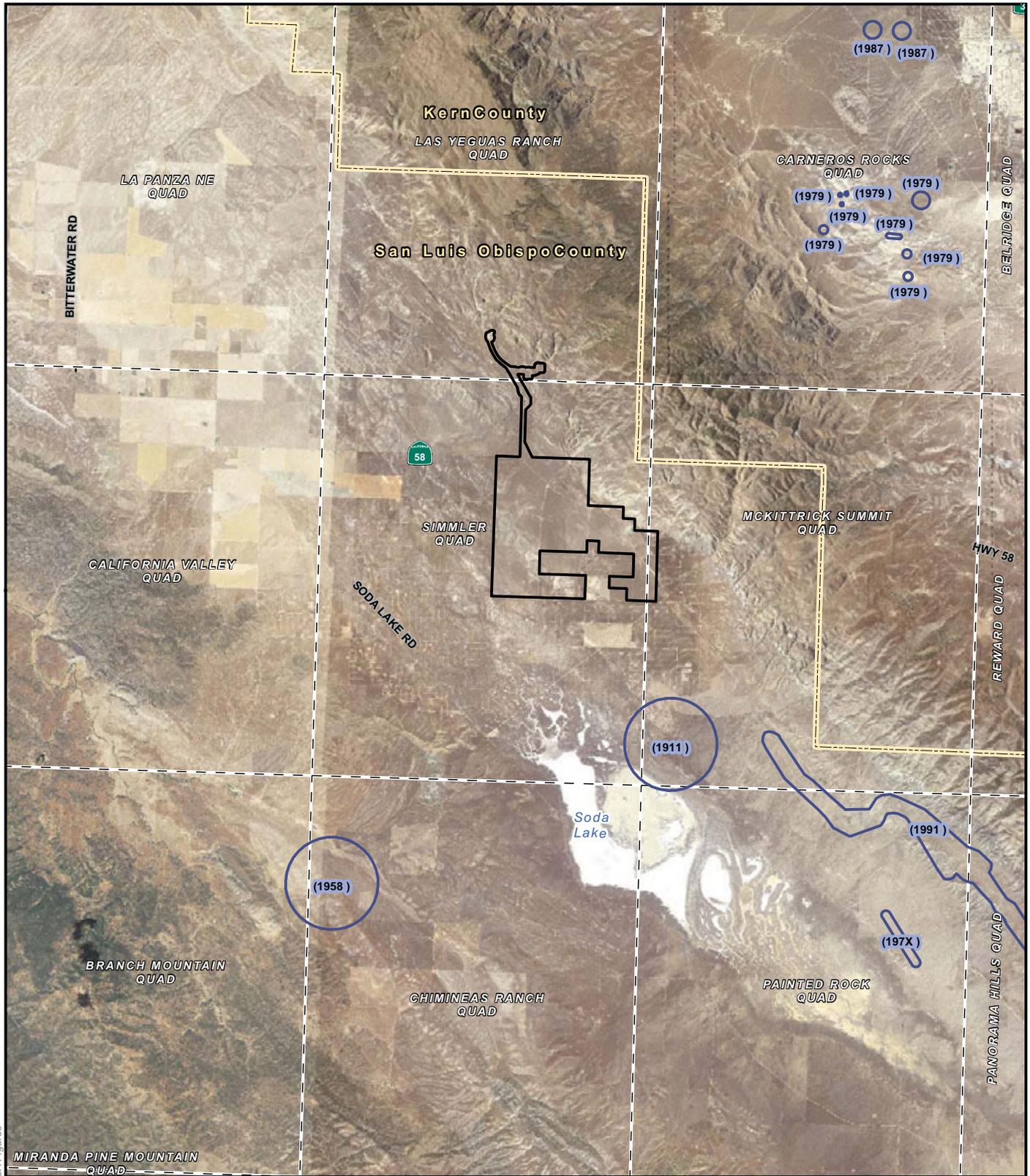
California Valley Solar Ranch

Biological Assessment

Figure 15: Kern Primrose Sphinx Moth Larval Hostplant Locations

HPR II





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Legend

CNDDB 06-2010

blunt-nosed leopard lizard

County Boundary

7.5 Quad Index

Biological Study Area Boundary

Data Sources: [1] California Natural Diversity Database (CNDDB, JUN 2010), [2] 1m Natural Color NAIP (2009).

Scale

1:190080

1 inch = 3 miles

0 3 Miles

0 10,000 20,000 Feet

Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North

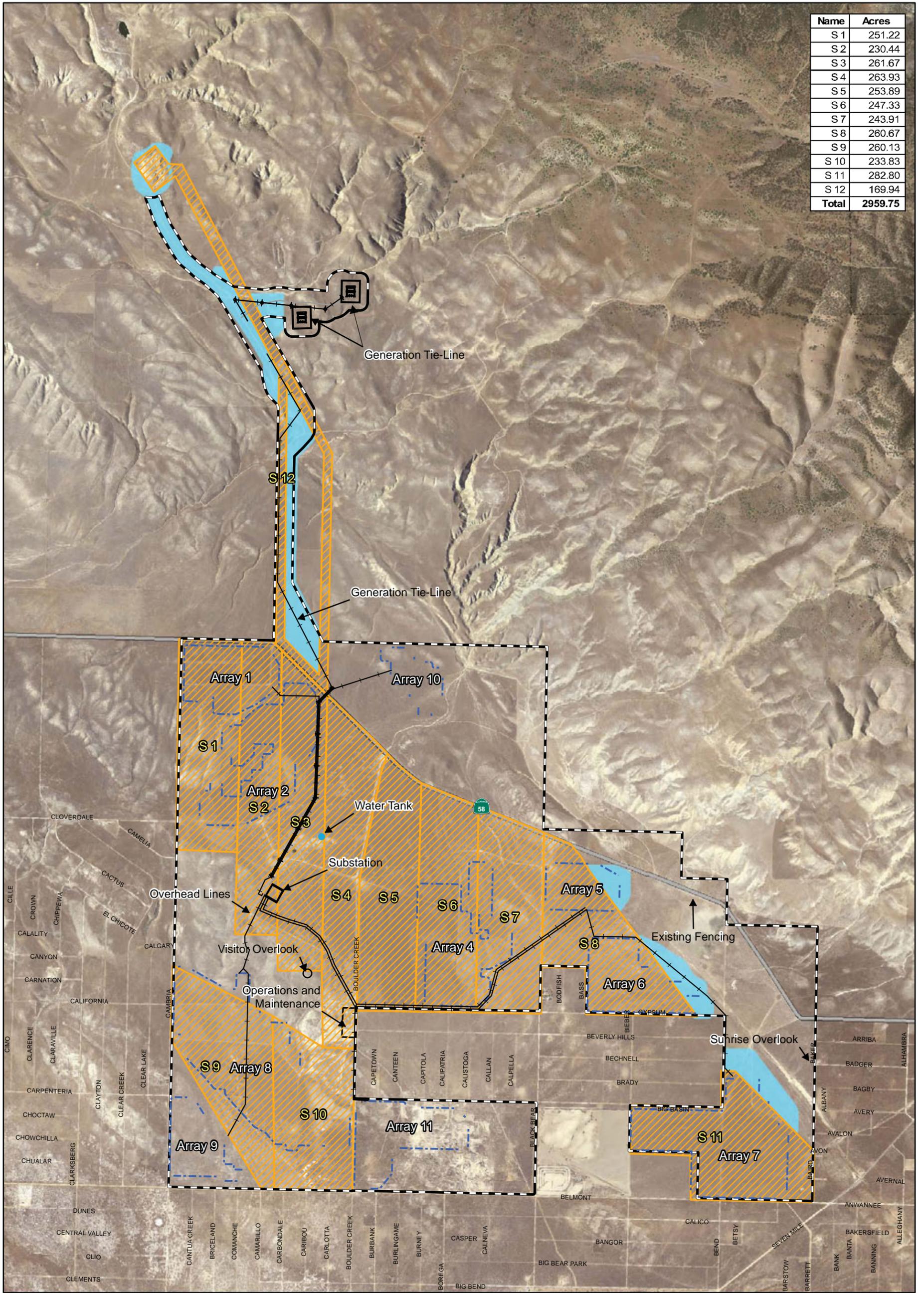
California Valley Solar Ranch
Biological Assessment

Figure 16: CNDDB Results for Blunt-nosed Leopard Lizard

HPR II

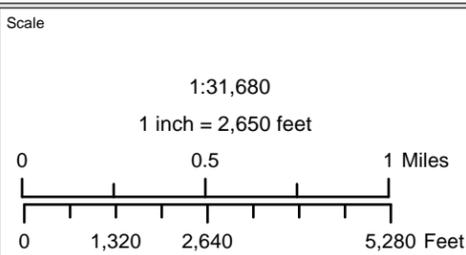
H.T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

Name	Acres
S 1	251.22
S 2	230.44
S 3	261.67
S 4	263.93
S 5	253.89
S 6	247.33
S 7	243.91
S 8	260.67
S 9	260.13
S 10	233.83
S 11	282.80
S 12	169.94
Total	2959.75



Legend

- Biological Study Area Boundary
- 2009 Protocol-level Survey Areas
- Solar Panel Arrays
- 2010 Protocol-level Survey Areas



California Valley Solar Ranch

Biological Assessment

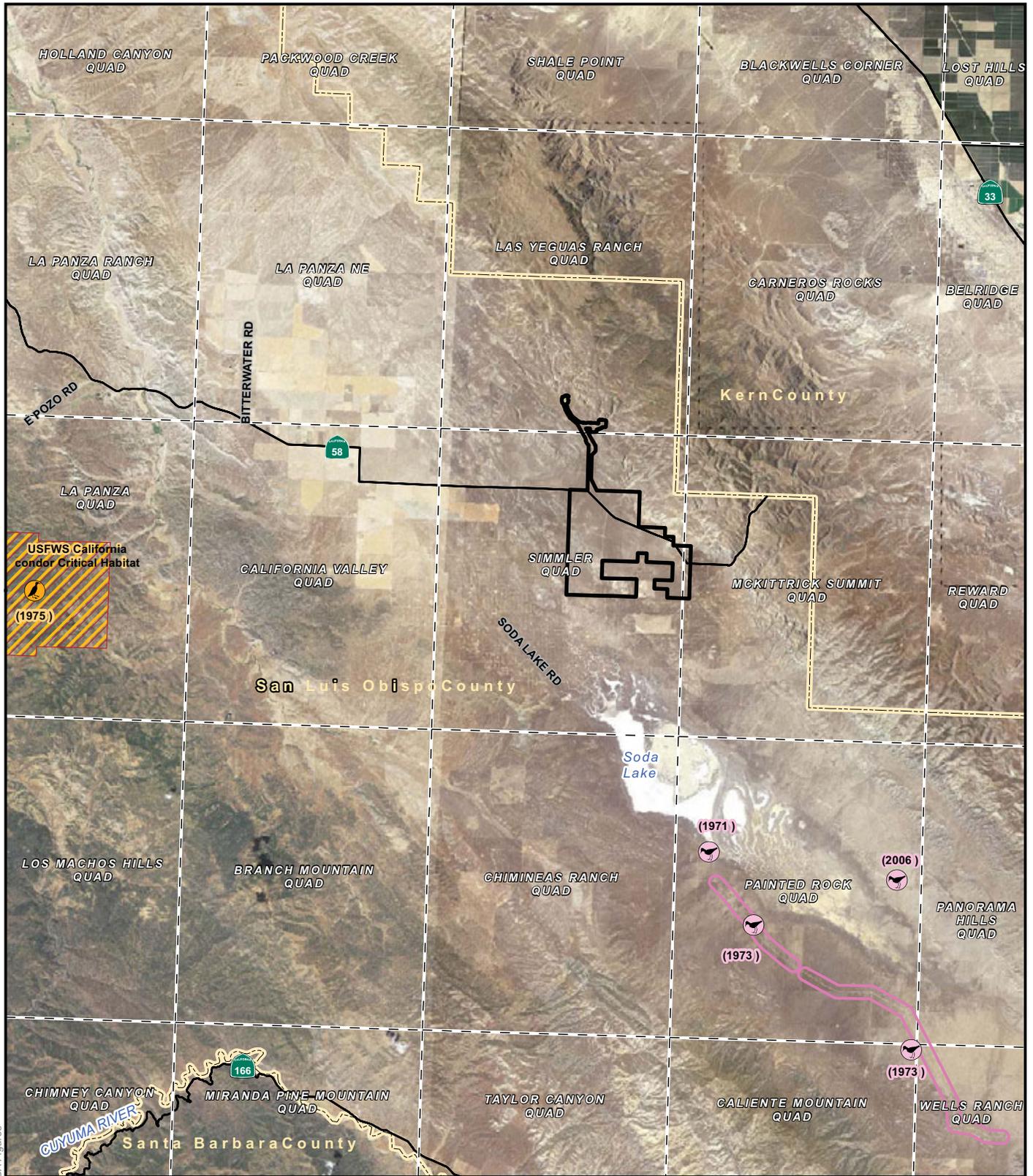
Figure 17: Blunt-nosed Leopard Lizard Field Survey Map

HPR II



Data Sources: [1] San Luis Obispo County Graphic Information Systems (February 2000), [2] ESRI StreetMap USA (2006), [3] 1ft Natural Color SunPower Aerial (2009)

Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North



Legend

CNDDB 06-2010

-  California condor
-  mountain plover
-  California condor USFWS Critical Habitat
-  County Boundary
-  7.5 Quad Index
-  Biological Study Area Boundary

Data Sources: [1] California Natural Diversity Database (CNDDB, JUN 2010), [2] 1m Natural Color NAIP (2009).

Scale

1:253440

1 inch = 4 miles

0 4 Miles

0 12,500 25,000 Feet

Coordinate System: North American Datum 83 Universal Trans Mercator (UTM) Zone 11 North

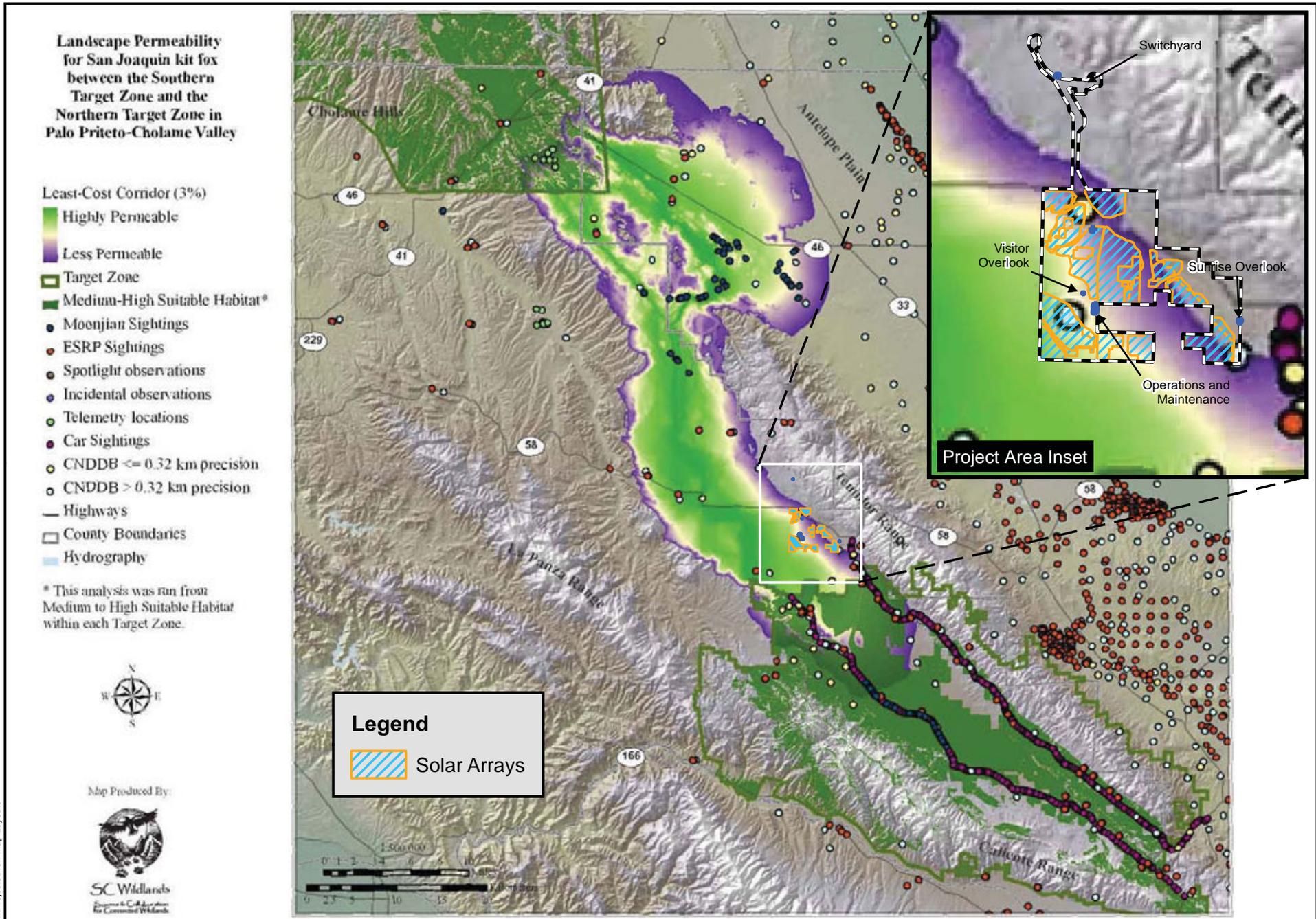
California Valley Solar Ranch

Biological Assessment

Figure 18: CNDDB Results for Birds

HPR II





N:\Projects\New Map Layouts

Figure 19. Location of the California Valley Solar Ranch with respect to identified San Joaquin Kit Fox movement corridor California Valley Solar Ranch Biological Assessment

APPENDIX A.
OTHER SPECIAL-STATUS SPECIES CONSIDERED FOR THE CALIFORNIA
VALLEY SOLAR RANCH PROJECT AREA

THREATENED, ENDANGERED, AND PROPOSED THREATENED OR ENDANGERED SPECIES

The following species were considered in determining effects on threatened, endangered, candidate, or proposed species from the proposed Project.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Federal or State Endangered Species			
California jewel-flower (<i>Caulanthus californicus</i>)	FE, SE, CNPS 1B.1	Chenopod scrub; valley and foothill grassland; pinyon-juniper woodland from approximately 200 to 6,562 ft elevation.	Low. Suitable grassland habitat is present on-site in the Annual Grassland, Wildflower Field, Inner Coast Range Saltbush Scrub, and Desert Sink Scrub vegetation communities. Recorded approximately 10 mi south of the Project site in 1952 (CNDDDB 2010). The reference population 10 mi south of the Project site and five mi south of Soda Lake was visited on April 16, 2009, and no plants were found. This species was not located on the CVSR site during rare plant surveys in 2009 and 2010. There is some potential for this species to occur on portions of the Project site that have not been surveyed (i.e., switchyard alternatives, Array 11) in the floristic period for this species.
San Joaquin woollythreads (<i>Monolopia congdonii</i>)	FE, CNPS 1B.2	Chenopod scrub; valley and foothill grassland; alkaline or loamy plains, sandy soils from 197 to 2,625 ft elevation.	Low. Suitable habitat is present on-site in Annual Grassland, Wildflower Field, Inner Coast Range Saltbush Scrub, and Desert Sink Scrub vegetation communities. Was recorded approximately 10 mi northeast of the Project site in 2008, as well as approximately 12 mi southeast of the site near the KCL Campground in 1988 (CNDDDB 2010, CCH 2009). This species was not located on the CVSR site during rare plant surveys in 2009 and 2010. There is some potential for this species to occur on portions of the Project site that have not been surveyed (i.e., switchyard alternatives, Array 11) in the floristic period for this species.
Kern mallow (<i>Eremalche kernensis</i>)	FE	Valley saltbush scrub communities on east side of Temblor Range.	Absent. Project site is outside the species' range; absent.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
<p>Longhorn fairy shrimp (<i>Branchinecta longiantenna</i>)</p>	<p>FE</p>	<p>Clear to turbid sandstone, grass or clay-bottomed vernal or seasonal pools</p>	<p>Low. The only features in the BSA that could potentially support suitable habitat are small seasonal wetlands in the southwestern portion of the Project site and a playa pool in the northeastern part of the site. During Project surveys in 2009, ponding was not observed in these features, and plant species typical of vernal pools occupied by this species in nearby areas are absent from the site. However, the wetlands in the southwestern part of the site ponded in 2010, and versatile fairy shrimp were present in these pools in February and March 2010, suggesting the possibility that suitable conditions for the longhorn fairy shrimp are present although they were not detected during surveys. The playa pool in the northeastern portion of the BSA may be too saline/alkaline to support this species, but this cannot be proven without direct water chemistry measurements or surveys for the species conducted in a non-drought year (this pool contained no water in February and March 2010).</p>
<p>Conservancy fairy shrimp (<i>Branchinecta conservatio</i>)</p>	<p>FE</p>	<p>Vernal pools, especially in the Central Valley.</p>	<p>Absent. Project site is outside the species' range; absent.</p>

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Blunt-nosed leopard lizard (<i>Gambelia sila</i>)	FE, SE, SP	Occurs in grassland, alkali sinks, and washes. Scattered shrubs (e.g., saltbush) often present.	Low. Habitat on-site is suitable for the species, though less than optimal due to the scarcity of shrubs. Blunt-nosed leopard lizards were not detected during extensive protocol surveys conducted in areas to be occupied by the proposed arrays and along the powerline alignment in 2009. Although drought has been shown to impede the detectability of this species, individuals were observed at a reference site at Elkhorn Plain Ecological Reserve, approximately 20 mi southeast of the site, during seven of nine site visits conducted during the protocol surveys on-site. Thus, conditions were suitable for detecting the species if present on-site. The negative results of on-site, protocol-level surveys coupled with positive results of surveys at a nearby reference site indicate that the species is absent from the portions of the Project site surveyed in 2009. Due to changes in the array alignment, new surveys are underway in 2010 to confirm absence in the altered Project footprint. To date, no individuals have been detected.
California condor (<i>Gymnogyps californianus</i>)	FE, SE	Requires vast expanses of open savannahs, grasslands, and foothill chaparral in mountain ranges of moderate altitude. Nests in clefts of rocky walls of deep canyons. Can forage up to 100 mi from roosts and nests.	Low. Though not recently observed in the vicinity of the Project site, the Carrizo Valley is part of the former range of the California condor before the remaining population was captured for the captive breeding program. There is a low potential for foraging on carcasses of cattle, pronghorn, or elk on the Project site. The site is within 13 mi of California condor critical habitat and a former captive condor release site.
Bald eagle (<i>Haliaeetus leucocephalus</i>)	SE, SP	Requires large bodies of water, or free-flowing rivers with abundant fish and adjacent snags and large trees for perching and nesting.	Low. Though wintering bald eagles have occasionally been observed in the Project vicinity and could potentially occur on the Project Site, their presence there is expected to be incidental at most. Nesting habitat and habitats that would attract bald eagles for prolonged periods are absent from the Project site.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
American peregrine falcon (<i>Falco peregrinus</i>)	SE, SP	Nests primarily on cliffs, forages over open habitats.	Low. Migrants may occasionally occur on the Project site, however, nesting habitat and habitats that would attract peregrine falcons for prolonged periods are absent from the Project site.
Giant kangaroo rat (<i>Dipodomys ingens</i>)	FE, SE	Annual grasslands on the western side of San Joaquin Valley. Alkali scrub provides marginal habitat. Requires level terrain and sandy loam soils for burrowing.	Present. Annual Grassland areas on-site provide suitable habitat, especially in areas with <11% slope. Of 5,346 acres surveyed in 2010, 426 acres were occupied by the species, with an estimate of 1,784 individuals.
Tipton kangaroo rat (<i>Dipodomys nitratooides nitratooides</i>)	FE, SE	Alkaline shrub and annual grassland communities on the San Joaquin Valley Floor.	Absent. The site is outside the range of this subspecies. Two CNDDDB records from the vicinity of the Project site likely pertain to the short-nosed kangaroo rat, the subspecies that is known to occur in the Carrizo Plain.
Buena Vista Lake shrew (<i>Sorex ornatus relictus</i>)	FE	Wetlands in the southern San Joaquin Valley.	Absent. Project site is outside the species' range, suitable habitat is absent from the Project site; absent.
San Joaquin kit fox (<i>Vulpes macrotis mutica</i>)	FE, ST	Annual grasslands or grassy open stages with scattered shrubby vegetation. Require loose-textured sandy soils for burrowing, and suitable prey base. Pups born in dens excavated in open, level areas with loose-textured soils.	Present. Suitable den and foraging habitat present throughout most of the study area, and the species was detected in most areas surveyed (see Figure 8). Surveys in 2008 detected a number of potential dens, and five natal dens, including three where pups were observed, were found on-site in 2009. Thus, at least 6 resident adults were using the portion of the site south of SR 58 in 2009. San Joaquin kit fox are also present north of SR 58.
Federal or State Threatened or Candidate Species			
Parish's sidalcea (<i>Sidalcea hickmanii</i> ssp. <i>parishii</i>)	FC	Chaparral and open coniferous forest.	Absent. No suitable habitat on Project site, and no populations known from nearby areas; absent.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Vernal pool fairy shrimp (<i>Branchinecta lynchi</i>)	FT	Clear to turbid sandstone, grass or clay-bottomed vernal or seasonal pools	Low. The only features in the BSA that could potentially support suitable habitat are small seasonal wetlands in the southwestern portion of the Project site and a playa pool in the northeastern part of the site. During Project surveys in 2009, ponding was not observed in these features, and plant species typical of vernal pools occupied by this species in nearby areas are absent from the site. However, the wetlands in the southwestern part of the site ponded in 2010, and versatile fairy shrimp were present in these pools in February and March 2010, suggesting the possibility that suitable conditions for the longhorn fairy shrimp are present although they were not detected during surveys. The playa pool in the northeastern portion of the BSA may be too saline/alkaline to support this species, but this cannot be proven without direct water chemistry measurements or surveys for the species conducted in a non-drought year (this pool contained no water in February and March 2010).
Kern primrose sphinx moth (<i>Euroserpinus euterpe</i>)	FT	Presence of <i>Camissonia</i> spp. sandy washes with sandy alluvial soil	Moderate. Grassland and sandy washes provide potentially suitable habitat. Proximity to the Carrizo Plain National Monument where known sites exist and the presence of evening primrose, the species' larval host plant, suggest that the species could potentially be present. No evening primrose plants were identified during floristic surveys on the Project in the spring of 2009; however, the species was located in low densities in spring of 2010. Specimens were located in 14 locations, 12 of which are to the north of SR 58, in the northeastern section of the BSA and in two areas west of the Twisselman Quarry access road, outside the Project's impact areas. Only six individuals were detected south of SR 58, in proposed Array 6 and Array 11. No surveys have been conducted for the Kern primrose sphinx moth itself. Therefore, there is some potential for the species to breed and forage on the site.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Valley elderberry longhorn beetle (<i>Desmocerus californicus dimorphus</i>)	FT	Riparian habitats providing elderberry (<i>Sambucus</i>) shrubs.	Absent. Project site is outside the species' range; absent.
Delta smelt (<i>Hypomesus transpacificus</i>)	FT, ST	Brackish-water areas in the Sacramento – San Joaquin River delta.	Absent. Project site is outside the species' range; absent.
California red-legged frog (<i>Rana draytonii</i>)	ST, CSSC	Streams, freshwater pools, and ponds with emergent or overhanging vegetation.	Absent. Project site is outside the species' range; absent.
California tiger salamander (<i>Ambystoma californiense</i>)	FT, SC, CSSC	Vernal or temporary pools in annual grasslands or open woodlands.	Absent. Project site is outside the species' range; absent.
Giant garter snake (<i>Thamnophis gigas</i>)	FT, ST	Wetlands, marshes, sloughs, and canals in the Central Valley.	Absent. Project site is outside the species' range and lacks suitable habitat; absent.
Mountain plover (<i>Charadrius montanus</i>)	FC, CSSC	Winters in Central California in sparse, and/or short grasslands and plowed fields. Breeds in short-grass prairies outside of California.	Present. Has been observed on the Project site and its immediate vicinity. The open areas of the site are suitable foraging habitat for wintering or migrating birds, especially when vegetation heights are low.
Swainson's hawk (<i>Buteo swainsoni</i>)	ST	Nests in trees near foraging areas that include agricultural croplands, especially alfalfa and pastures, and grasslands.	Low. The Carrizo Plain is outside the current nesting range of this species. Has been observed there during migration, though that is expected to be a rare event.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
San Joaquin antelope squirrel (<i>Ammospermophilus nelsoni</i>)	ST	Dry, sparsely vegetated loam soils in western San Joaquin Valley from 200 to 1,200 ft elevation. Prefers widely scattered shrubs, forbs and grasses in broken terrain with gullies and washes although may be found in sparsely-vegetated habitat with giant kangaroo rat burrows.	Present. No San Joaquin antelope ground squirrels were trapped during small mammal trapping in July 2008. However, this species was recorded just outside the Project site in 1976, and on July 15, 2008, a vocalization was detected on the Project site north of SR 58 by B. Stafford of CDFG. In the southeastern portion of the Project site in 2009, URS biologists observed two on July 29 and August 31; B. Boroski and B. Parker observed one on October 12; and R. Burton and D. Newman observed at least two on November 22. On December 17, R. Burton observed an individual north of SR 58 approximately 0.25 mi. west of the Bend Rd alignment. Areas with low shrub cover and the presence of appropriately sized and arranged burrow entrances in areas where there is suitable vegetation were considered evidence of potentially occupied habitat. Of 4,692 acres surveyed by H. T. Harvey & Associates for sign of SJAS in 2009, 334 acres contained evidence of SJAS occupancy. Of the area that contained evidence of SJAS, 65% (217 acres) occurred north of SR 58.

***SPECIAL-STATUS SPECIES CODE DESIGNATIONS**

- FE = Federally listed Endangered
- FT = Federally listed Threatened
- FC = Federal Candidate for Listing
- SE = State-listed Endangered
- ST = State-listed Threatened
- SC = State Candidate for Listing
- CSSC = California Species of Special Concern
- CNPS 1B = Plants Rare, Threatened, or Endangered in California and Elsewhere
- SP = State fully protected

** "Site" refers collectively to the Solar Generation Facility, generation tie-line, Twisselman Quarry, and potential switching station locations

CALIFORNIA SPECIES OF SPECIAL CONCERN AND CNPS SPECIES

The following species were also considered in determining effects of the Project on special-status species.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
California Species of Special Concern			
Western spadefoot (<i>Spea hammondi</i>)	CSSC	Occurs in grasslands and occasionally hardwood woodlands, washes, floodplains, and playas. Primarily occurs in lowlands, but also in foothills and mountains. Vernal pools or similar ephemeral pools required for breeding.	Moderate. Seasonal wetlands in the southwestern portion of the Project site and a seep within the transmission corridor could potentially provide breeding habitat, at least in very wet years. However, ponding has not been observed in the wetlands in the southwestern part of the site, and data are lacking on whether the hydroperiod in any of these features is sufficiently long to enable larvae to complete metamorphosis.
Southern Pacific pond turtle (<i>Actinemys marmorata pallida</i>)	CSSC	Occurs in and around a wide variety of permanent or nearly permanent aquatic habitats.	Absent. Suitable aquatic habitat is absent from the Project site and its vicinity.
Silvery legless lizard (<i>Anniella pulchra pulchra</i>)	CSSC	Requires sandy or loose loamy soils covered by sparse vegetation.	Low. The potential for the silvery legless lizard to occur within most of the Project site is very low. However, a strip of tamarisk scrub habitat that occurs along a drainage that bisects the proposed transmission line corridor may contain enough soil moisture and soil friability to potentially support the species.
San Joaquin coachwhip (<i>Masticophis flagellum ruddocki</i>)	CSSC	Occurs in valley grasslands and saltbush scrub habitats in open, dry areas with few or no trees.	Present. Suitable habitat exists on the Project site, and this species was detected in 2009 during surveys conducted for the blunt-nosed leopard lizard; however they were not detected during surveys conducted in 2010.
Coast horned lizard (<i>Phrynosoma blainvillii</i>)	CSSC	Inhabits areas of loose sandy loam and alkaline soils in habitats including chaparral, grasslands, saltbush scrub, coastal scrub, and clearings in riparian woodlands.	Present. Suitable habitat exists on the Project site, and this species was detected in 2009 and 2010 during surveys conducted for the blunt-nosed leopard lizard.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Two-striped garter snake (<i>Thamnophis hammondi</i>)	CSSC	Occurs primarily in stream and riparian habitats but also found in freshwater marsh, coastal sage scrub, chaparral, oak woodland, and grassland habitats.	Absent. The Project site is within the range of two-striped garter snakes, but no high-quality habitat is present on or near the site. Streams in the hills west of the site may support the species. However, to reach the site from these areas would require overland movements approaching 10 mi across arid, inhospitable habitat, and such movements are not expected. No individuals have been recorded on the site during intensive surveys for blunt-nosed leopard lizards in 2009 and 2010. Thus, this species is not expected to occur on the Project site.
Northern harrier (<i>Circus cyaneus</i>)	CSSC	Nests on ground in tall grass or shrubby vegetation usually near wet meadow and grassland habitats.	Present. Northern harriers have been observed foraging within the Project site and potential foraging habitat is found throughout the site. However, this species is unlikely to nest there due to lack dense tall grass.
Lesser sandhill crane (<i>Grus canadensis Canadensis</i>)	CSSC	Forages mainly in agricultural (pastures, grain, corn and alfalfa) and short grassland habitats. Roosts in shallow water.	Low. The grassland habitats on the site are too dry to provide optimal foraging habitat. Though lesser sandhill cranes wintering in the Carrizo Valley could potentially forage on grassland habitats on the Project site, their occurrence there would likely be incidental at best.
Burrowing owl (<i>Athene cunicularia</i>)	CSSC	Open grasslands with mammal burrows.	Present. Suitable habitat is present throughout the Project site. Several burrowing owls have been observed throughout the Project site and at least 4 pairs were observed nesting there in 2009.
Long-eared owl (<i>Asio otus</i>)	CSSC	Nest in conifer, oak, riparian, pinon-juniper and desert woodlands that are open or are adjacent to grasslands, meadows, or shrublands.	Present One was observed in a stand of salt cedar in the proposed transmission line corridor. Though this bird was not relocated, there is potential nesting habitat in the salt cedar there and long-eared owls are known to nest in the Project area. The entire Project site is suitable foraging habitat.
Short-eared owl (<i>Asio flammeus</i>)	CSSC	Breeds in marshes, moist grasslands or fallow fields. Forages in the same habitats but may also forage in agricultural fields and dry grasslands.	Moderate. Potential foraging habitat is found throughout the Project site, and short-eared owls are known to be present in the Carrizo Valley year-round. However, this species is unlikely to nest there due to lack of dense, tall grass.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Loggerhead shrike (<i>Lanius ludovicianus</i>)	CSSC	Nests in bushes or trees surrounded by open grassland or ruderal habitats.	Present. Observed nesting in the proposed generation tie-line corridor within the Project site. Suitable nesting habitat occurs in areas of saltbush, salt cedar, and Russian thistle. May forage throughout the Project site.
Le Conte's thrasher (<i>Toxostoma lecontei</i>)	CSSC (San Joaquin Valley Population)	Occurs in saltbush habitats with gentle to rolling, well drained slopes in the vicinity of dry washes. Requires patches of bare ground and well developed litter layer surrounding shrubs.	Low. There is potential habitat in areas of the Project north of SR 58 and outside of the arrays in dominated by saltbush scrub in the vicinity of dry washes. The saltbush scrub in the proposed generation tie-line corridor is less suitable since it lacks sandy washes.
Oregon vesper sparrow (<i>Pooecetes gramineus affinis</i>)	CSSC	Occurs in open areas with low-growing grasslands or annuals, stubble fields, meadows and road edges.	Present. There is suitable wintering habitat for vesper sparrow throughout the Project site and the Carrizo Valley.
Grasshopper sparrow (<i>Ammodramus savannarum</i>)	CSSC	Can occur in a variety of grassland habitats, but generally prefers short to middle-height, moderately open grasslands with scattered shrubs.	Present. One was observed singing in the proposed transmission line corridor. The grasslands of the majority of the Project site are too sparse to be optimal habitat for this species.
Tricolored blackbird (<i>Agelaius tricolor</i>)	CSSC	Breeds in extensive stands of tall, dense, emergent herbaceous vegetation. Forages in a variety of grassland and agricultural habitats.	Present. Observed foraging on the site. Emergent wetland or other dense vegetation suitable for nesting is not present on, or in the vicinity of, the Project site.
Short-nosed kangaroo rat (<i>Dipodomys nitratoides brevinasus</i>)	CSSC	Grasslands with scattered shrubs. Inhabit highly saline soils around Soda Lake on the Carrizo Plain.	Low. Although no short-nosed kangaroo rats were captured during the small mammal trapping survey in July 2008, the species has been recorded just outside the Project site (USFWS 1998). Potentially suitable habitat occurs on the Project site, and the species may be present.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Pallid bat (<i>Antrozous pallidus</i>)	CSSC	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures, very sensitive to disturbance of roosting sites.	Present. Two pallid bats were observed flying over the Project site during San Joaquin kit fox spotlight surveys on June 10–11, 2009. Suitable foraging habitat occurs throughout the site. Potential roosting habitat may occur on the Project site in abandoned buildings, though such roost sites are very limited on the site.
Tulare grasshopper mouse (<i>Onychomys torridus tularensis</i>)	CSSC	Hot, arid valleys and scrub deserts in the southern San Joaquin valley. Requires an abundant supply of insects. Sandy and gravelly soils with presence of abundant arthropods are preferred.	Low. Suitable habitat is present on-site, but species has not been recorded in the area in over 50 years. No Tulare grasshopper mice were captured during small mammal trapping surveys. Low potential for occurrence on the Project site.
American badger (<i>Taxidea taxus</i>)	CSSC	Open, dry habitats, especially grasslands but also including scrub and woodland habitats, with friable soils. Needs sufficient food (preys on burrowing rodents) and uncultivated ground for denning.	Present. Appropriate foraging habitat and abundant prey in the form of California ground squirrels and kangaroo rats present throughout the Project site. Potentially suitable burrowing habitat present throughout most of the study area, and a badger was observed near a potential badger den just south of SR 58 and east of proposed Array 1 (see Figure 8-3). Two observations of badgers on site and three more within 0.5 mi to west of site, in 2009. A den was detected in the potential switchyard/tie-line alternative locations, east of the Twisselman Quarry access road, in 2010.
CNPS Species			
California androsace (<i>Androsace elongata</i> ssp. <i>acuta</i>)	CNPS 4.2	Found in dry, grassy slopes in chaparral, cismontane woodland, coastal scrub, and valley and foothill grassland habitats at elevations from 492 to 3,937 ft.	Present. <i>Androsace elongata</i> was observed within the potential tie-line/switchyard portion of the BSA, and a population was also located to the northwest of the northern extent of the BSA. Suitable habitat is present on-site in the Annual Grassland and Wildflower Field vegetation communities. Specimens collected near the Project site (“35 mi east of Paso Robles”, and “13 mi from McKittrick...toward Simmler” within the Carrizo Plain and the Temblor Range) by W. L. Jepson and P. A. Munz (CCH 2009).

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Oval-leaved snapdragon (<i>Antirrhinum ovatum</i>)	CNPS 4.2	Found in chaparral; cismontane woodland (i.e., pygmy oak woodland); pinyon-juniper woodland; valley and foothill grassland; heavy adobe clay soil breaking into blocks as it dries on very gentle stable slopes from 656 to 3,281 ft elevation.	Low. Suitable habitat is present on-site in the Annual Grassland and Wildflower Field vegetation communities; however, it was not located during rare plant surveys in 2009 and 2010. Suitable soil is rare on the main portion of the Project site. Six plants were recorded in 1954 at a gypsum mine in the northeast region of the Project site north of SR 58 in the foothills, but it is unknown whether this occurrence is extant.
Salinas milk-vetch (<i>Astragalus macrodon</i>)	CNPS 4.3	Openings in chaparral; cismontane woodland or valley and foothill grassland; sandstone, shale or serpentine soils from 820 to 3,117 ft elevation.	Low. Suitable habitat is present on-site in the Annual Grassland and Wildflower Field vegetation communities; and suitable soil is present on the Project site. However, this species was not located in rare plant surveys in 2009 and 2010. Occurrences have been noted as recently as 2009 in the Carrizo Plains National Monument, the Carrizo Plains Preserve, north of SR 58 off of Bitterwater road, and the Chimineas Unit of the Carrizo Plain Ecological Reserve, located along the western edge of the Plain (CalFlora 2009). Low potential for occurrence on the Project site.
Heartscale (<i>Atriplex cordulata</i>)	CNPS 1B.2	Chenopod scrub; valley and foothill grassland; meadows; alkaline flat and scalds in the central valley; sandy soils from 3 to 1,230 ft elevation.	Low. Suitable habitat is present on-site in Annual Grassland, Wildflower Field, Desert Sink Scrub, Interior Coast Range Saltbush Scrub and Alkaline Seasonal Wetland-Wildflower Field Complex vegetation communities. However, this species was not located in rare plant surveys in 2009 and 2010. While the Project site is outside the published elevation range for the species, an occurrence of this species is reported in the CNDDDB (recorded in 1956 approximately 2 mi southwest of the Project site); that occurrence was undoubtedly at an elevation similar to that on the site. Both CNDDDB (2010) and CNPS (2009) list this occurrence as extant. The location of this occurrence was visited on April 16, 2009, and no plants were found.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Crownscale (<i>Atriplex coronata</i> var. <i>coronata</i>)	CNPS 4.2	Found in strongly alkaline, open soils in chenopod scrub, valley and foothill grassland, and vernal pools from 3 to 1,950 ft elevation.	Present. This species was located in the alkaline sink just south of Hwy 58 in the northeast, and in the southwest portion of the BSA. Suitable habitat is present on-site in alkaline areas of Annual Grassland, Wildflower Field, Desert Sink Scrub, and particularly, the Alkaline Seasonal Wetland-Wildflower Field Complex communities. Populations have been found in the Carrizo Plain within the Simmler quad in which the majority of the Project site is located, as well as the neighboring Painted Rock and California Valley quads (Calflora 2009).
Lost hills crownscale (<i>Atriplex vallicola</i>)	CNPS 1B.2	Chenopod scrub; valley and foothill grassland; and vernal pools; in powdery, alkaline soils that are vernal moist with <i>Frankenia</i> spp., <i>Atriplex</i> spp., and <i>Distichlis</i> spp. from 164 to 2,083 ft elevation.	Low. Marginally suitable habitat is present on-site. This species was not recorded during 2009 and 2010 rare plant surveys. Recorded in 1984 approximately 1.25 mi south of the Project site (CNDDDB 2010). Plants were observed at the reference populations south of the study site just south of the BSA during a visit on July 6, 2010.
Round-leaved filaree (<i>California macrophylla</i>)	CNPS 1B.1	Found in clay soils in valley and foothill grassland or open cismontane woodland habitats at elevations from 49 to 3,937 ft.	Low. Marginally suitable habitat is present on-site in the Annual Grassland and Wildflower Field vegetation communities; however, inclusions of heavy clays are not located on rolling hills on-site as favored by this species. This species was not observed in rare plant surveys in the BSA in 2009 or 2010. Occurrences have been recorded from hills within the neighboring Chimineas Ranch and La Panza NE quads (CNDDDB 2010).
La Panza mariposa (<i>Calochortus simulans</i>)	CNPS 1B.3	Chaparral; cismontane woodland; lower montane coniferous forest; valley and foothill grassland; sandy, often granitic, sometimes serpentinitic substrate from 1,296 to 3,609 ft elevation.	Low. Suitable grassland habitat is present on-site in the Annual Grassland and Wildflower Field vegetation communities. This species was not observed in rare plant surveys in the BSA in 2009 or 2010. The nearest occurrence to the Project site is documented as being in the La Panza NE quad northwest of the Project site's Simmler quad, with the exact location and date unknown (CNDDDB 2010). Low potential for occurrence on the Project site.

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Lemmon's jewel-flower (<i>Caulanthus coulteri</i> var. <i>lemmonii</i>)	CNPS 1B.2	Pinyon-juniper woodland; valley and foothill grassland; prefers steep west-facing slopes from 262 to 4,003 ft elevation.	Low. Suitable habitat is present in the northernmost margins of the Project site in Annual Grassland and Wildflower Field vegetation communities where the slopes are steepest and elevation is greatest. However, this species was not observed in rare plant surveys in the BSA in 2009 or 2010. Recorded approximately 1.75 mi east of the Project site in 1962 and 4 mi east of the Project site in 1990 (CNDDDB 2010).
Gypsum-loving larkspur (<i>Delphinium gypsophilum</i> ssp. <i>gypsophilum</i>)	CNPS 4.2	Found in chenopod scrub, cismontane woodland, and valley and foothill grassland habitats from 328 to 2,707 ft elevation.	Present. This species was located in the northeast portion of the BSA, north of SR 58. Suitable habitat is present on-site in alkaline areas of Annual Grassland, Wildflower Field, Desert Sink Scrub, and particularly, the Alkaline Seasonal Wetland-Wildflower Field Complex communities, as well as within the gypsum mine. Populations have also been found in the Carrizo Plain west of Soda Lake, in the Chimineas Unit of the Carrizo Plains Ecological Reserve, and west of McKittrick (Calflora 2009).
Recurved larkspur (<i>Delphinium recurvatum</i>)	CNPS 1B.2	Chenopod scrub; valley and foothill grassland; cismontane woodland on alkaline soils; often in valley saltbush from 10 to 2,461 ft elevation.	Present. This species was located in the northeast portion of the BSA, north of SR 58. Suitable habitat is present on-site in the Annual Grassland, Wildflower Field, Desert Sink Scrub, and Interior Coast Range Saltbush Scrub vegetation communities. Recorded in 1962 approximately 0.25 mi west of the Project site (CNDDDB 2010). The reference populations south of the study site were visited on April 16, 2009, and a number of plants were found.
Hoover's eriastrum (<i>Eriastrum hooveri</i>)	CNPS 4.2	Chenopod scrub; valley and foothill grassland; pinyon and juniper woodland; sparsely vegetated alkaline alluvial fans from 164 to 3,002 ft elevation.	Low. Suitable habitat is present on-site near drainages in the Annual Grassland, Wildflower Field, Desert Sink Scrub, and Inner Coast Range Saltbush Scrub vegetation communities. However, this species was not observed in rare plant surveys in 2009 and 2010. Recorded in 1971 approximately 8 mi north of the Project site in alluvium atriplex scrub (CNDDDB 2010), and in 1995 in the Carrizo Plain at a similar distance south of the site (CalFlora 2009).

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Cottony buckwheat (<i>Eriogonum gossypinum</i>)	CNPS 4.2	Clay soils, particularly clay-based hills (Hickman 1993) in chenopod scrub and valley and foothill grassland at elevations from 328 to 1,815 ft.	Low. Suitable habitat is present on-site in the Desert Sink Scrub, Wildflower Field, and Annual Grassland vegetation communities; however, suitable clay soils do not intersect with the appropriately hilly portions of the site and this species was not observed in rare plant surveys in 2009 and 2010. Occurrences have been recorded in the Carrizo Plain National Monument and in the Temblor Range (CalFlora 2009). Low potential for occurrence on the Project site.
Temblor buckwheat (<i>Eriogonum temblorense</i>)	CNPS 1B.2	Valley and foothill grassland; barren clay or sandstone outcrops (Hickman 1993) from 984 to 3,281 ft elevation.	Low. Marginally suitable habitat is present on-site in Annual Grassland and Wildflower Field vegetation communities, but no sandstone outcrops or suitably bare clay grassland areas exist on-site. This species was not observed in rare plant surveys in 2009 and 2010. The species was reported in 1971, 7 mi northeast of the Project site (CNDDDB 2010).
Diamond-petaled California poppy (<i>Eschscholzia rhombipetala</i>)	CNPS 1B.1	Valley and foothill grassland; alkaline, clay slopes and flats from 0 to 3,199 ft elevation.	Low. Suitable habitat is present on-site in the Annual Grassland, Wildflower Field, and Alkaline Seasonal Wetland-Wildflower Field Complex vegetation communities where soil conditions are appropriately alkaline or clay-based, however this species was not observed in rare plant surveys in 2009 and 2010. Recorded approximately 4 mi north of the Project site in 1986 (CNDDDB 2010).

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Ferris' goldfields (<i>Lasthenia ferrisiae</i>)	CNPS 4.2	Occurs in central and northern California in alkaline, clayey vernal pools and clay-based alkaline sinks at elevations of 66 to 2,297 ft.	Present. This species was observed in the southwestern and eastern portions of the BSA in 2010. Suitable habitat is present on-site in the Desert Sink Scrub and Alkaline Seasonal Wetland-Wildflower Field Complex vegetation communities, and although suitable soils on-site are rare, clay soils are located in these habitat types. This species has been reported as recently as 2008 (among such species as spiny saltbush, <i>Atriplex spinifera</i> , which occurs on the Project site) in the vicinity of the Project site, 0.2-1 mi east of Soda Lake Road 3.5 mi south of SR 58, at the north end of the Carrizo Plain, and in the vicinity of California Valley (CalFlora 2009).
Coulter's goldfields (<i>Lasthenia glabrata</i> ssp. <i>coulteri</i>)	CNPS 1B.1	Coastal salt marshes; playas; vernal pools from 3 to 4,593 ft elevation.	Low. Suitable habitat is present on-site in the Desert Sink Scrub and Alkaline Seasonal Wetland-Wildflower Field Complex vegetation communities, but this species was not detected in rare plant surveys in 2009 and 2010. The closest reported location was in 1950 approximately 4 mi north of the Project site (CNDDB 2010).
Pale-yellow layia (<i>Layia heterotricha</i>)	CNPS 1B.1	Cismontane woodland; pinyon-juniper woodland; valley and foothill grassland; alkaline or clay soils, open areas from 984 to 5,594 ft elevation.	Present. This species was observed at locations scattered throughout the BSA in 2010. Suitable habitat is present on-site in the Annual Grassland, Wildflower Field, and Alkaline Seasonal Wetland-Wildflower Field Complex vegetation communities. The species has been recorded approximately 6 mi northeast of the Project site in 1954, as well as near Soda Lake in 1950 (CNDDB 2010, CCH 2009).

NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE ON SITE**
Munz's tidy-tips (<i>Layia munzii</i>)	CNPS 1B.2	Chenopod scrub and valley and foothill grassland; in white-gray alkaline clay soils from 492 to 2,297 ft elevation.	Present. A large population was located in the southwest portion of the BSA during rare plant surveys conducted in 2010. Suitable habitat is present on-site in the Annual Grassland, Wildflower Field, Desert Sink Scrub, and portions of the Tamarisk Scrub vegetation communities. Recorded in 1962 approximately 0.75 mi south of the Project site (CNDDDB 2010). Reference populations 0.75 mi south of the study site and 0.5 mi south of Soda Lake along Soda Lake Road were visited on April 16, 2009, and no plants were found.
Jared's pepper-grass (<i>Lepidium jaredii</i> ssp. <i>jaredii</i>)	CNPS 1B.2	Valley and foothill grassland; alkali flat and sinks; alkaline sandy, or sometimes adobe soils from 1,099 to 3,297 ft.	Present. This species was located in the southwest portion of the BSA during rare plant surveys conducted in 2010. Suitable habitat is present on-site in the Desert Sink Scrub and Alkaline Seasonal Wetland-Wildflower Field vegetation communities. Recorded approximately 4 mi south of the Project site on an unknown date (CNDDDB 2010). The reference populations south of the study site near Soda Lake were visited on April 16, 2009, and a number of plants were found. Low potential for occurrence on the Project site.
Showy golden madia (<i>Madia radiata</i>)	CNPS 1B.1	Valley and foothill grassland; cismontane woodland; mostly on grassy slopes from 82 to 2,970 ft elevation.	Low. Suitable habitat is present on-site in Annual Grassland and Wildflower Field vegetation communities; however this species was not recorded on site during rare plant surveys in 2009 and 2010. Recorded in 1965 approximately 3.75 mi northwest of the Project site (CNDDDB 2010).
State or Locally Protected Species			
White-tailed kite (<i>Elanus leucurus</i>)	SP	Nests in trees surrounded by extensive open areas used for foraging.	Low. Trees suitable for nesting are absent from the site. Could be present as an occasional forager on the Project site.
Golden eagle (<i>Aquila chrysaetos</i>)	SP	Breeds on cliffs or in large trees isolated from disturbance.	Present. Observed within the Project site; all of the Project site provides suitable foraging habitat. Nesting habitat is absent from the site; nesting surveys of the Carrizo Plain in 2010 identified the closest nest as being 3.2 mi from the site (Latta 2010).

***SPECIAL-STATUS SPECIES CODE DESIGNATIONS**

- CSSC = California Species of Special Concern
- CNPS 1A = Plants Presumed Extinct in California
- CNPS 1B = Plants Rare, Threatened, or Endangered in California and Elsewhere
- CNPS 2 = Plants Rare, Threatened, or Endangered in California, but More Common Elsewhere
- CNPS 4 = Plants of Limited Distribution (a watch list)
- SP = State Fully Protected

** "Site" refers collectively to the Solar Generation Facility, generation tie-line, Twisselman Quarry, and potential switching station locations

The content of these special-status species lists, and determinations regarding the species that could potentially occur on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites and which species would be addressed in this BA, were made based on the results of numerous investigations and surveys, as described below.

Numerous special-status species surveys, many conducted according to protocols specified by the USFWS and CDFG, have been conducted on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. Many of these surveys were conducted during the preparation of, and were summarized in, the *Revised Biological Resources Assessment Report for the California Valley Solar Ranch Project, San Luis Obispo County, California* (URS Corporation and H. T. Harvey & Associates 2009). These studies include:

- Reconnaissance-level botanical surveys and habitat mapping by URS in 2008 and 2009, and by H. T. Harvey & Associates in 2009 and 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010b)
- Focused surveys for special-status plants by URS in 2009 and by H. T. Harvey & Associates in spring and late summer 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010c, 2010d). Although late summer surveys included the entirety of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry areas, spring surveys did not include portions of the switching station location and the 320-acre “Martin parcel”. Focused surveys for spring-flowering special-status plants will be conducted by H. T. Harvey & Associates in spring of 2011 in these two areas.
- Field surveys for jurisdictional wetlands and other Waters of the U.S. by URS in 2008 and 2009, and by H. T. Harvey & Associates in 2009 and 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010g, 2010 h)
- Habitat assessments and reconnaissance-level field surveys for special-status branchiopods by URS in 2009, branchiopod habitat assessments by H. T. Harvey & Associates in 2009 and 2010, and wet-season branchiopod surveys in potential habitat (the latter being located entirely on the Solar Generation Facility site) by H. T. Harvey & Associates in 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010a)
- Protocol-level surveys for blunt-nosed leopard lizards (allowing for focused surveys for other special-status reptiles) on the majority of the Project site by URS in 2009 and on portions of the revised Project footprint (i.e., new array configuration and tie-line/switching station alternatives) by H. T. Harvey & Associates in 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010f). Some areas, such as arrays 9 and 10, the Sunrise Overlook and Visitor Overlook sites, and portions of the potential switching station locations, were not included in either the 2009 or 2010 surveys. Therefore, in 2011, HPR II will have qualified biologists conduct protocol-level surveys in any areas within the project’s impact footprint that were not

surveyed according to protocol in 2009 or 2010. The survey area will also include a 1,500-foot-wide buffer around the construction footprint, as long as the Applicant has authorization from adjacent landowners to do so.

- Habitat assessments and reconnaissance-level field surveys for special-status amphibians by URS in 2009, and habitat assessments for such species by H. T. Harvey & Associates in 2009 (URS Corporation and H. T. Harvey & Associates 2009)
- Wintering bird surveys by URS in 2009 using transects and point count stations and reconnaissance-level surveys for birds in other seasons by URS in 2008 and 2009, on the Project site, and habitat assessments for special-status birds on the Twisselman Quarry and switching station alternative sites by H. T. Harvey & Associates in 2009 and 2010 (URS Corporation and H. T. Harvey & Associates 2009, H. T. Harvey & Associates 2010g, 2010 h)
- Small mammal trapping surveys of 16 small mammal live-trap lines in the Solar Generation Facility area by URS in 2008 (URS Corporation and H. T. Harvey & Associates 2009)
- Protocol-level San Joaquin antelope squirrel trapping surveys at seven locations with 100 trap grids each for two non-consecutive 5-day periods, totaling 7,000 trap days, by H. T. Harvey & Associates June through September 2010 (H. T. Harvey & Associates 2010i)
- Focused diurnal surveys for giant kangaroo rat precincts and San Joaquin antelope squirrels by H. T. Harvey & Associates in 2009 and 2010 (H. T. Harvey & Associates 2010e)
- Protocol-level surveys, with modifications that were coordinated with the USFWS and CDFG, for the San Joaquin kit fox by URS in 2009, including camera station surveys and spotlighting surveys (URS Corporation and H. T. Harvey & Associates 2009)
- San Joaquin kit fox den surveys by URS in 2008-2009 and by H. T. Harvey & Associates in 2009 (URS Corporation and H. T. Harvey & Associates 2009)
- San Joaquin kit fox surveys in the revised Project footprint (i.e., new array configuration, new property, and tie-line switching station alternatives) by H. T. Harvey & Associates in fall 2010
- Focused surveys for special-status species, including potential kit fox dens, giant kangaroo rat precincts, blunt-nosed leopard lizards, and rare plants were conducted on the two potential switching station locations and in the 320-acre Martin parcel, by H. T. Harvey & Associates in late spring and summer 2010

Published information concerning threatened, endangered, or other special-status species that may occur on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project site and in the vicinity of these areas was collected from several sources and reviewed by URS and H. T. Harvey & Associates biologists.

The sources consulted included the USFWS species' lists for San Luis Obispo County and for the U.S.G.S. quadrangles in which these Project components are located, California Native Plant Society's (CNPS's) online Inventory of Rare and Endangered Plants (CNPS 2009), Rarefind 3.0.1 (CNDDDB 2010), *The Jepson Manual* (Hickman 1993), CalFlora (2009), the Consortium of California Herbaria (CCH 2009), and miscellaneous information available through the USFWS, CDFG, and technical publications.

A search of published accounts on the location of these species was conducted for the Simmler U.S.G.S. topographic quadrangle map, on which the Project site occurs, and the eight surrounding quads, using the California Natural Diversity Data Base, Rarefind 3.0.1 (CNDDDB 2010). All plant species listed as occurring in San Luis Obispo and Kern counties and present on CNPS lists 1A, 1B, 2, or 4 were reviewed.

Special-Status Plants

From an initial list of 143 plants reviewed based on their potential for occurrence in the vicinity of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, only 25 special-status plant species were considered to have some potential to occur in these areas. These 25 species are listed in the tables above, which provide the regulatory status, habitat and ecological requirements, Project site suitability, observations of all special-status plant species identified in our literature search as occurring within the vicinity of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, and final determination regarding potential for occurrence in these areas. A discussion of relevant ecological and range information for each special-status species with potential for occurrence on or near these areas is included in this section, including legal status, known occurrences, habitat, and range restrictions.

Of the 143 special-status plant species identified by the CNDDDB and CNPS with known occurrences within the general vicinity of the site, or which were included on the USFWS species list, many, such as straight-awned spineflower (*Chorizanthe rectispina*) and golden violet (*Viola aurea*), were excluded from further consideration due to their reliance on habitats not present or potentially present on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites; such habitats include chaparral, cismontane woodland, or coastal scrub habitat for straight-awned spineflower or pinyon and juniper woodland habitat for golden violet. Other species, such as Hall's tarplant (*Deinandra halliana*), were excluded because they occur on soil types such as serpentine (Safford et al. 2005) which we have confidence do not occur on the site, even as inclusions.

As described in the species account for the California jewel-flower, URS biologists conducted seasonally-timed, focused botanical surveys in the Solar Generation Facility, generation tie-line, and Twisselman Quarry areas on the following dates: March 18 to 20, April 8 to 9, and April 22 to 23, 2009 (URS Corporation and H. T. Harvey & Associates 2009). The botanical survey involved pedestrian transects walked by at least three biologists approximately 30 to 60 ft apart

depending on topography. These surveys were conducted in accordance with USFWS, CDFG, and CNPS guidelines (USFWS 1996a; CDFG 2000; CNPS 2001) by URS biologists familiar with special-status plant species that occur in the Carrizo Plain. In addition, URS biologists surveyed reference sites within the vicinity of the Project site on April 16, 2009. The purpose of the reference site surveys was to determine whether special-status plants were detectable in areas of known occurrence, and confirm that conditions (e.g., recent precipitation) were suitable on-site for detecting these species, if present.

Although no special-status plant species were found during these surveys, the 2009 surveys were conducted during a drought year, which may have affected the detectability of at least some of these species. Because rainfall totals during the 2009-2010 wet season were conducive to providing suitable conditions for germination and detection of these species, if present, H. T. Harvey & Associates (2010c, 2010d) conducted special-status plant surveys on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites on March 15 to April 13, April 22, May 3 to May 7, 2010, June 29 to July 2, and July 6 to July 6. These surveys were conducted according to the most recent CDFG, CNPS, and USFWS protocols (USFWS 1996c, revised 2002; CDFG 1983, revised 2000; CDFG 2009c; CNPS 1983, revised 2001). These surveys were conducted by trained botanists familiar with special-status plant species that occur in the Carrizo Plain.

The two special-status plants covered by this BA, the California jewel-flower and San Joaquin woollythreads, are the only federally or State-listed plants with potential to occur on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites. In addition, 21 special-status plants that are not federally or State-listed have some potential for occurrence. These species, which are addressed in the Table entitled “California Species of Special Concern and CNPS Species” above, include the California androsace (*Androsace elongata* ssp. *acuta*), oval-leaved snapdragon (*Antirrhinum ovatum*), Salinas milk-vetch (*Astragalus macrodon*), heartscale (*Atriplex cordulata*), crownscale (*Atriplex coronata* var. *coronata*), lost hills crownscale (*Atriplex vallicola*), round-leaved filaree (*California macrophylla*), La Panza mariposa lily (*Calochortus simulans*), Lemmon’s jewel-flower (*Caulanthus coulteri* var. *lemmonii*), gypsum-loving larkspur (*Delphinium gypsophilum* ssp. *gypsophilum*), recurved larkspur (*Delphinium recurvatum*), Hoover’s eriastrum (*Eriastrum hooveri*), cottony buckwheat (*Eriogonum gossypinum*), Temblor buckwheat (*Eriogonum temblorense*), diamond-petaled California poppy (*Eschscholzia rhombipetala*), Ferris’ goldfields (*Lasthenia ferrisiae*), Coulter’s goldfields (*Lasthenia glabrata* ssp. *coulteri*), pale-yellow layia (*Layia heterotricha*), Munz’s tidy-tips (*Layia munzii*), Jared’s pepper-grass (*Lepidium jaredii* ssp. *jaredii*), and showy golden madia (*Madia radiata*). Of these, California androsace (*Androsace elongata* ssp. *acuta*), crownscale (*Atriplex coronata* var. *coronata*), gypsum-loving larkspur (*Delphinium gypsophilum* ssp. *gypsophilum*), recurved larkspur (*Delphinium recurvatum*), Ferris’ goldfields (*Lasthenia ferrisiae*), pale-yellow layia (*Layia heterotricha*), Munz’s tidy-tips (*Layia munzii*), and Jared’s pepper-grass (*Lepidium jaredii* ssp. *jaredii*) were recorded in the BSA during protocol-level surveys in 2010.

Of the 25 special-status plants in the tables above, two species are listed in those tables because they were on the USFWS species lists for San Luis Obispo County and/or one of the U.S.G.S. quadrangles containing the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, but they are not expected to occur in these areas. These two species, which include the federally endangered Kern mallow (*Eremalche kernensis*), and the Parish's sidalcea (*Sidalcea hickmanii* ssp. *parishii*), which is a candidate for federal listing, are discussed in greater detail below.

Kern Mallow (Federally Listed Endangered). Kern mallow occurs in valley saltbrush scrub vegetation communities, on alkaline sandy loam or clay soils at elevations of 315 to 900 ft (Wolf 1938, CNDDDB 2010). Historically, Kern mallow occurred in several locations in western Kern County (Wolf 1938). The species' current distribution is restricted to an approximately 40 square-mile area between the cities of Buttonwillow and McKittrick (Taylor and Davilla 1986) and possibly to a few sites in western Kern County (Skinner and Pavlik 1994, CNDDDB 2010). Kern mallow is not known to occur in San Luis Obispo County. The Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites are outside the limited range of this species, and Kern mallow is considered absent from these areas. No take of this species is expected to occur as a result of Project activities on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, and thus it is not covered by this BA.

Parish's Checkerbloom (Candidate for Federal Listing). Parish's checkerbloom is associated with chaparral and open conifer forest habitats from 3280 to 8200 ft in elevation (Hickman 1993). One literature record of the species occurs in San Luis Obispo County near La Panza, west of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites (CNDDDB 2010), however, no documented specimens are known from San Luis Obispo County (Calflora 2009). Suitable habitat for Parish's checkerbloom does not occur on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, and this species was not observed during botanical surveys of these areas in 2009. Parish's checkerbloom is thus considered absent from these areas. No take of this species is expected to occur as a result of Project activities on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, and thus it is not covered by this BA.

Special-Status Animals

Based on database and literature searches, as well as field studies conducted on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites and in their vicinity, a list of special-status species known from the Project vicinity was developed. These species are listed in the tables above. Several of those species included California species of special concern that are not expected to occur in these areas for various reasons. For example, the southern Pacific pond turtle (*Actinemys marmorata pallida*) is associated with permanent or nearly permanent aquatic habitat, which is absent from the Project area. No occurrences of the two-striped garter snake (*Thamnophis hammondi*) are known from the immediate Project vicinity, and this species is not expected to reach the site from streams in the hills to the west

where the species is known to occur due to the inhospitability of intervening habitat. Suitable habitat for the Tulare grasshopper mouse (*Onychomys torridus tularensis*) is present on the project site, but the species has not been recorded in the area for over 50 years and was not captured during small mammal trapping surveys, and this species is thus considered absent.

In addition to the eight animal species covered by this BA, another 23 special-status wildlife species are known to occur or could potentially occur on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, but are not covered in this BA. These include 20 species that are California species of special concern or State fully protected species that are not listed, or proposed for listing, under either the Federal or California Endangered Species Acts. Such species include the western spadefoot (*Spea hammondi*), silvery legless lizard (*Anniella pulchra pulchra*), San Joaquin coachwhip (*Masticophis flagellum ruddocki*), coast horned lizard (*Phrynosoma blainvillii*), northern harrier (*Circus cyaneus*), white-tailed kite (*Elanus leucurus*), golden eagle (*Aquila chrysaetos*), lesser sandhill crane (*Grus canadensis canadensis*), burrowing owl (*Athene cunicularia*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), loggerhead shrike (*Lanius ludovicianus*), Le Conte's thrasher (*Toxostoma lecontei*), Oregon vesper sparrow (*Pooecetes gramineus affinis*), grasshopper sparrow (*Ammodramus savannarum*), tricolored blackbird (*Agelaius tricolor*), short-nosed kangaroo rat (*Dipodomys nitratooides brevinasus*), pallid bat (*Antrozous pallidus*), American badger (*Taxidea taxus*),

In addition, three State-listed species have some potential to occur on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites as occasional visitors, but they are not expected to occur regularly or in large numbers, and they do not breed on or near these areas. Project activities on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites are not expected to result in take of these species, which include Swainson's hawk (*Buteo swainsoni*), which is State-listed as threatened, and American peregrine falcon (*Falco peregrinus anatum*) and bald eagle (*Haliaeetus leucocephalus*), both of which are State-listed as endangered.

Eight federally listed (and in some cases State-listed) species were mentioned in literature or database searches, including the USFWS species list for San Luis Obispo County, as potentially occurring in the vicinity of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites, but they are not expected to occur there at all: Conservancy fairy shrimp (*Branchinecta conservatio*; federally endangered), Tipton kangaroo rat (*Dipodomys nitratooides nitratooides*; federally and State endangered), Buena Vista Lake shrew (*Sorex ornatus relictus*; federally endangered), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*; federally threatened), Delta smelt (*Hypomesus transpacificus*; federally and State threatened), California red-legged frog (*Rana draytonii*; federally threatened), California tiger salamander (*Ambystoma californiense*; federally threatened and a State candidate for listing), and giant garter snake (*Thamnophis gigas*; federally and State threatened). Thus, these species are not covered by this BA. Following is brief discussion as to why these eight federally listed species are not covered by this BA.

Conservancy Fairy Shrimp (Federally Listed Endangered). Conservancy fairy shrimp typically occur in large, deep, neutral-to-slightly alkaline vernal pools that are low in dissolved salts, dominated by vernal pool plants, and that support a variety of vernal pool invertebrates (Eriksen and Belk 1999). This species is endemic to California's Central Valley, and is usually found at elevations below 475 ft (Eriksen and Belk 1999). Suitable habitat consists of deep pools that pond sufficiently to allow the species to complete its life cycle, which may last 49 days or more (Helm 1998, Eriksen and Belk 1999). Although the habitat used by this species is similar to that of the longhorn fairy shrimp and vernal pool fairy shrimp, which are covered in this BA, the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project site is outside the range of the Conservancy fairy shrimp. No take of this species is expected to occur as a result of Project activities in these areas, and thus it is not covered by this BA.

Valley Elderberry Longhorn Beetle (Federally Listed Threatened). The valley elderberry longhorn beetle is associated with the species of elderberry that serve as its host plant (*Sambucus* spp., primarily *S. mexicana* and *S. caerulea*), and occurs in and near riparian habitats throughout the Central Valley (USFWS 1980, 1984). The valley elderberry longhorn beetle may also occur in isolated elderberry shrubs (i.e., those away from riparian habitats) in the Central Valley; however, these shrubs do not provide high-quality habitat for this species (Collinge et al. 2001). The range of the valley elderberry longhorn beetle extends from southern Shasta County to Fresno County, including portions of the Central Valley below 3000 ft in elevation. The Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project site occur southwest of the species' range, and the valley elderberry longhorn beetle is not known from the Carrizo Plan. No take of this species is expected to occur as a result of Project activities in these areas, and thus it is not covered by this BA.

Delta Smelt (Federally and State-listed Threatened). Delta smelt are endemic to the upper Sacramento/San Joaquin Delta. During spawning, adults travel into freshwater systems including the Sacramento River, the Mokelumne River, Cache Slough, the Delta, and the Montezuma Slough (USFWS 1995). Delta smelt do not occur in San Luis Obispo County. No take of this species is expected to occur as a result of the Project, and thus it is not covered by this BA.

California Red-legged Frog (Federally Listed Threatened). California red-legged frogs are associated with a number of freshwater and terrestrial habitats (Jennings 1988). Individuals have been recorded dispersing more than 2 mi between aquatic habitats (Bulger et al. 2003), typically along creek drainages, but during wet months they may also move across upland habitats (USFWS 2006b). The key to the presence of frogs in these habitats is the presence of perennial (or near perennial) water and the general lack of introduced aquatic predators. Historically, the range of the California red-legged frog included much of the Central Valley from Redding southward, however, it has disappeared from approximately 70% of its former range including most of the Central Valley floor (USFWS 2002). In San Luis Obispo County, California red-legged frogs occur on the coastal plain and western slopes of the Santa Lucia Range (USFWS

2002). The Project site does not occur within California red-legged frog core area distribution (USFWS 2002); the site is located south of the Estrella River core area and east of the Estero Bay and Arroyo Grande Creek core areas (USFWS 2002). The nearest record of California red-legged frogs occurs approximately 17.1 mi south of the Project site, in the Cuyama River (CNDDDB 2010). Therefore, although habitat for this species may be present in the Carrizo Plain, California red-legged frogs are considered absent from the area. No take of this species is expected to occur as a result of the Project, and thus it is not covered by this BA.

California Tiger Salamander (Federally Listed Threatened; State Candidate for Listing). California tiger salamanders inhabit grasslands and open oak woodlands throughout central and northern California. The species breeds in ephemeral pools (e.g., vernal pools) where water remains present long enough for metamorphosis to occur. Individuals spend the majority of their lives in subterranean refuges, which typically consist of small mammal burrows (USFWS 2004, USFWS 2005b). The nearest occurrence of California tiger salamanders to the Project site is approximately 13.7 mi to the northwest, in Kern County (CNDDDB 2010). Therefore, although habitat for this species may be present in the Carrizo Plain, California tiger salamanders are considered absent from the area. No take of this species is expected to occur as a result of the Project, and thus it is not covered by this BA.

Giant Garter Snake (Federally and State-listed Threatened). The giant garter snake is endemic to the Central Valley, and is associated with low-gradient streams and sloughs as well as valley floor wetlands and marshes (USFWS 1993, 1999b). Giant garter snakes use burrows as far as 164 ft from wetland habitat during the active season, and as far as 820 ft from wetland habitat during the winter (Hansen 1986, Wylie et al. 1997, USFWS 1999b). The species occurs as far south as Fresno County, but is not known from San Luis Obispo County (USFWS 1993, 1999b, CNDDDB 2010), and does not occur in any areas within feasible dispersal distance from the Project site. Therefore, giant garter snakes are absent from the Project site. No take of this species is expected to occur as a result of the Project, and thus it is not covered by this BA.

Tipton Kangaroo Rat (Federally and State-listed Endangered). The Tipton kangaroo rat occurs in alkaline shrub and annual grassland communities on the San Joaquin Valley floor (Williams et al. 1993). The CNDDDB identified 2 occurrences of the Tipton kangaroo rat within the nine U.S.G.S. quadrangles including the Project site and surrounding quads; however, upon further review of this record it is considered inaccurate given what is known about the distribution of this subspecies. The range of the Tipton kangaroo rat extends from the northern boundaries of Kings County to the Tehachapi Mountains in Kern County, but does not extend as far south as the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry components of the Project site. Rather, CNDDDB reports of this species near the site should pertain to the short-nosed kangaroo rat (*Dipodomys nitratooides brevinasus*), the subspecies that is known to occur in the Carrizo Plain. Therefore, due to range restrictions, the Tipton kangaroo rat is determined to be absent from the Carrizo Plain. No take of this species is expected to occur as a result of Project activities in the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry areas, and thus it is not covered by this BA.

Buena Vista Lake Shrew (Federal Endangered). Historically, the Buena Vista Lake shrew occurred in wetland habitats surrounding Buena Vista Lake in the Tulare Basin in Kern County. The species' current distribution is not well known (USFWS 1998). A few recent records are known from the Kern Lake and Kern National Wildlife Refuge areas (USFWS 1998), but there are no other recent records of this species. Because this species' known range is restricted to the Tulare Basin in Kern County, it is determined to be absent from the Carrizo Plain. No take of this species is expected to occur as a result of Project activities in the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry areas, and thus it is not covered by this BA.

APPENDIX B.
USFWS SPECIES LIST



United States Department of the Interior
FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825



January 27, 2010

Document Number: 100127092009

Brian B. Boroski, Ph.D.
H. T. Harvey & Associates
7815 N Palm Ave, Ste 310
Fresno, CA 93711

Subject: Species List for California Valley Solar Ranch and Transmission Line Reconductoring Project

Dear: Dr. Boroski

We are sending this official species list in response to your January 27, 2010 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be April 27, 2010.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found at www.fws.gov/sacramento/es/branches.htm.

Endangered Species Division

U.S. Fish & Wildlife Service
Sacramento Fish & Wildlife Office
Federal Endangered and Threatened Species that Occur in
or may be Affected by Projects in the Counties and/or
U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 100127092009

Database Last Updated: December 1, 2009

Quad Lists

Listed Species

Invertebrates

Branchinecta conservatio

Conservancy fairy shrimp (E)

Branchinecta longiantenna

Critical habitat, longhorn fairy shrimp (X)

longhorn fairy shrimp (E)

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)

vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Fish

Hypomesus transpacificus

delta smelt (T)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Rana aurora draytonii

California red-legged frog (T)

Reptiles

Gambelia (=Crotaphytus) sila

blunt-nosed leopard lizard (E)

Thamnophis gigas

giant garter snake (T)

Birds

Gymnogyps californianus

California condor (E)

Mammals

Dipodomys ingens

giant kangaroo rat (E)

Vulpes macrotis mutica

San Joaquin kit fox (E)

Quads Containing Listed, Proposed or Candidate Species:

LAS YEGUAS RANCH (243B)

SIMMLER (243C)

MCKITTRICK SUMMIT (243D)

LA PANZA NE (244A)

County Lists

San Luis Obispo County

Listed Species

Invertebrates

Branchinecta conservatio

Conservancy fairy shrimp (E)

Branchinecta longiantenna

Critical habitat, longhorn fairy shrimp (X)

longhorn fairy shrimp (E)

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)

vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana aurora draytonii

California red-legged frog (T)

Critical habitat, California red-legged frog (X)

Reptiles

Gambelia (=Crotaphytus) sila

blunt-nosed leopard lizard (E)

Thamnophis gigas

giant garter snake (T)

Birds

Gymnogyps californianus
California condor (E)

Mammals

Dipodomys ingens
giant kangaroo rat (E)

Dipodomys nitratoides nitratoides
Tipton kangaroo rat (E)

Sorex ornatus relictus
Buena Vista Lake shrew (E)

Vulpes macrotis mutica
San Joaquin kit fox (E)

Plants

Caulanthus californicus
California jewelflower (E)

Eremalche kernensis
Kern mallow (E)

Monolopia congdonii (= *Lembertia congdonii*)
San Joaquin woolly-threads (E)

Proposed Species

Amphibians

Rana aurora draytonii
Critical habitat, California red-legged frog (PX)

Candidate Species

Plants

Sidalcea hickmanii ssp. *parishii*
Parish's sidalcea (C)

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the [National Oceanic & Atmospheric Administration Fisheries Service](#). Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online [Inventory of Rare and Endangered Plants](#).

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. See our [Protocol](#) and [Recovery Permits](#) pages.

For plant surveys, we recommend using the [Guidelines for Conducting and Reporting Botanical Inventories](#). The results of your surveys should be published in any environment documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal [consultation](#) with the Service.

During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our [Map Room](#) page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. [More info](#)

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined

by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be April 2010.

APPENDIX C.
PLAN FOR RELOCATION OF GIANT KANGAROO RATS

California Valley Solar Ranch Project

**Plan for Relocation of
Giant Kangaroo Rats (*Dipodomys ingens*)**

Prepared by:



H. T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

**7815 N. Palm Avenue, Suite 310
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Prepared for:

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File No. 3103-01

November 2010

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EXPERT ASSISTANCE

This plan is the culmination of months of literature research; workshops, field meetings, and written and oral communications with biologists that have studied kangaroo rat species, managed their habitats and populations, and regulated their habitats and populations through state and federal impact assessments and permits; and the synthesis of the findings and recommendations resulting from this process. We maintain sole responsibility for any omissions that might occur in the plan, and thank and acknowledge the gracious assistance of the following individuals, listed in alphabetical order, which dedicated time, data, and expertise to improve the quality of this plan for the purpose of contributing to the preservation of the giant kangaroo rat.

Mr. Tim Bean University of California Berkeley
Dr. Brian Cypher, CA State University-Stanislaus, Endangered Species Recovery Program
Dr. David Germano, CA State University, Bakersfield
Mr. Christopher Diel United States Fish & Wildlife Service
Mr. Dave Hacker CA Department of Fish & Game
Mr. Chris Huntley Aspen Environmental Group
Dr. Laura Prugh University of California Berkeley
Dr. Jan Randall San Francisco State University, Emeritus
Mr. Ken Sanchez United States Fish & Wildlife Service
Mr. Larry Saslaw Bureau of Land Management
Ms. Kathy Sharum Bureau of Land Management
Dr. Debra Shier San Diego Zoo, Institute for Conservation research
Mrs. Julie Vance CA Department of Fish & Game
Mr. Jared Varonin Aspen Environmental Group

INTRODUCTION

The proposed California Valley Solar Ranch (CVSR) project in the Carrizo Plain would include some unavoidable impacts on giant kangaroo rats (*Dipodomys ingens*); a species protected by both the federal Endangered Species Act and the California Endangered Species Act. The U.S. Fish and Wildlife Service and the California Department of Fish and Game have recommended that in addition to modifying the project design to minimize such impacts, the unavoidable impacts should be alleviated in part by developing and implementing a program to relocate giant kangaroo rats from impacted areas of the project site to suitable unoccupied areas of the project site that will be managed for conservation of the species.

Relocation of animals into previously occupied or restored habitat can be a viable and effective strategy for conserving and managing a wide variety of species (Griffith et al. 1989). Over the past three decades the relocation of wildlife has been primarily associated with resolving human-animal conflicts (e.g., Kuhnz et al. 2005), reintroduction of populations of threatened or endangered species to formerly occupied habitats (e.g., Grantham 2007), or supplementing game populations (Fischer and Lindenmayr 2000, Griffith et al. 1989). Although the outcomes of relocations and reintroductions have been varied; reviews of relocation and reintroduction programs have revealed important criteria clearly associated with substantially increased success rates.

Griffith et al. (1989) surveyed ongoing reintroduction programs involving mammals and birds throughout a wide variety of habitats in the United States, Canada, New Zealand, and Australia. They estimated that in the 1980s there were 700 relocations each year within these regions and the vast majority of these (98%) occurred in the United States. A similar study by Fischer and Lindenmayr (2000) reviewed 180 published case studies and theoretical papers on animal relocations that had been carried out since 1980.

Both studies found similar results suggesting that certain factors involving the ecology of the target species, habitat conditions, and methods were strongly associated with success of relocation and reintroduction efforts. Griffith et al. (1989) found that relocation or reintroduction of populations of wild-caught herbivores were far more successful than efforts to establish populations of carnivores or populations sourced from captive breeding programs. They also found that animals that bred frequently and at an early age were more successful at establishing stable populations than those that typically bred later in life and/or with lower frequency. Likewise they concluded that habitat condition and competition are important factors; with the greatest successes involving relocations into high quality habitat that is void of conspecific or sympatric competitors and is located within the core of a species' historic range.

Fischer and Lindenmayr (2000) found that releases involving more than 100 individuals were more successful than attempts using smaller numbers of individuals. Griffith et al. (1989) recognized the necessity for the relocation of relatively large numbers of animals and concluded that relocation of game species was generally more successful than efforts to reintroduce threatened or endangered species because of limitations in the number of individuals that could be relocated from diminished source populations. Fischer and Lindenmayr (2000) also found

empirical evidence underlying the fundamental need to recognize and ensure that the initial causes leading to declines or extirpation of local populations have been removed.

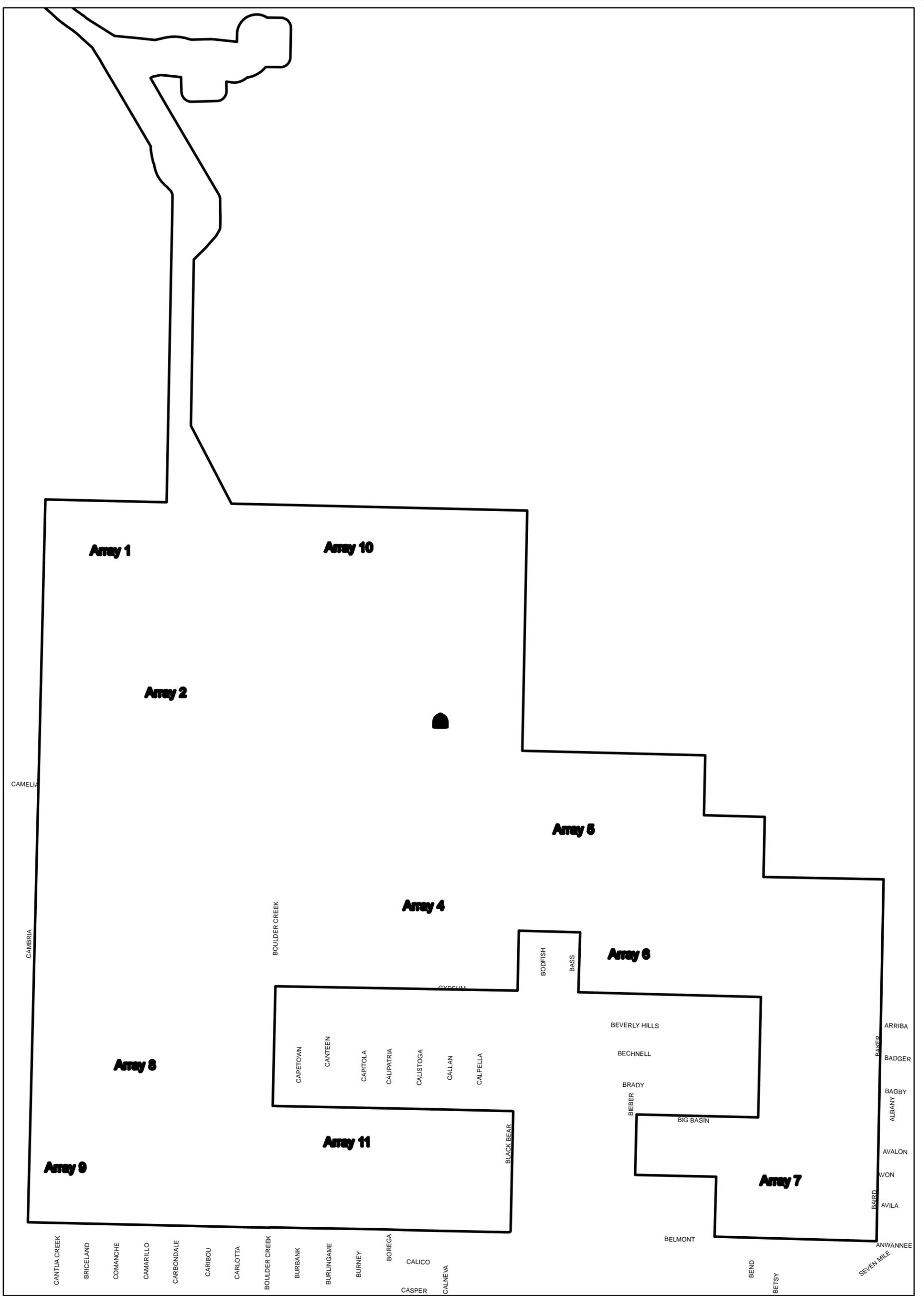
The findings of the Griffith et al. (1989) and Fischer and Lindenmayar (2000) reviews of relocations of a wide variety of types of species, indicate that relocation of kangaroo rats (*Dipodomys spp.*) in general and giant kangaroo rats on the Carrizo Plain in particular would be successful, as the criteria associated with success are highly compatible with the ecology of giant kangaroo rats and the reintroduction setting. Furthermore, empirical evidence from previous relocations of giant kangaroo rats on the Carrizo Plain indicates a high potential for success (Williams et al. 1999). The proposed relocation of giant kangaroo rats from impacted areas of the California Valley Solar Ranch (CVSR) Project site to suitable unoccupied areas of the project site that will be managed for conservation of the species is expected to be successful for a number of reasons including aspects of giant kangaroo rat ecology, habitat conditions, and methods utilized.

Giant kangaroo rats will breed within their first year (USFWS 1998) and can produce up to 2 to 3 litters each year with a modal litter size of four offspring (Williams and Kilburn 1991). The individuals would be wild-caught and forage for this herbivorous species will be readily available at the release sites. The release sites onsite will be located within known, existing suitable habitat currently supporting giant kangaroo rats. The distribution and number of giant kangaroo rats occupying any location on the site is known as are unoccupied or underoccupied yet suitable habitat ensuring that competition with conspecifics will be at the release site. Possibly most important, the cause of the original decline of giant kangaroo rats north on the CVSR project site was most likely dryland farming (Germano pers. comm.), which will be permanently eliminated from conservation lands to which giant kangaroo rats will be relocated.

AVOIDANCE AND RELOCATION OF GIANT KANGAROO RATS

Approximately 91% of giant kangaroo rat precincts on the CVSR Project site will be avoided due to extensive redesign of the Project (Figure 1). The majority of this population, which is currently vulnerable to changes in land use (e.g., dryland farming, residential subdivision and development); will be protected along with ~ 2,810 acres of suitable habitat on the Project site. However a number of giant kangaroo rats precincts occur within the proposed Project footprint and these will be directly impacted by assembly of the solar arrays, trenching, all-weather roads, buildings, and other infrastructure. Giant kangaroo rats occupying burrow precincts that cannot be avoided will be relocated to suitable unoccupied onsite locations.

Determining how to handle each precinct and/or group of precincts, which may be impacted, will be done on a case by case basis. Strategies employed will depend on the level of impact, the temporal extent of the impact, and the potential for giant kangaroo rats to relocate on their own when not directly impacted but conditions are altered beyond suitable levels (e.g. – microclimate or vegetation shifts that may occur under the solar panels).



Legend

Biological Study Area Boundary
 M3 Alternative Solar Arrays

Number of GKR Precincts per Grid

1	7
2	8
3	10
4	11
5	12
6	14

Data Sources: [1] San Luis Obispo County Geographic Information Systems (February 2000), [2] ESRI StreetMap USA (2006), [3] 1ft Natural Color SunPower Aerial (2009)

Scale

1:24,000
1 inch = 2,000 feet

0 0.38 0.76 Miles

0 1,000 2,000 4,000 Feet

Coordinate System: North American Datum 83 Universal Trans Mecator (UTM) Zone 11 North

California Valley Solar Ranch

Figure 1. Distribution of Giant Kangaroo Rats on the California Valley Solar Ranch Project site, 2010

HPR II

H. T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

Impact Minimization for Temporary Impacts to Giant Kangaroo Rat Precincts

There are numerous cases where construction activities will take place near a precinct and although there may be indirect impacts, the precinct itself would not be directly affected by the action. For example, there is sufficient flexibility in the placement of the wooden poles that support the 34.5 KVa power lines so that giant kangaroo precincts can be avoided as the impact footprint for each pole is $\sim 7 \text{ ft}^2$; and although equipment required to place the pole may temporarily produce excessive sound pressure levels, nearby precincts would not be directly impacted. Likewise the placement of the helical screws, though less flexible in terms of placement location, represents a temporary impact to a very small area.

Activities that do not result in disturbance of the ground surface within the area where vegetation is cropped around the precinct, would not impact the main burrow chamber, and therefore would not render the precinct unusable. Temporary impacts are considered to be those impacts that are limited to disturbances that occur over a period of less than 48 hours.

In a case where precincts would be temporarily impacted, the resident giant kangaroo rat(s) will be trapped, held temporarily, and then released back into the precinct where trapped. Before trapping, the area that is to be temporarily impacted will be fenced with temporary construction fencing with a mesh size small enough to ensure that giant kangaroo rats can not pass through or become entangled, and the bottom of the fence will be buried at sufficient depth to ensure giant kangaroo rats can not enter the enclosure. The enclosure fence will ensure that other giant kangaroo rats do not occupy the vacant precinct(s). The resident(s) of the precinct(s) will be trapped using Sherman live traps large enough to ensure animals will not be injured by the closing trapdoor. The location of the precinct from which each animal is trapped will be recorded with high precision GPS (e.g., Trimble® GeoXH™ capable of recording geographic coordinates with precision of ± 12 inches) and mapped, to ensure that trapped animals are released into their initial precinct(s).

Animals occupying precincts that are located under the arrays but within 35-40 feet of the edge of the array will also be returned to precincts that are not permanently impacted. Giant kangaroo rats will regularly travel distances of 33 feet (10 m) during the course of their nightly activities (Jan Randall Pers. Comm.), and would be expected to readily move outside of the array should conditions under the arrays become unsuitable. Escape burrows will be augured into the ground along the outside edge of the array, where animals are left within the interior, to facilitate movement out of the arrays. Exceptions include areas where the outside edge of the array is unsuitable or already densely occupied in which case animals under the arrays will be relocated.

Impact Minimization for Permanent Impacts to Giant Kangaroo Rat Precincts

Giant kangaroo rats inhabiting precincts that will be directly impacted or are located in areas within the interior of the arrays (beyond 35-40 ft from the array edge) will be permanently relocated to onsite locations. Onsite release sites will include areas with low densities of occupied precincts as well as suitable unoccupied areas adjacent to occupied habitat. Release sites will be prepared for “soft release” including construction of artificial burrows, predator exclusion fencing, and supplemental feed. The spatial relationship of neighbor groups from the

capture will be maintained at the release site and monitoring will include short term telemetry and long term trapping surveys to characterize the status and composition of the released population over time.

Preparation of Release Sites

Artificial burrows and temporary enclosure fencing will be used to reduce risk of predation or mortality resulting from disoriented animals fleeing the release sites. Artificial burrows will be based on designs developed by Williams et al. (1993) and Germano (2001) which have been successfully used for relocating kangaroo rats. Improvements to these designs that have been experimentally derived will be incorporated as those results become available (Debra Shier pers. comm.).

The basic design utilizes two tubes (3-4 inches wide by 48-60 inches in length) that are sloped from opposite directions to a central chamber that is set 12-18 inches below ground surface. A 10 to 12-foot long trench will be excavated to a maximum depth of 18 inches in the middle with gentle slopes extending up to ground level at each end. The central chamber will be constructed with sections of corrugated cardboard that will form walls in a two foot square excavation at the bottom center of the trench. Corrugated cardboard will provide structure to the chamber yet will not deter animals from excavating new tunnels and chambers. A square of plywood set within the walls of the trench will be used to ensure the central chamber is not crushed while backfilling the trench. Each chamber will be provisioned with a food cache of seeds (~5 lbs of a mix consisting of 75% proso white millet and 25% oat groats) along with a few sheets of paper towels that can be shredded for bedding material. Once all of the elements of the burrow system are in place, the trench will be carefully backfilled with the displaced soil.

The release site will be temporarily enclosed with a predator enclosure fence that will also restrict flight of the released animal, away from the release site. The enclosure design is based on predator deterrence measures developed by Deblinger et al. (1992) to protect piping plover (*Charadrius melodus*) nest sites from red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*); and known characteristics of giant kangaroo rat precinct size, and activity patterns (Williams and Kilburn 1991).

The protective fence will be constructed with 48 inch tall welded, wire mesh fencing material; with mesh openings sufficiently small enough to prevent giant kangaroo rats from prematurely leaving the release site. The enclosure will be circular, supported by metal fence posts, with a 15-20 foot diameter fully enclosing the constructed burrow. The bottom 8 inches of the fence material will be buried below ground level to deter predators and giant kangaroo rats from excavating passages under the fence. The remaining 40 inches will be above ground and across the top of the enclosure there will be a web of string spanning the opening to deter avian predators from landing inside the enclosure.

Each relocated group of giant kangaroo rats will be situated so that the group of precincts is connected to other relocated groups or native colonies with connecting corridors of suitable habitat to prevent isolation. The spacing and perimeter of the precincts within each release site will be established in a manner that ensures dispersing individuals have ready access to

unoccupied habitats adjacent to the release site. Open areas adjacent to very high densities of existing precincts will be avoided when selecting relocation sites.

Relocation of Giant Kangaroo Rats

Active precincts that may be impacted during each phase of the CVSR Project development will be identified in advance of construction activities. The area that will be impacted will be fenced with temporary construction fencing with mesh size small enough to ensure that giant kangaroo rats can not pass through or become entangled. The area will then be trapped to depletion using Sherman live traps large enough to ensure animals will not be injured by the closing trapdoor. The location of each precinct from which an animal was removed will be recorded with high precision GPS (e.g., Trimble® GeoXH™ capable of recording geographic coordinates with precision of ± 12 inches) and mapped so that the spatial relationship of trapped animals can be replicated at the release site.

The trapping protocol that will be used is adapted from a protocol developed for relocation of Tipton kangaroo rats (David Germano, pers. comm. 2010). The trapping period will consist of six consecutive trap nights, using 20% more traps than the number of identified precincts in the enclosed trapping area (e.g., an enclosure encompassing 10 precincts would require at least 12 traps). An area will be considered vacant if the last two nights of trapping yield no additional captures. If, on the last two nights of trapping, another target animal is captured, two more nights of trapping will be added to the session. This will continue until no target animals are captured for two consecutive nights. If there is evidence a giant kangaroo rat remains within the enclosure but is avoiding the traps, based on observations of activity at a precinct location, then that animal will be removed by carefully excavating the occupied precinct with hand tools. Prior to the excavation, a temporary fence will be set up around the perimeter of the precinct to prevent the animal fleeing into unfamiliar territories.

Each captured animal will be temporarily held prior to their release at relocation sites. Animals will be held in 7-gallon plastic buckets, each supplied with a layer of sandy soil and sections of cardboard tube, which will provide shelter. Each bucket will have a screen on the top to prevent escape, and will be held in a sheltered and safe location (e.g., climate controlled and designated construction trailer) prior to their release. Each individual will be fitted with a passive integrated transponder (PIT) tag that will enable identification of individuals during post-release trapping to monitor survival, movement, and condition of relocated individuals over time. A limited number of animals will also be fitted with radio-collars (see Monitoring). Every effort will be made to release individual giant kangaroo rats within 48 hours of their initial capture, and no animals will be held for more than 7 days. The enclosure fence around the trapped area will be left in place after all giant kangaroo rats are removed to prevent re-colonization of the vacant habitat until all construction activities are completed.

Release of Giant Kangaroo Rats at the Prepared Release Sites

Soft release methods including artificial burrows, supplemental food, and temporary fencing will be employed to minimize exposure of relocated giant kangaroo rats to predators and stress (Germano pers. comm. 2010). Trapping and relocating animals will take place primarily during the late summer and early fall. The optimal timing for relocating animals will vary somewhat depending on climatic conditions, which may affect the reproductive status of the populations.

Trapping surveys and, if possible, coordination with researchers surveying giant kangaroo rats at other location on the Carrizo Plain will be used to ensure that relocation takes place during the post-breeding season in order to avoid disrupting family units. Relocation during this time of year will also ensure that day and nighttime temperatures are moderate, reducing the risk of thermal stress for animals during temporary housing and transportation.

Study of several species of kangaroo rats indicate that they foot-drum to advertise their presence, defend territories, and communicate with neighbors (Randall 1997, 2001; Shier and Yoerg 1999). Play-back experiments indicate that these animals differentiate between the foot-drumming of known neighbors, which represent little threat, and that of strangers in search of a territory which may represent a more significant threat (Randall 1984). Stability of groups of known neighbors may affect a wide range of behaviors from reproductive to territorial defense and maintaining the original spatial relationships of closely associated groups of giant kangaroo rats, at the release site, is expected to provide a significant benefit. The spatial distribution of individuals captured within a specific area will be mapped at the capture site and animals will be released in a manner that reflects their original distribution in order to maintain the juxtaposition of known neighbors.

Immediately preceding their release individuals will be transported from the temporary holding facility to the relocation site. Each animal will be released into separate, fenced artificial burrows, which will be located adjacent to other released animals. The animals will be placed into the burrow chamber by inserting them into one of the cardboard tubes, and then temporarily plugging both openings to prevent the animal from exiting the burrows before nightfall. The temporary plugs will be removed at night, which will enable the animals to explore their new environment under the relative safety of darkness and during a period of the day when they are typically most active above ground.

The predator enclosure fence will be maintained for 7 days after the relocation in order to enable the animals to acclimate to their new location. After the 7-day acclimation period, the fencing will be removed. Before removing the fence, the openings to the constructed burrows will be plugged and then re-opened at nightfall, at which time the animals will be free to explore their surroundings. The release sites will be visited 2-3 times each week during the first 30 day period to confirm that animals are still present (see Monitoring). Enclosure fences will be monitored and maintained during the 7-day period and supplemental food will be provided for 30 days.

MONITORING AND ADAPTIVE MANAGEMENT

Relocated giant kangaroo rats will be monitored along with a reference population(s) on the main CVSR Project site. The objective of the monitoring program will be to characterize the status of relocated animals (e.g., survival, reproduction, dispersal, persistence of relocated groups of precincts) and to inform management of the onsite conservation lands. Full details of the monitoring program will be developed as part of the conservation lands management plan. The monitoring program will involve the following elements:

Monitoring With Radio-telemetry Immediately Following Initial Release

A subset of relocated animals will be fitted with radio-collars, following methods developed and utilized by the San Diego Zoo Institute for Conservation Research to study relocated populations of various species of kangaroo rats by (Debra Shier Pers. Comm.). Radio telemetry monitoring will be used to determine survival, movement within the habitat, and dispersal from the release site. Individuals fitted with radio-collars will be monitored 2-3 times each week for 60 days after release.

Individuals will be fitted with radio transmitters weighing less than three grams and capable of transmitting for at least 60 days, such as the Holohil Systems Ltd. PD-2C (2.0 g) which is equal to ~1.7% of a male or female average mass; or the Advanced Telemetry Systems M1510 (2.4 g) which is equal to ~2.1% of the average mass. Germano and Saslaw (2007) successfully used similar sized units (2.2 g) with much smaller Tipton's kangaroo rats (*Dipodomys nitratooides nitratooides*). Radio-collared animals will be re-captured after the 60 day study period and collars will be removed.

Monitoring During Years 1 through 5 following the Initial Release

During the first year following the initial relocation of giant kangaroo rats, monitoring will involve monthly visits to assess activity of relocated animals, which will be based on diurnal surveys designed to quantify the number, distribution, and status of precincts (active vs. inactive). It will also involve two trapping sessions (spring and fall) to locate and identify PIT tagged individuals and to determine if offspring are present (e.g., condition of lactating females). If, after one year, monitoring reveals a statistically significant decline in the relocated animals, relative to an onsite reference population, an expanded effort will be initiated at that site to determine the cause of the decline. This effort may also include additional radio telemetry studies designed to determine the cause of the decline (such as resource limitations, or high predation pressure). Baseline and supplementary monitoring results will be incorporated into an adaptive management strategy for the site designed to ameliorate unusual sources of mortality or other limiting factors within the relocated or pre-existing colonies.

During the second through fifth year following the initial release of a group of animals, the diurnal precinct and trapping surveys may be conducted on a semiannual basis (spring and fall) if monitoring during the previous year indicates that relocated animals are persisting and increasing.

Monitoring during years 6-10 following the initial release:

If the results of monitoring during the five year period following the initial relocation of giant kangaroo rats indicates that relocated individuals and/ or their offspring are persisting and increasing, the frequency of monitoring visits will be reduced with one visit (fall) during year seven and year ten.

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Compensatory Conservation Measures

Overview. Permanent loss of habitat for listed species as a result of the replacement of habitat with facilities and the presence of solar arrays will be compensated by the preservation, enhancement, and management in perpetuity of suitable lands outside the Project's immediate impact areas. Although some of the species covered by this BA, such as the San Joaquin kit fox and giant kangaroo rat (and possibly others), may continue to use the areas occupied by the solar arrays after installation, ~~these habitat within solar array areas are considered acreage for which compensatory conservation measures will be provided elsewhere and conservation lands will not include habitat within the solar arrays~~ will not be considered to provide conservation habitat. However, conservation lands within the ~~4,74700-acre property on which the Solar Generation Facility is located~~ that are not ~~permanently converted lost to facilities or under arrays subject to ongoing O&M activities~~ will be included within compensatory conservation habitat. ~~There are approximately 3,272 acres of undisturbed land within the property suitable for perpetual preservation and management to benefit a suite of rare endemic species. A subset of approximately 2,810 acres of suitable, but undeveloped habitat within the property— are suitable for conserving giant kangaroo rats~~ may only be appropriate to be this specific if we are talking about GKR; such areas are shown on Figure 6.) In addition, off-site habitat that is suitable for the species in question will be provided.

Compensatory Conservation Guidelines. The conservation habitat that is proposed by the applicant varies among species depending on the quality of habitat on the Solar Generation Facility site and a focus on the ~~the likelihood of~~ replacement and enhancement of lost functions and values through the preservation, enhancement, and management of habitat outside the impact areas. ~~The acres of~~ The amount of off-site conservation habitat preserved often may also varies by species and project circumstances y for a given species depending on the species life history requirements and relative value of the impact and conservation sites. Conservation using highly important lands that provide high value for the species in question or that contribute significantly to regional preservation efforts (e.g., lands that augment large areas of contiguous, preserved habitat), or lands that currently provide very low value but that could be enhanced to increase value considerably, are most beneficial to species as they have the greatest likelihood of achieving the objective of ~~will result in the preservation of fewer acres of off site habitat than lands that are roughly similar in quality to impacted habitat. As a result, the applicant has not identified set conservation ratios that will be achieved precisely. Rather, the applicant has identified broader conservation ratios to guide compensatory habitat conservation, or in some cases a range of ratios, that have been used as guidelines to determine the extent of compensatory conservation to be provided, recognizing that the~~ maintaining enancee or enhancing ement of the pre-project conditions baseline and replacing emor enhancing ent of lost functions and values. Thus,

the conservation of lands that provide high value for species through their significant contribution to regional preservation efforts and/or enhancing lands that currently provide very low value but restore functions and values in key areas within a regional context –will be the primary focus of compensatory conservation measures. These guiding conservation ratios are as follows:

- ~~Permanent loss of San Joaquin kit fox habitat permanently lost to facilities and under the presence of solar arrays will be compensated at a ratio of not less than 24:1 and not greater than 3:1 (conservation lands: impacted lands) for all permanently impacted acreage and for the such habitat acreage of habitat under the solar arrays; the final conservation ratio will be determined in consultation with the USFWS and CDFG, based on an analysis of the quality (i.e., biological functions and values) of the conservation land (a lower ratio is appropriate for higher quality conservation land). If monitoring does not detect continued kit fox use of the site following completion of construction, then the total conservation requirement will be increased by 1:1 for the acreage of the solar array footprints not being utilized.~~
- ~~Permanent loss of g Permanent loss of giant kangaroo rat habitat to facilities and the presence of solar arrays will be compensated at a ratio of not less than 4:1 for all permanently impacted acreage and for the acreage of habitat under the solar arrays. The 4:1 ratio will comprise 2:1 of preserved occupied habitat to be enhanced, 1:1 of created or enhanced habitat adjacent to occupied suitable habitat, and 1:1 of preserved occupied habitat. Giant kangaroo rat habitat permanently lost to facilities and under the presence of solar arrays will be compensated at a ratio of not less than 2:1 and not greater than 3:1 (conservation lands:impacted lands) for all permanently impacted acreage and for the such habitat acreage of habitat under the solar arrays; the final conservation ratio will be determined in consultation with the USFWS and CDFG, based on an analysis of the quality (i.e., biological functions and values) of the conservation land (a lower ratio is appropriate for higher quality conservation land). If monitoring does not detect continued kangaroo rat use, after completion of construction, of areas equivalent to occupied areas prior to solar array installation, then the total conservation requirement will be increased by 1:1 for the reduction in utilized acreage within the solar array footprint.~~
- Surveys of the majority of the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry sites in 2009 and 2010 did not detect the California jewel-flower or San Joaquin woollythreads. However, there is some potential for these species to occur in portions of the project sites that were not surveyed during the floristic period for these species, including portions of the switching station alternative sites and the recently acquired Martin parcel where array 11 would be located. Those previously unsurveyed areas will be surveyed according to protocol in spring 2011. If either species is detected ~~on the site~~

during ~~those future~~ surveys, ~~permanent loss of occupied~~ California jewel-flower or San Joaquin woollythreads habitat and ~~areas occupied by~~ individual plants ~~lost~~ to facilities and ~~the presence of under the~~ solar arrays will be compensated at a ratio of 1:1 (~~conservation lands: impacted lands~~) for all ~~occupied such~~ habitat ~~that is permanently impacted and for the acreage of occupied habitat under the solar arrays~~. While plants beneath the arrays would be monitored to determine their response to indirect impacts such as shading and other land use changes, shading impacts are assumed to be great enough to require compensatory conservation if direct and indirect impacts to these plants cannot be avoided. Temporary impacts to the California jewel-flower and San Joaquin woollythreads will be compensated at a ratio of 0.5:1 (~~conservation lands: impacted lands~~) if these species reappear within the impacted area within 2 years following revegetation. If under appropriate rainfall conditions, the species impacted do not appear in the impacted area within 2 years following revegetation, conservation shall be increased to 1:1 (~~conservation lands: impacted lands~~). The conservation areas must provide habitat supporting the impacted plant species.

- Unless surveys demonstrate that the Kern primrose sphinx moth is absent, permanent loss of *Camissonia* plants to facilities and the presence of solar arrays will be compensated at a ratio of 3:1 (~~conservation~~ on an individual plant basis ~~outside the impact areas~~) and temporary impacts will be compensated at a ratio of 2:1 (i.e., 1:1 conservation by revegetation in place and 1:1 conservation outside the impact areas ~~on an individual plant basis~~). ~~The conservation ratios will be determined on the basis of the abundance of individual plants.~~ The conservation areas must provide habitat with *Camissonia* and must be located within the range of the Kern primrose sphinx moth (or, if presence has not been verified on the Project site but has only been assumed, the conservation areas must be in the vicinity of the Solar Generation Facility or closer to areas of known occupancy than the *Camissonia* impact areas).

The same lands can be used to compensate for habitat impacts to multiple species as long as those lands support all those species.

Compensatory Conservation Strategy. The primary goal of the Project's conservation strategy is to ensure that the Project has no net adverse effect, and preferably has a net benefit, to populations of the federally listed species that will be impacted by the Project. This goal will be accomplished through the following:

- Avoidance and minimization of impacts to individuals of these species (as described in the previous avoidance and minimization sections), both to minimize take of individuals and to retain individuals on and near the Project site as a source of colonists for ~~preserved and~~ enhanced on-site and off-site habitats

- Avoidance, preservation, and management of on-site habitat. The Project will preserve approximately 3,272 acres (~~~2,810 acres suitable for giant kangaroo rat~~) of high-quality habitat ~~of the 4,74700 acre property on which within~~ the Solar Generation Facility ~~portion of the site is located~~. The majority of this habitat will not be impacted at all during Project construction; rather, measures will be implemented to avoid indirect effects during Project construction ~~and operation~~. The remainder of the on-site conservation areas consists of ~~land-habitat~~ that will be temporarily impacted but will then be restored following the completion of construction. ~~All of the un-impacted, -and temporarily impacted land that is subsequently restored, and restored habitat on this property will provide high-quality habitat during the operation of the Project.~~ Management of this habitat in perpetuity will target conditions providing high-quality habitat for listed species. In particular, the Project has avoided, and will preserve and enhance, areas containing approximately 91% of the giant kangaroo rat precincts that have been identified in the BSA, and the majority of the on-site conservation areas (approximately 2,810 acres) provide high-quality habitat for the giant kangaroo rat. Preservation and management of these lands for the giant kangaroo rat will benefit not only this species but also the San Joaquin kit fox (which preys upon the kangaroo rat) and other grassland-associated species, such as the mountain plover (*Charadrius montanus*). Managed grazing of these on-site conservation areas by cattle will ensure the maintenance of high-quality habitat in these areas.
- Preservation and management of off-site habitat. HPR II will acquire ~~off-site preservation habitat prior to construction of project facilities, and preserve, and manage~~ the off-site conservation areas ~~in perpetuity~~ for the listed species covered by this BA ~~within areas of regional importance for the species and approved by USFWS~~. These conservation areas will ~~comprise include~~ habitat that is occupied by the species that are impacted by the Project, to ensure the presence and enhancement (through targeted management) of populations of these species ~~and habitat~~. ~~In addition, these off-site conservation areas will include habitat that is unoccupied and suitable, or that could be made suitable through restoration or enhancement changes in management, for these listed species, but that is currently unoccupied.~~ Through land use changes and targeted management for these species (e.g., by removing active discing, ~~reseeding, and/~~ or introducing managed grazing), habitat quality for listed species will be improved considerably. For species, such as the San Joaquin kit fox and giant kangaroo rats, we anticipate the natural colonization of these improved and enhanced conservation lands because of their proximity to occupied habitat.

In June 2010, the Project applicant organized a meeting of representatives from the USFWS, CDFG, HPR II, First Solar (which is proposing the development of another large solar power plant on the Carrizo Plain), H. T. Harvey & Associates, Althouse and Meade, BLM, ESRP, and TNC to discuss a regional conservation

strategy for the Carrizo Plain. At this meeting, which was held on 21 June 2010, the attendees discussed the preservation and restoration strategies that would be necessary to maintain populations of special-status species within the Carrizo Plain, and habitat connectivity for these species both within the Carrizo Plain and between the Carrizo Plain and adjacent areas connecting to important conservation areas within the San Joaquin Valley. On 20 and 21 October, 2010, the Project applicant organized a meeting focused on conservation of the giant kangaroo rat. BLM, CDFG, USFWS, San Luis Obispo County, and Aspen staff along with researchers with San Diego Zoo, U.C. Berkeley, and San Francisco State University participated and assisted in further refining the preservation and restoration strategies for this species that would particularly benefit this species in the vicinity of the project site. The outcome of these meetings has guided HPR II in identifying regional off-site compensatory conservation areas, which will not only provide the ability for high-quality habitat enhancement and management in and of themselves, but will also contribute to the regional conservation of these species.

The applicant has been investigating potential conservation areas that would build upon the benefits provide by the management of populations on north of the Carrizo National Monument and link this regional population center with conservation areas in the San Joaquin Valley. Certain privately-held parcels of land proximate to the CVSR project site, south of the Carrizo National Monument, and in eastern Kern County possess extremely important ecological values for populations of giant kangaroo rats and San Joaquin kit fox. ~~During aerial surveys, California Department of Fish and Game biologist Bob Stafford recently located extant populations of giant kangaroo rats on privately held rangeland to the northwest of the project site, within some of the larger parcels that remain south of the project site, and within the California Valley Subdivision itself (Dave Hacker CDFG, pers. comm). SunPower has also located other populations of giant kangaroo rats between the Carrizo Plain National Monument and SR 58 in an area that is extremely important for conservation as it contains what is likely to be the northernmost extant population of giant kangaroo rats on the Carrizo Plain. Williams, et al. (1992) reported giant kangaroo rats from locations within the northern Carrizo Plain, and, although giant kangaroo rats may be currently limited by higher precipitation levels in the northern portions of the Plain, they appear to have been more widespread during drier periods.~~

At present, the northern portion of the Carrizo Plain is, for the most part, isolated from populations of giant kangaroo rats on the Monument by unsuitable habitats and land use. Preserving the few remaining populations on these privately-held sites that could potentially spread into the upper portion of the Carrizo Plain during these drier periods is an important element of the proposed off-site conservation.

Another objective of the off-site conservation strategy addresses a pattern of isolation and fragile connectivity between the large widespread populations of giant kangaroo rats on the Monument and ~~elsewhere in the region—the smaller satellite populations located north of the Monument.~~ This is one of the most important ecological factors likely to affect the long term persistence of the species in areas ~~of the Carrizo Plain~~ outside of the Monument. ~~For example, it is apparent that most of the CVSR project site was farmed as late as the early 1990's, and it is also apparent that giant kangaroo rats have only recolonized the project site in the last few years (Dave Germano, pers. comm.). It also appears that giant kangaroo rats that did finally recolonize the project site, after disking and tilling was ceased, ultimately came from extant populations to the south of the project site.~~

~~¶~~There is a clear opportunity to identify, enhance, and permanently protect the connectivity that enabled recolonization of the site and to enhance the connectivity of between the project site and suitable habitats within the region to the north by expanding the amount of suitable habitat in this area and building a series of habitat linkages. Lots within the California Valley Subdivision and a number of large parcels along the eastern edge of the Carrizo Plain contain potentially suitable habitat with conservation potential if managed for giant kangaroo rats. Combined, these areas include several thousand acres of habitat that contain the physical characteristics of habitats throughout the Carrizo Plain that support giant kangaroo rats. The protection and management of a subset of these lands currently being refined based upon suitability and availability, if managed for the benefit of giant kangaroo rats, would provide a significantly enhanced level of connectivity for populations occurring north of the Monument.

~~○~~Additional acreage within the subdivision is owned by the California Valley Community Services Department. Most of these parcels are approximately 40 acres in size and comprise native habitat with conservation value.

~~○~~SunPower has also identified an area along the eastern edge of the Carrizo Plain where soil type and slope are the same as areas throughout the Monument and project site, which are occupied by giant kangaroo rats.

~~○~~The California Valley Subdivision may contain a consolidated group of lots that available for acquisition, and would be suitable for additional preservation. This subdivision, which spans the two to three mile wide gap between the project site and the Carrizo Plain National Monument, is located immediately to the west, southwest, and south of the CVSR project site. The California Valley Subdivision was developed in the 1960s, when land speculators bought

~~an 18,400-acre ranch and subdivided the bulk of the ranch into 2.5-acre parcels, which were quickly sold to several thousand buyers. The water in this portion of the valley contains elevated salt content and is generally not potable. While largely undeveloped, the present management of these undeveloped lands is not aimed at maintaining suitable conditions for giant kangaroo rats. The land is designated for residential development. There are large populations of giant kangaroo rats on the Monument just a few miles from the Solar Generation Facility site and there are also giant kangaroo rat colonies of various sizes distributed throughout the California Valley subdivision. This is, in large part, a result of San Luis Obispo County Public Works' maintenance of most of the roads throughout the subdivision, preserving some open habitat along the road margins. Much of this edge habitat is occupied by giant kangaroo rats in areas with suitable soils and moderate vegetative cover. Habitats in the lot interiors have only been infrequently grazed for several decades and, for the most part, the vegetation has become too dense for giant kangaroo rats. Nonetheless, during reconnaissance of the subdivision, H.T. Harvey & Associates' mammalogists detected a number of locations where there were relatively dense giant kangaroo rat precincts, particularly in areas where there is evidence of some level of disturbance to the vegetation. The County currently holds a large number of these parcels in the vicinity of the project site and the Carrizo Plain National Monument. These lands are located in areas with slope and soil types similar to those occupied by giant kangaroo rats on the project site and the Monument. The availability of these parcels for purchase and their individual conservation value is variable, but the opportunity exists to develop a joint habitat management plan. Some areas within the subdivision support large numbers of giant kangaroo rat precincts within areas that appear to have been disturbed by alluvial deposits in the recent past that created suitable habitat for giant kangaroo rats.~~

~~SunPower will explore options to incorporate existing lots and Community Services Department parcels within the California Valley Subdivision into the broader conservation strategy to promote connectivity between the main segment of the population on the project site and colonies within the subdivision and National Monument.~~

The conservation strategy for this Project would result in permanent protection of high-quality habitat for all of the listed species that occur on the Solar Generation Facility, generation tie-line, switching station, and Twisselman Quarry [components of the Project sites](#), on lands where these habitats are currently vulnerable to conversion to incompatible land uses such as dryland farming or viticulture. On-site and off-site conservation will also involve the restoration of habitat on otherwise physically suitable lands for San Joaquin kit fox and giant kangaroo rats. The preservation and enhancement of degraded,

at risk habitat for giant kangaroo would provide a number of substantial benefits. Giant kangaroo rats are a keystone species, and re-establishment or population growth in areas where they have been extirpated or exist in low numbers will benefit numerous other species including the San Joaquin kit fox, American badger (*Taxidea taxus*), and burrowing owl (*Athene cunicularia*), which rely on them as prey, as well as San Joaquin antelope squirrels and potentially blunt-nosed leopard lizards, which rely on giant kangaroo rat burrows for shelter.