Appendix B-1

Biological Resources Technical Report

BIOLOGICAL RESOURCES TECHNICAL REPORT
PALEN SOLAR PV PROJECT
BLM CASE FILE NUMBER CACA-48810
RIVERSIDE COUNTY, CALIFORNIA

Prepared for
EDF Renewable Energy
505 14th Street, Suite 1150
Oakland, CA 94612

Prepared by:
IRONWOOD CONSULTING INC.
370 Alabama Street, Suite A
Redlands, CA 92373

April 12, 2017

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Acronyms

agl	above ground level
amsl	above mean sea level
AC	Alternating Current
BRSA	Biological Resources Study Area
BRTR	Biological Resources Technical Report
BBCS	Bird and Bat Conservation Strategy
BUC	Bird Use Count
BBI	Bloom Biological, Inc.
BLM	Bureau of Land Management
CDD	California Desert District
CDFG	California Department of Fish and Game (now Wildlife)
CDFW	California Department of Fish and Wildlife
CDFA	California Department of Food and Agriculture
CDPA	California Desert Protection Act of 1994
CESA	California Endangered Species Act
CEC	California Energy Commission
CEQA	California Environmental Quality Act
Cal-IPC	California Invasive Plant Council
CNPS	California Native Plant Society
CNDDB	California Natural Diversity Database
CRPR	California Rare Plant Rank
CDV	Canine Distemper Virus
CHUs	Critical Habitat Units
DRECP	Desert Renewable Energy Conservation Plan
DWMA	Desert Wildlife Management Area
DC	Direct Current
EA	Environmental Assessment
FESA	Federal Endangered Species Act
FWS	Fish and Wildlife Service
GIS	Geographic Information Systems
GPS	Global Positioning System
IWMP	Integrated Weed Management Plan
I-10	Interstate 10
MCL	Midline Carapace Length
MBTA	Migratory Bird Treaty Act
MFTL	Mojave Fringe-toed Lizard
NEPA	National Environmental Protection Act
NPS	National Park Service
NECO Plan	Northern and Eastern Colorado Desert Coordinated Management Plan

O&M	Operations and Maintenance
POD	Plan of Development
PSEGS	Palen Solar Energy Generating Station
PSPP	Palen Solar Power Project
PV	Photovoltaic
PA/FEIS	Plan Amendment/Final Environmental Impact Statement
PVA	Population Viability Assessment
RTHA	Red-tailed Hawk
RSA	Revised Staff Assessment
RESEZ	Riverside East Solar Energy Zone
TCAs	Tortoise Conservation Areas
USFWS	US Fish and Wildlife Service
WHMA	Wildlife Habitat Management Area
WRI	Wildlife Research Institute

1 INTRODUCTION

1.1 Background

In 2007, Chevron Energy Solutions and Solar Millennium proposed the Palen Solar Power Project (PSPP) in unincorporated Riverside County, California, through an application for a right-of-way (ROW) grant from the Bureau of Land Management (BLM). The PSPP included over 4,300 acres of concentrating solar project (solar parabolic trough technology). In 2011, the California Energy Commission (CEC) prepared a Staff Assessment, the BLM prepared a Final Environmental Impact Statement (FEIS), and the U.S. Fish and Wildlife Service prepared a Biological Opinion for effects to desert tortoise (*Gopherus agassizii*) for the PSPP. In 2012, BrightSource acquired the pending ROW grant application and proposed the Palen Solar Electric Generating System (PSEGS), which included a change in technology that consisted of two 750-foot towers, associated heliostat arrays, and modifications to linear project components (including the generation interconnection line (gen-tie) to accommodate the relocation of the Red Bluff Substation). In 2013, BrightSource and its joint venture, Abengoa Solar, Inc., submitted updated documentation to the CEC and BLM. The BLM prepared a Draft Supplemental EIS for the PSEGS project in July 2013. In 2015, EDF Renewable Energy (EDF RE) acquired the pending ROW grant application. Palen Solar III, LLC (Applicant), a fully owned subsidiary of EDF RE (and Palen Solar Holdings, LLC), has applied to amend the ROW grant application (Case File Number CACA-48810) from the BLM to construct, operate, and decommission a solar photovoltaic (PV) energy generating facility. The solar facility and associated gen-tie are collectively referred to in this report as the Palen Solar PV Project (Project), which is proposed to be sited within the previously analyzed PSPP and PSEGS footprints.

1.2 Purpose

This Biological Resources Technical Report (BRTR) provides a description of methods and results of biological resource surveys and investigations conducted between 2009 and 2016 for the PSPP, PSEGS, and Palen Solar PV Project.

The primary purpose of this report is to provide biological information that will be used as the foundation for impact assessments pursuant to the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA). The focus of this report is to consolidate and describe relevant biological resource data. A full assessment of impacts to biological resources can be found in the NEPA/CEQA environmental document. The discussion included herein may also be used to support formal consultation between Bureau of Land Management (BLM) and U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Federal Endangered Species Act

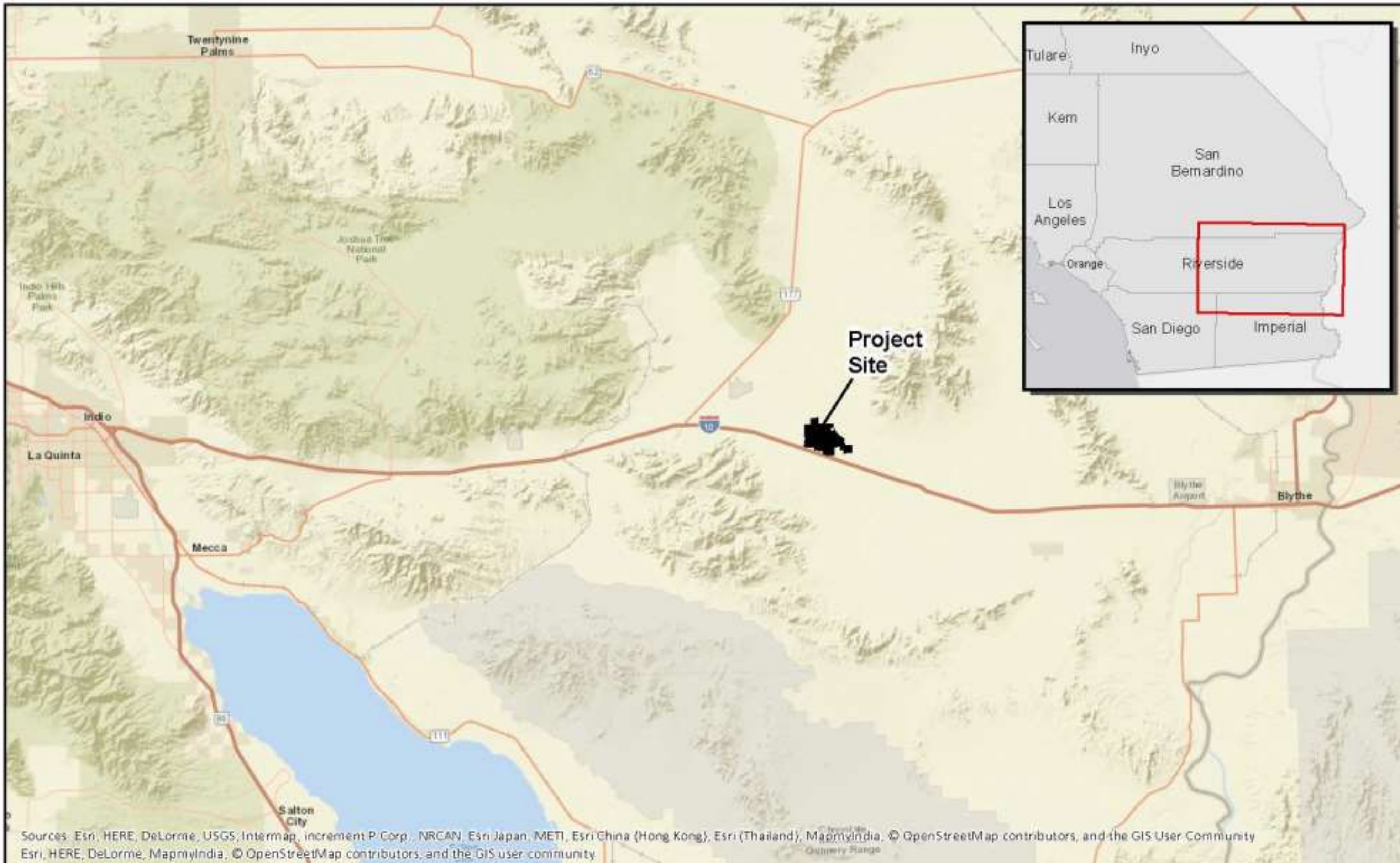
(FESA), and any necessary incidental take authorization from the California Department of Fish and Wildlife (CDFW) with respect to the California Endangered Species Act (CESA).

1.3 Site Location

The Project site is located entirely on lands administered by the U.S. Department of the Interior, Bureau of Land Management (BLM), located in unincorporated Riverside County, California. The site is located approximately ten miles east of the unincorporated community of Desert Center along Interstate 10 (I-10), halfway between the cities of Indio and Blythe (Figures 1 and 2). The Project site can be found on the Sidewinder Well 7.5-Minute U.S. Geological Survey topographic quadrangle. The Project site is located within the Riverside East Solar Energy Zone (SEZ) of BLM's Western Solar Plan, as designated in the Solar Programmatic Environmental Impact Statement and approved by a Record of Decision signed by the BLM on October 12, 2012.

The Project site is located within two wildlife habitat management areas (WHMA) designated in the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO): Palen-Ford WHMA and Desert Wildlife Management Area (DWMA) Connectivity WHMA. Management emphasis for the Palen-Ford WHMA is on the dunes and playas within the Palen-Ford dune system. Management emphasis for the DWMA Connectivity WHMA is on the geographic connectivity for the desert tortoise between the Chuckwalla DWMA and the wilderness area north of I-10. The Palen-McCoy Wilderness is 3 miles to the northeast, Chuckwalla Mountains Wilderness is 1.5 miles to the south, Little Chuckwalla Mountains Wilderness is 16 miles to the southeast, and the Joshua Tree Wilderness is 8.5 miles northwest of the Project site. Approximately 200 acres of the Chuckwalla desert tortoise critical habitat unit (CHU) overlaps the Project site. The majority of the CHU (over 1,023,000 acres) is located south and west of the Project site.

The site is located in the Sonoran Desert ecoregion setting, Chuckwalla Valley ecoregion subsection, of the Desert Renewable Energy Conservation Plan (DRECP). The DRECP includes areas managed by the BLM as the first implementation step. These lands were addressed in the Proposed Land Use Plan Amendment (LUPA) and Final Environmental Impact Statement (FEIS) (BLM 2015). The preferred alternative proposed in the LUPA/FEIS includes the Project site as a Development Focus Area (DFA). The preferred alternative also includes an expansion of Areas of Critical Environmental Concern (ACEC) within the proximity of the Project site including approximately 20,000 acres within the Chuckwalla DWMA, approximately 320,000 acres associated with desert tortoise linkage between the Chuckwalla and Chemehuevi DWMAs, approximately 3,600 acres associated with Palen Dry Lake, and approximately 41,000 acres associated with the Palen-Ford Playa Dunes.



Ironwood Consulting

0 10 20
Kilometers

FIGURE 1

Regional Location
Riverside County, CA

Palen Solar PV Project

S:\GIS\Projects\Maverick\BRTR Fig 01 - Regional Location.mxd | 8/2/2016

Ironwood
Consulting

0 0.75 1.5
Kilometers

Project Study Area

SCE Red Bluff Substation

** Alternative solar facility configurations, all within the Project Study Area are likely to be evaluated during the CEQA/NEPA process.*

FIGURE 2

Site Location

Riverside County, CA

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\BRTR Fig 02 - Site Location.mxd | 2/3/2017

1.4 Project Summary

The 500 MW (alternating current [AC]) Project would entail a single-axis tracking system with mounted photovoltaic (PV) technology. For the purpose of this report, Ironwood evaluated an approximately 4,200-acre study area, which included the proposed solar facility, main access road, and 300-foot wide, 7-mile long gen-tie line (Figure 2) as well as approximately 840 acres that are not planned for project use. The project disturbance area, equipment used, and schedule estimates may be reduced and/or modified consistent with the final engineering and permit requirements. As part of the Supplemental EIS/EIR, an evaluation of alternatives will be thoroughly analyzed. It is anticipated that BLM will propose and evaluate alternative solar facility configurations, technologies and or other land uses contained within the study area boundary referenced in this report. Alternatives examined will be evaluated during the CEQA/NEPA process. The Project would consist of several main components:

- Main project access road;
- Main generation area—PV arrays, switchyard, inverters, overhead lines, and access corridors;
- O&M Facility – either on or off site;
- On-site electrical substation and switch gear;
- Site security, fencing, and lighting; and
- Gen-tie Line with access road.

1.4.1 Solar Facility

The field of panels consists of repeating blocks of up to 2.50 MW (alternating current [AC]). The approximate dimensions of an array block consisting of 8,046 panels, separated into four quadrants. Within each quadrant, there would be 25 rows comprised of 27-panel strings. Each block would employ two inverters of up to 1.25 MW, set along the access roads, in the middle of the panel array area.

A horizontal single-axis balanced-mass tracker with independently-driven rows is proposed to be used for the PV modules. Tracking systems have a motor that rotates the PV modules from east to west during the day to track the sun across the sky. The tracking system would utilize a wireless communication system so that no communication wiring would be needed. Engineering design of the tracking system would be designed in accordance with code for wind loading and would be constructed of galvanized and stainless steel.

The panel field would be laid out by installing vertical H-pile galvanized steel beams directly into the ground by means of a small pile-driver. A preliminary walk-through by civil engineers suggests that this foundation would be sufficient to meet geotechnical requirements for wind stability. Site-specific soil tests would be required to validate the preliminary engineering. If tests conclude that further foundations are required, then the vertical H-pile galvanized steel beams would be attached to concrete ballasts. No welding would be required for assembly.

Spacing of the rows is driven primarily by engineering and shading constraints, but would also involve some micro-topography compensation.

1.4.2 Onsite Towers, Substation and Transmission Lines

A PV inverter would convert the DC electric input into grid-quality AC electric output. The AC electrical output would be transmitted from the PV inverter to the adjacent transformer. The transformer would step up the voltage of the AC electrical input and then would transmit the power via the PV collection system to the Project substation. The PV collection system connecting the panels to the inverters will be underground and utilize trenches for the electrical cabling, which would be 3 feet deep and from 3 feet to 6.5 feet wide. The substation would be located in the northerly portion of the Project site and would cover an estimated 5 acres. At the on-site substation, the generated electricity would be stepped up to 230 kV and routed via a new gen-tie line to the approved Southern California Edison (SCE) Red Bluff Substation.

Steel monopoles approximately 115 to 135 feet tall would be used for the gen-tie line. Typical spans between poles would be 900 to 1,100 feet. Self-weathering steel would be used for the monopoles, which are intended to blend with the surrounding mountains. The tower foundations for the gen-tie line would require ground disturbance to a depth of 20 to 30 feet. All fiber optic communication lines necessary to support the on-site telecommunication equipment would be located on the same poles used to support the gen-tie line.

1.4.3 Access Roads

The primary point of access to the Project site would be via the I-10 off the Corn Springs Exit along an existing road. Leaving the northern terminus of Corn Springs Road, the project will have an access road of less than a ¼ mile to the main gates. Although the existing road would be used to the extent possible, a new, 24-foot wide unpaved road would be constructed to serve as a primary point of access from the I-10 Corn Springs exit to the Project site. The access road would be constructed from a point just north of the I-10 Corn Springs Road exit, northerly along the existing dirt road for a short distance, then east to the Project site entrance. The new entrance road would enter the site at its western-most extent, near the temporary construction laydown area. Access roads within the Project site would be 24 feet wide and would be cleared, graded and covered with aggregate. Up to a 30-foot wide perimeter road, separating the solar arrays from the perimeter fencing, would be constructed around the entire perimeter of the

Project, on the inside of the fenceline. The roads would be constructed to allow fire and maintenance vehicle access.

1.4.4 Site Security Fencing

Site security would be of the utmost importance due to the high value of the solar panels used and the safety of personnel and the public. At the onset of construction, site access would be controlled for personnel and vehicles. Prior to panel installation, security fencing would be erected around the entire perimeter of the Project area, with an access gate in the southwesterly corner of the site at the access road and immediately north of the Project substation. The security fence would be 8 feet high and have an overall height of no more than 12 feet from the bottom of the fabric to the top barbed wire. The fence would have top rail, bottom tension wire, and three strands of barbed wire mounted on 45-degree extension arms. Posts would be set in concrete. The security fence will be installed near the start of construction but may be preceded by mowing and or vegetation clearance as required. The on-site substation would be surrounded by 12-foot security fencing and locked gates. All required laydown areas are expected to be contained within the defined Project boundaries, and thus no additional temporary fencing would be required. Additional gates may be installed to provide access in the event of an emergency.

1.4.5 Operations and Maintenance (O&M) Building

The onsite O&M building would be located within the southwesterly portion of the site in the laydown yard area near the main entrance to the Project and would consist of a 120-foot-wide by 240-foot-long prefabricated building set on concrete slab-on-grade that would be poured in place. The building would be an estimated 19 feet tall at its highest point. The facility would be designed for Project security, employee offices, and parts storage.

1.4.6 Gen-Tie Line

The Project's gen-tie route would remain the same as described and analyzed in Revision 5 of the existing Plan of Development (POD), as was proposed in the Palen Solar Energy Generating Station (PSEGS) project. Detailed plans to interconnect via a stand-alone gen-tie transmission line inclusive of the required electrical interconnection facilities would be developed in coordination with CAISO requirements and finalized prior to construction. Approximately six (6) temporary construction pull-sites for purposes of stringing the gen-tie line would be required.

1.4.7 Temporary Construction and Staging Areas

The staging area would include temporary construction trailers for the management of the construction, a parking area, and site security facilities. The Applicant has specified the southwesterly corner of the Project for this area. This area would accommodate delivery of materials, vehicles, etc. Material deliveries for the solar field would be ongoing, and panels and framing structures would be delivered throughout the solar field adjacent to the subunit locations. Portable latrines would also be located in this area.

Temporary staging areas for material laydown including boxes of solar panels, steel, aluminum framing, conduit for underground electrical, transformers, and other materials would be located throughout the Project area. The laydown areas would be subsumed by the build-out of the panel array with some exceptions. Laydown areas would not be required within the solar field as such. Materials such as boxes of panels, steel and aluminum framing, etc. would be laid out between rows of panels and along the access roads.

1.4.8 Site Preparation

The Project would use construction site preparation techniques that prepare the site for safe and efficient installation and operation of PV arrays.

The Applicant proposes to use site preparation techniques that would minimize the required volume of earth movement, including a “disc and roll” technique that uses grading equipment to till the soil over much of the solar facility site and then roll it level, as well as “micro-grading” or “isolated cut and fill and roll” of other areas of the site to trim off high spots and use the material to fill in low spots.

Much of the solar field would be impacted by some form of soil disturbance, either from compaction, micro-grading, or disc-and-roll grading. Scarifying, where required, would disturb the soil to several inches and potentially allow some roots to remain to assist in soil stabilization and reduce the possibility of erosion.

The Applicant will minimize grading and vegetation removal for the Project. When feasible, construction activities will implement drive and crush rather than grading. Construction equipment would drive over and crush native plants to minimize impacts to the roots of desert shrubs. Drive and crush is expected to reduce the recovery time of desert shrubs within the temporary construction areas. Mowing and/or trimming will be implemented wherever possible, allowing some native vegetation to remain in place under the PV panels.

Solar tracking and framing structures will generally follow the existing land contours with localized grading utilized only where necessary to address major variations in topography in areas that would not significantly impact existing vegetation or surface hydrology. Site grading within the Project site will be localized in nature and limited to major access roads (described in Section 1.4.3 above), inverter pad locations, lay down areas, internal and external transmission poles, and ancillary facilities (including parking area, material storage, operations and maintenance building and substation).

As described above, trenches will be excavated for electrical conductors that connect the PV modules and the inverters to the substation. The PV modules would be electrically connected by wire harnesses and combiner boxes that would collect power from several rows of modules and feed the Project's power conversion stations via direct current (DC) cables placed in underground covered trenches.

With regard to California Department of Fish and Wildlife (CDFW) jurisdictional streambeds, localized grading will be required to allow vehicle access when the slope is greater than 1 percent at the boundaries of delineated CDFW jurisdictional streambeds and the streambed is deeper than 12 inches (i.e., too steep for vehicles to traverse unassisted). Additionally, grading within CDFW jurisdictional streambeds is anticipated to only occur when no other equally-sound method of engineering will allow development of the Project at an equal or lesser cost than grading. Grading within CDFW jurisdictional areas with occur in accordance with the permit requirements. Temporarily disturbed areas will be revegetated.

Best Management Practices will be employed to prevent loss of habitat due to erosion caused by Project-related impacts (i.e., grading or clearing for new roads). All detected erosion will be remedied within 2-days of discovery. Additionally, fueling of equipment will take place within designated areas and not within or adjacent to drainages or native desert habitats. Contractor equipment will be checked for leaks prior to operation and any identified leaks will be repaired immediately.

Access roads would be moderately graded to allow regular access with a small vehicle. Where temporary access is needed to install facilities, such as along the perimeter fencing, no removal of existing vegetation or grading would occur. Instead, equipment would drive over or around existing desert scrub vegetation without direct removal. As noted above, crushed vegetation is more likely to recover faster than where vegetation is removed and reseeded, or where soils are disturbed. Revegetation with native species would be implemented where feasible in areas of temporary disturbance.

Continued weed management in cleared areas would be maintained through regular monitoring and targeted application of the herbicide glyphosate, which is approved for use on BLM lands and/or by occasional blading. Some vegetation may be allowed to grow back among the field of solar panels. Additional soil disturbance by regular operations of the plant is not expected. The Project would implement a Weed Management Plan (WMP). The WMP would tier from the BLM's 2007 Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement and would describe applicable regulations for the use of herbicides on federally managed lands in California, and provide the basis for proper management and use of herbicides at the site. The WMP would include weeding, annual pruning, and soil monitoring if necessary. Weeding would occur frequently during the initial growth period to ensure that invasive plants do not mature and set seed. Weeding activities would follow the approved WMP. Once revegetated native plant species are established in the temporarily disturbed areas at the site, weeding frequency would drop to less frequent levels. Native vegetation would be allowed to re-grow within the solar panel field to the extent that it does not interfere with the panels themselves (no higher than 18 inches) to avoid growing into electrical connections and creating a fire hazard, or disrupting the panel's performance. The access roads would be kept clear of vegetation through the use of targeted herbicide spraying, occasional scarifying, or weeding to reduce fire hazard and allow access to the panel arrays.

2 SITE CHARACTERISTICS

The following descriptions are primarily sourced from the California Energy Commission (CEC) Revised Staff Report (CEC 2010) and Palen Solar Power Project (PSPP) PA/FEIS (BLM 2011).

2.1 Regional Setting

The Project site is located in the central portion of Chuckwalla Valley, an area east of Palm Springs in the Colorado Desert. The elevation of Chuckwalla Valley ranges from under 400 feet at Ford Dry Lake to approximately 1,800 feet above mean sea level (amsl) west of Desert Center and along the upper portions of the alluvial fans that surround the valley perimeter. The surrounding mountains rise to over 3,000 feet amsl. The topography of the Project site generally slopes downward to the southeast at a slight gradient of less than 1 percent. Ground surface elevations at the Project site itself range from approximately 680 feet amsl in the southwest to 425 feet amsl in the northeast. Steeper grades are present at isolated sand dunes along the northern portion of the site.

Existing anthropogenic features and private land uses exist in the vicinity of the Project site includes agricultural, residential, renewable energy, energy transmission, historical military, and recreation development. Much of the agriculture has waned in the past 10-15 years, including most of the aquaculture (fish farms) and jojoba ventures; however, several crops are still grown, including a citrus orchard and date palm orchard just west of the Project site. Approximately 1,600 acres of private lands occur within one mile west of, and immediately adjacent to, the Project site. Approximately 830 acres of these private lands currently support active agricultural practices on converted natural desert habitat.

Evidence of historical military use from the 1942 Desert Training Center, California-Arizona maneuvers can be found in the Project vicinity. There are also many tracks of four-wheel-drive vehicles near the freeway, presumably made during freeway construction, that have disrupted the surface and are clearly evident in the interfluvial desert pavement.

The I-10 is located just south of the Project site. The developed footprint of I-10 and associated wing dikes and bridges have altered natural habitat within and adjacent to the freeway. These alterations have likely resulted in changes to surface hydrology and condition of natural habitat within the Project site over time. These alterations are discussed further herein with regard to biological and hydrological resources.

2.2 Hydrology

The Project site occurs within the Chuckwalla Valley Drainage in the Colorado River Hydrologic Basin Planning Area. Palen Dry Lake and Ford Dry Lake represent the lowest elevations within the basin. Desert washes within this region contract and expand dramatically in size due to extreme variations in flow, which can range from high-discharge floods to periods when surface flow is absent. The Project site lies between the alluvial fans emanating from the Chuckwalla Mountains to the south, the Coxcomb Mountains to the north, and the Palen Mountains to the northeast. The Project site resides in the lower reaches of the neighboring alluvial fans and is characterized by less stabilized soils consisting of finer sand and silt as compared to the upper alluvial fan reaches that support stabilized, rocky soils with well-defined channels.

Alluvial processes across the majority of the site generally flow from southwest to northeast. To the south, the I-10 was constructed over 45 years ago across the alluvial fan outlet of Corn Springs Wash (CEC 2010). Interstate 10 and associated wing dikes have altered natural surface flows from dozens of meandering small alluvial washes into concentrated discrete channels. Flows associated with the alluvial fan emanating from the Chuckwalla Mountains (primarily associated with the Corn Springs Wash system) are routed under the I-10 via three bridge spans and enter the Project site. Measurements of these spans were conducted during wildlife connectivity surveys and analysis: Underpass 10 is 3.0 meters high, 30.1 meters wide, and 60.3 meters in length; Underpass 11 is 3.3 meters in height, 24.3 meters wide, and 58.4 meters in length; and Underpass 12 is 3.3 meters in height, 17.3 meters wide, and 57.8 meters in length (Solar Millennium 2010b). The westerly bridge (Underpass 10) near Corn Springs Road Interchange conveys flow from the main branch of Corn Springs Wash to the northwest corner of the site. This channel supports the most substantial flow depth of the three; however, the prominent channels eventually spread out into numerous small channels within the relatively flat topography to the north of the I-10 (CEC 2010). Underpasses 11 and 12 convey flows to the center and east side of the Project site respectively.

2.3 Soils

The Project site supports two general soil types per the United States General Soil Map: (1) the Rositas–Dune land–Carsitas map unit and (2) the Vaiva-Quilotosa-Hyder-Cipriano-Cherioni map unit (CEC 2010). The Rositas-Dune land-Carsitas map unit occurs on the northeastern 32 percent of the site and is characterized by soils with a very high sand percentage (greater than 95 percent) and is highly susceptible to wind erosion. The remaining 68 percent of the site was mapped as the Vaiva-Quilotosa-Hyder-Cipriano-Cherioni map unit characterized by soils with high percentage (greater than 65 percent) of sand with moderate susceptibility to wind erosion.

These data were used in conjunction with field observations and laboratory testing conducted as the result of field reconnaissance to better characterize the soils on site (CEC 2010).

Soil profiles observed in the test pits were typically sands, and laboratory analysis measured sand content from 83 to 94 percent. Silt content measured in the soils ranged from 2 to 8 percent, and clay content from 2 to 11 percent. Observed profiles exhibited a range of effervescence from none to slight in the top layers, but effervescence increased with depth indicating increasing percentages of carbonates (CEC 2010).

2.4 Rainfall

Measurements of precipitation during winter (October through March) and summer (April through September) periods are important in determining the efficacy of both desert tortoise and special status plant surveys. Data was obtained from the Western Regional Climate Center (WRCC 2016) for the most proximate stations to the Project site: Blythe Airport and Eagle Mountain weather stations (approximately 26 and 13 miles from the Project site, respectively). Historical rainfall data from 2009 to 2017 were totaled and averaged (Table 1). Over the period of analysis, the highest winter rainfall occurred in 2010 and highest summer rainfall occurred in 2012. Since 2014, annual winter and summer rainfall has measured less than 50% compared to the peaks in 2010 and 2012.

Table 1 - Regional Rainfall Totals Since 2009

Year	October to March (inches)	April to September (inches)
2009	2.4	0.2
2010	4.8[1, 2]	0.1
2011	2.5	1.2
2012	1.0	3.3[1]
2013	1.5	2.6
2014	0.7	1.2
2015	2.1	1.3
2016	1.5	0.7
2017	3.4	n/a

[1]Maximum average recorded winter and summer rainfall during 2009 – 2017

[2] Includes 0.72 inches in October 2010.

2.5 Sand Transport System

Sand transport within the Chuckwalla Valley region involves an interaction between hydrological (alluvial and fluvial) and aeolian (wind-blown) processes (Philip Williams and Associates [PWA] 2010, Kenney 2010, Desert Research Institute [DRI] 2013, Palen Solar Holdings [PSH] 2013, and Lancaster et al. 2014). The sand transport system located in the

Chuckwalla Valley has been the subject of several previous studies. Studies have centered on two distinct objectives; (1) characterizing the existing conditions of sand transport, including evaluating the patterns of sand migration, and (2) assessing the potential impacts of solar development on the sand transport system resulting from proposed solar facilities.

The Chuckwalla Valley Drainage System includes Palen Dry Lake and Ford Dry Lake, which represent the lowest elevations within the basin. Alluvial fans that emanate from the neighboring mountain ranges including the Chuckwalla Mountains, Coxcomb Mountains, and Palen Mountains entrain sediments during periods of surface flow and deposit sediments downstream. Larger sediments fall out higher in the alluvial fan, while finer sand is deposited further down the alluvial fan. At the lowest reaches of alluvial wash system along the edges of the valley basins, finer sand accumulates and is subject to wind erosion, becoming a source of sand within a larger aeolian sand transport corridor (PWA 2010).

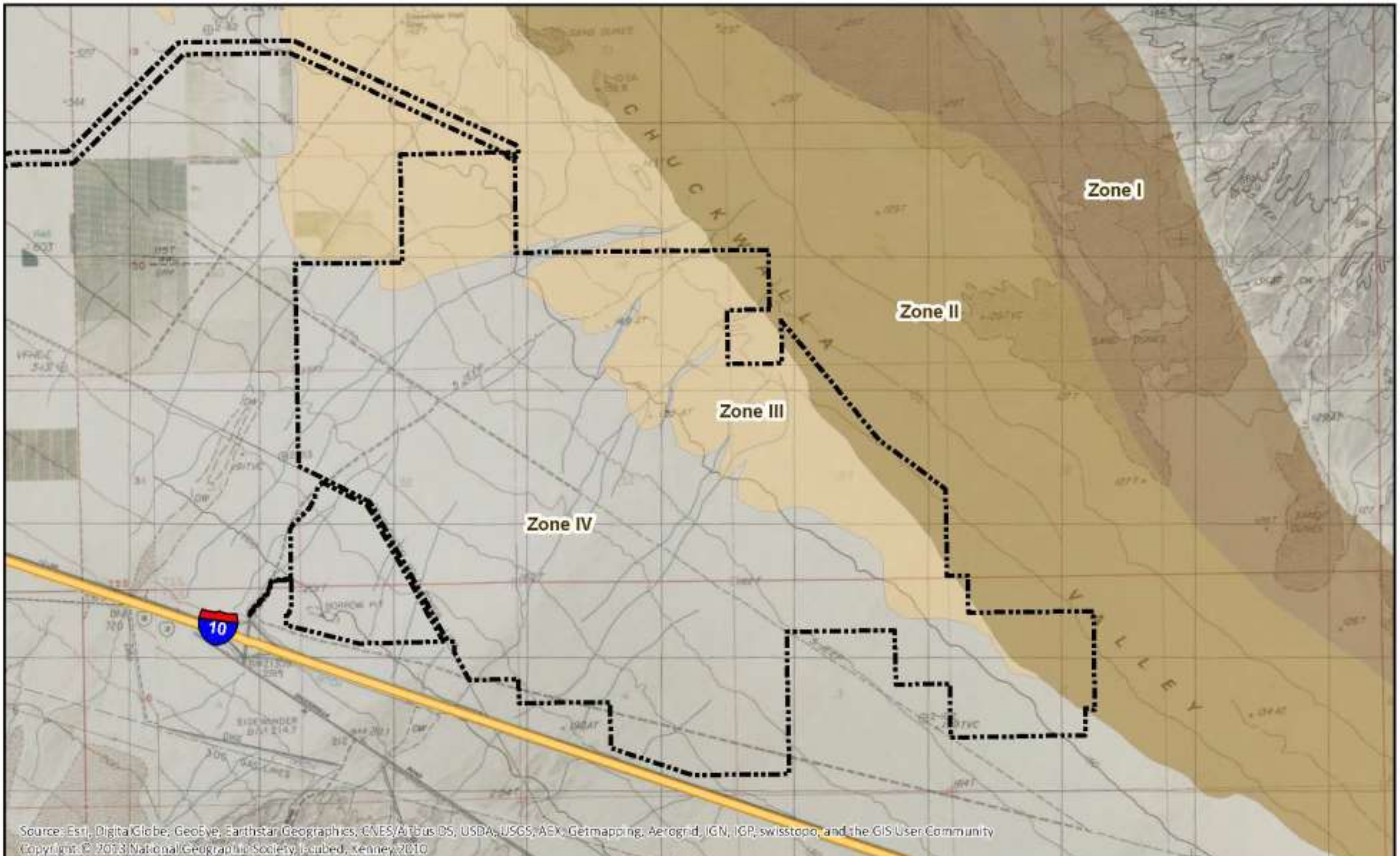
Within the Chuckwalla Valley, sand accumulates within three primary aeolian sand transport corridors: (1) Dale Lake-Palen Dry Lake-Ford Dry Lake sand migration corridor along the Chuckwalla Valley; (2) Palen Valley-Palen Dry Lake sand migration corridor where sand is transported southeast along the Palen Valley; and (3) Palen Pass-Palen-McCoy Valley sand migration corridor, located between the Palen and McCoy Mountains, where sand is transported in a southerly direction/towards the Chuckwalla Valley (BLM 2011). Prevailing winds in this region vary seasonally, and indicate two dominant wind directions during typical years. During the spring and summer months, the strongest winds are associated with monsoonal storm events, and come from the south. During the fall and winter months, the prevailing winds are associated with Pacific Ocean derived weather patterns, and come from the north-northwest. Regional aeolian system studies indicate that the prevailing wind responsible for aeolian sand transport was locally influenced by mountain range topography (BLM 2011). Sand delivered from upwind is deposited, replenishing sand that has been lost downwind (CEC 2014a). Additional sand is added to corridors from local wind corridors that can be thought of as ‘sand corridor tributaries’ and by fluvial sources. The activity and location of sand transport corridors are not fixed in time or space. Sand corridors can expand, contract or migrate with changing weather and climate (PWA 2010).

The Project site is located within and adjacent to the Palen-Ford sand migration corridor, which is part of the Clark’s Pass sand ramp running from northwest to southeast from the Dale Lake playa, north of Joshua Tree National Park (San Bernardino County), to sediment sinks in the Palen-Ford dune field in Sonoran Desert of Riverside County (Zimbelman et al. 1995). Aeolian processes play a major role in the creation and establishment of sand dune formations and habitat in the Chuckwalla Valley (BLM 2011). Winds enable the sand ramp to surmount topographic barriers that otherwise separate the Dale Lake Basin and the Palen-Ford Basin.

At a finer scale, the Project site and adjacent lands have been characterized by four relatively discrete sand transport zones (Kenney 2010) that vary along a southwest to northeast gradient in the degree of aeolian sand transport present (Figure 3). The Project site transitions from a currently stable coarse gravel alluvial fan surface with some relict sand dunes that have largely deflated (blown away) in the southwest extent, to more active wind-blown sand with relatively shallow sand deposits, and finally an area of deeper and more active vegetated sand dunes in the northeastern extent and outside the Project site. An updated assessment using high resolution satellite imagery compared two images from June 21, 2010 and April 16, 2016. The zones described by Kenney (2010) were used for reference to detect any major changes in surface conditions. RGB-alpha channels, contrast and brightness settings were adjusted using Geographic Information Systems (GIS), similarly between both images. Figure 4 illustrates the comparison of the soil surfaces between 2010 and 2016 and indicates that the extent of relatively fine sand (displayed as magenta) was consistent between the two images.

On behalf of the California Energy Commission (CEC) in 2010, PWA provided independent mapping of sand transport land units within the project area and acknowledged agreement with the delineation of sand transport zones mapped by Kenney (2010), except for the eastern limit of Zone I and degree of sand transport within Zones I and II (both outside the Project boundary). The authors noted that the zones were ‘interwoven and gradual’ and that hydrological and aeolian processes on the site occurred as a gradient, from southwest to northeast. PWA (2010) also provided valuable context to the dynamic nature (expansion and contraction) of the sand transport corridors that result from annual cycles of wet and dry conditions:

> *The activity and location of sand transport corridors is not fixed in time or space. Fluvial delivery of sediment from mountain fronts to the alluvial fans, troughs and playas tends to occur in wet winters associated with El Niño events that occur on average every 3-5 years. Due to the wet conditions wind transport may be less active during these years, so sediment may be temporarily stored in downstream channel areas or playas. During La Niña events (also approximately every 3-5 years) winters tend to be drier, promoting wind transport and aeolian processes. Fluvially delivered sand deposited in channels or playas during an El Niño event can be transported by the wind during a subsequent La Niña event. In an analogous manner, sand corridors can expand, contract or migrate with changing weather and climate. Wetter than average conditions may allow vegetation to encroach on the edges of a sand transport corridor, thinning it; dryer or windier condition may add more sand to the corridor and bury vegetation, widening the corridor. Changes in prevailing wind direction or strength may change the location or intensity of sand transport.*



Ironwood Consulting

0 500 1,000

Meters

Base Layers

Project Study Area

I10

Aeolian Sand Zones

Zone I

Zone II

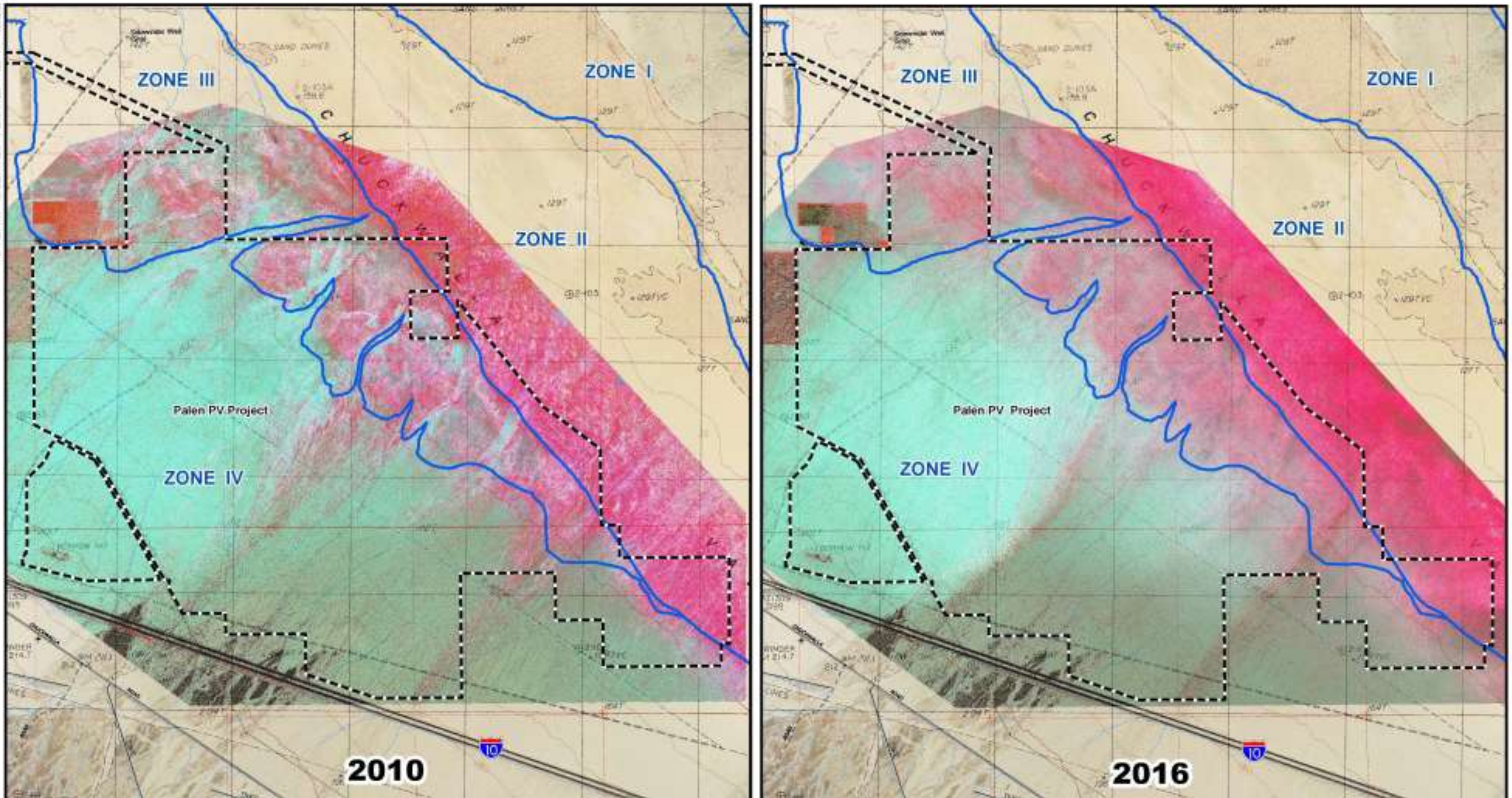
Zone III

FIGURE 3

Sand Transport Zones

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\BRTR Fig 03 - Sand Transport Zones.mxd | 2/3/2017



Aeolian Sand Zones

Palen PV Project Study Area

Layer Properties - Symbology Settings

RGB Composite
Red = Band 4, Green = Band 1, Blue = Band 2, Alpha = Band 3
Stretch = ESRI; Statistics 'From Each Raster Dataset'
Contrast = 60; Brightness = 0; Transparency = 0

0 1,500 3,000 Feet

PALEN PHOTOVOLTAIC SOLAR PROJECT

Figure 4

High Resolution Imagery Soil Assessment

Zone IV

In the southern and western extent of the Project site, the surface is a mixture of deflated vegetated dunes with thin coarse sand and patches of alluvial gravel and desert varnish with little available fine loose sand for transport to dunes downwind (BLM 2011). Zone IV represents an area where wind transport is not the significant process for sand migration rather hydrological (alluvial and fluvial) erosion is more prominent (Kenney 2010). The majority of the Project site (approximately 71 percent) is located within Zone IV. PWA (2010) described Zone IV as the mid-alluvial fan with degraded vegetated dunes and coarse alluvial surfaces. The authors noted that patches of vegetated, deflated sand dunes occurred within this zone and sand was being removed by wind but not replaced. It was observed that fine, loose sand was not readily present within this zone.

In conjunction with the DRECP process, the Department of Conservation's California Geological Survey (CGS) prepared a regional *Eolian System Mapping Report for Eastern Riverside County in 2014* (Lancaster et al. 2014). The report characterized the map units in Zone IV as consisting primarily of Qyf, which is described as modern alluvial fan deposits consisting of 'unconsolidated to slightly consolidated sand and gravel'. Within this map unit, local alluvial fans serve as a source of aeolian sand. PWA (2010) noted that the major washes, notably the central major wash, supported bordering sandy zones within one mile of Interstate 10 that appeared suitable for Mojave fringe-toed lizards. The authors asserted that the minor washes were likely degraded (transporting lower volumes of water and entrained sediment) due to the obstruction of Interstate 10 and, subsequently, the major washes receiving more surface flow, thus distributing a higher volume and fine sediment than prior to construction of Interstate 10. Lancaster et al. (2014) noted, like PWA (2010) that changes to upstream drainage patterns (e.g., construction of Interstate10 and associated dykes) result in downstream hydrological degradation, resulting in portions of the alluvial fan less active than under historical conditions. Lancaster et al. (2014) mapped the major washes that bisect Zone IV as map unit (Qw), which is described as unconsolidated fine to coarse-grained sand and sandy gravel with subordinate fine sand and silt with bar and swale morphology and is noted as an active aeolian source.

Zone III

Moving north and east the fan surface supports sandier conditions with slightly more active wind-blown sand area with relatively shallow sand deposits. Zone III supports shallow vegetated sand dunes and sand sheets that are deflated, although less than in Zone IV and that this zone contains more abundant sand than the dunes in the mid-alluvial fan. Approximately 23 percent of the Project site is located within Zone III. PWA (2010) asserted that the dunes appeared to be in relative equilibrium; losses of sand due to wind erosion were matched by deposition of sand from upwind; however, this contrasts with Kenney (2010) and PSH (2013) in that there were consistent observations that aeolian landforms within this zone were more extensive in the past than at present and that alluvial processes have disturbed relic sand dunes. PWA (2010) maintained that there was evidence of moderate levels of aeolian sand transport in Zone III, and this surface appears to form the outer zone of the sand transport corridor. Lancaster et al. (2014) provided additional observations of aeolian activity within the zone and mapped two relatively small units ranging from stabilized to active windblown deposits less than 1.5m thick. Due to the scale of mapping, Lancaster et al. (2014) provided additional context about the margins of the sand transport corridors by asserting these areas may have experienced a period of inactivity and substantial interactions (intergrading of fluvial erosion, active sand sheet accumulation, and aeolian dune formation) occur near the lower reaches of alluvial fans.

The high-resolution satellite imagery comparison between 2010 and 2016 reveals that the western boundary of Zone III corresponds well with the surface soil conditions and follows the topographical features derived from the mid-alluvial fan.

<u>Zone II</u>

Active aeolian sand migration occurs in migration corridors located along the northeastern boundary of the Project site. The vegetated dunes become deeper and the sand becomes more abundant in Zone II (PWA 2010). This area has hummocky vegetated dunes with greater topographic expression than the zone to the west, implying that they are more actively supplied by sand. This portion of the sand transport corridor is more active than the shallow vegetated sand dunes (Kenney 2010). Approximately 6 percent of the Project site is located within Zone II. Lancaster et al. (2014) mapped Zone II as Qe, which is described as active windblown deposits consisting of dunes and sand sheets typically greater than 1.5 m in thickness with fine to medium grained sand.

The high-resolution satellite imagery comparison between 2010 and 2016 reveals that the western boundary of Zone II is distinct and consistent between both years (Figure 4). The western boundary of Zone II near the Project site has not substantially changed since the original assessment in 2010.

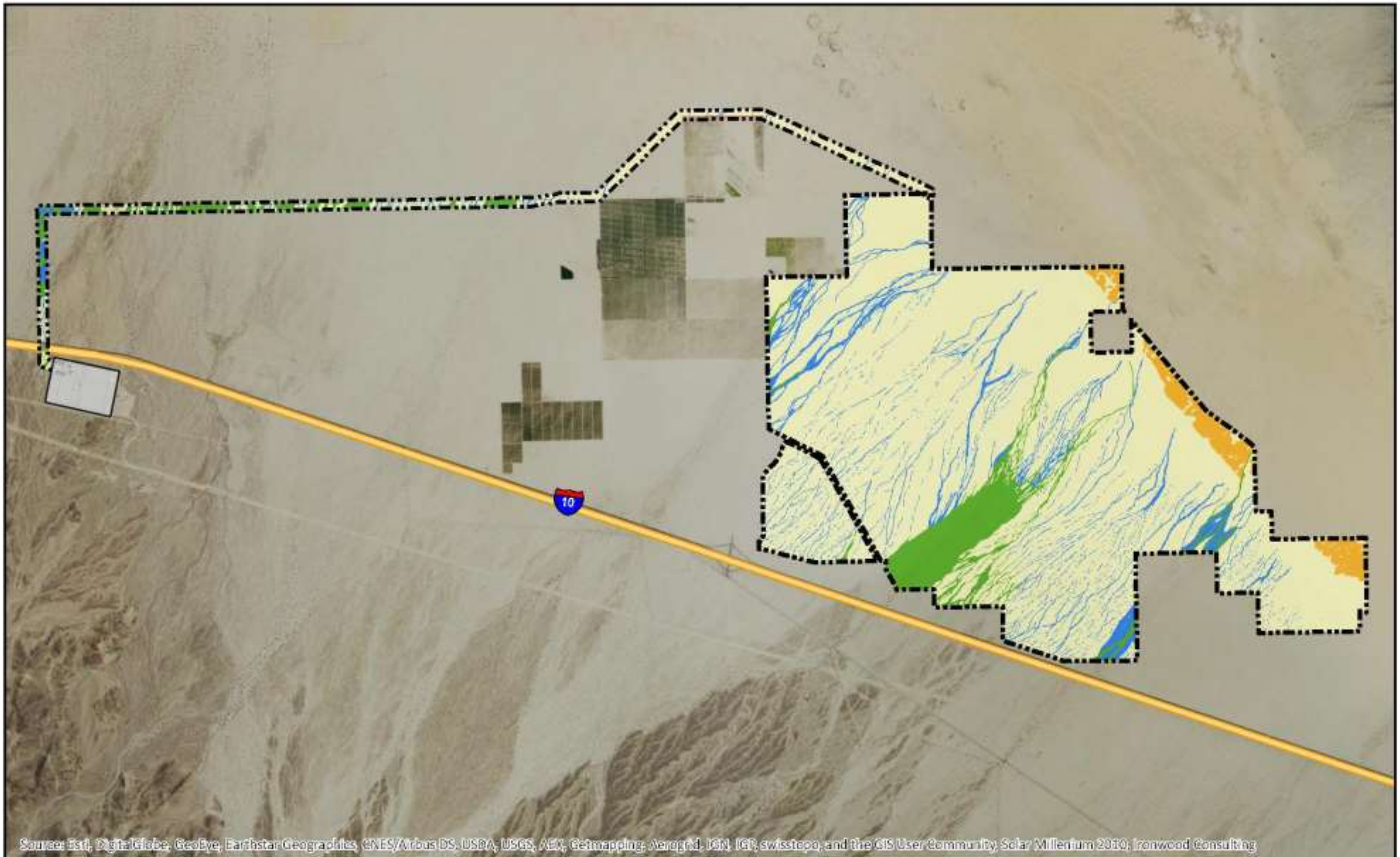
<u>Zone I</u>

Zone I is located outside and northeast of the Project site. This area has the greatest rate, most active, of sand transport of the four zones. Zone I supports active transverse dunes that are not stabilized and range from 8 to over 20 feet high. This area and portions of Zone II are included in the Palen Dune system. Potter and Weigand (2016) performed a comprehensive review of Landsat image spectral data between 1985 and 2014 to evaluate sand dune migration within the Palen Dunes. The study area was situated within the active dunes with sampling transects that were outside the Project boundary, apart from the southern-most transect that was located adjacent to the northern Project boundary. During the 30-year period of analysis, the study found that the aerial extent of the Palen Dunes had grown by 47%, active dune aerial extent had grown by 60%, and scattered bush decreased by approximately 18%. The authors estimated that the Palen dune had migration rates up to 50 m per year, with most active rates in 2014 and least active rates in 1995. These measurements were greatest in the middle of the Palen Dunes, with are located greater that two kilometers north of the Project site. The models indicated negligible dune formation within the periphery of the Palen Dunes, where the Project site is located. Potter and Weigand (2016) asserted that no active threats to energy facilities at Chuckwalla Solar I and the Palen Solar I [approximate location of the Palen Solar PV Project] was evident and that the leading edge of sand accumulation in 2014 remained greater than two kilometers from the Project site.

2.6 Vegetation

2.6.1 Natural Communities

The Project site consists almost entirely of four natural vegetation communities (Figure 5 and Table 2). Vegetation communities in the Project area were classified by Holland (1986) and cross-referenced with *A Manual of California Vegetation, 2nd edition* (Sawyer et al. 2009) and the National Vegetation Classification System (NVCS) referenced in the DRECP. Two communities (desert dry wash woodland and unvegetated ephemeral wash) that occur within the Project site are considered sensitive due to their association with alluvial processes and likely State water jurisdiction. One community (stabilized and partially stabilized desert dunes) that occurs within the Project site is considered sensitive due to its association with aeolian processes. Other sensitive groundwater-dependent vegetation communities described under PSPP (BLM 2011; CEC 2010) include honey mesquite woodlands, alkali (desert) sink scrubs, sparsely vegetated playa lake beds, and jackass clover. These vegetation types do not occur within the Project site and are not discussed in further detail herein.



Ironwood Consulting

0 750 1,500
Meters

Project Study Area
SCE Red Bluff Substation
I10

Agriculture
Sonoran Creosote Bush Scrub
Desert Dry Wash Woodland
Developed/Disturbed
Unvegetated Ephemeral Dry Wash
Stabilized and Partially Stabilized Sand Dunes

FIGURE 5

Vegetation Communities

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 020317\BRTR Fig 05 - Vegetation Communities4.mxd | 2/6/2017

Table 2 - Vegetation Communities within Project Survey Area[1]

Vegetation Communities	Community	Area (acres)
Sonoran Creosote Bush Scrub	Upland	3,362
Desert Dry Wash Woodland	Sensitive	322
Stabilized and Partially Stabilized Desert Dunes	Sensitive	123
Unvegetated Ephemeral Dry Wash	Sensitive	335
Agriculture	Upland	6
Developed/Disturbed	Upland	8
Total		**4,156**

[1] Acreages for survey area, not impact areas, and includes solar facility and 300-foot wide gen-tie survey areas.

2.6.1.1 Sonoran Creosote Bush Scrub

Sonoran creosote bush scrub habitat characterizes most of the Project site and intergrades with desert dry wash woodland along desert washes. This community is synonymous with *Larrea tridentata -Ambrosia dumosa* alliance (Sawyer et. al 2009) and *Lower Bajada and Fan Mojavean-Sonoran Desert Scrub* (NVCS). This vegetation community is not designated as a sensitive plant community by BLM (NECO Plan) but has a State Rarity rank of S5, and is classified in the DRECP (CEC 2014c). Sonoran creosote bush scrub occurs on well-drained, secondary soils of slopes, fans, and valleys and is the basic creosote bush scrub habitat of the Colorado Desert (Holland 1986). Within the Project site, this community is characterized by sandy soils with a shallow clay pan. Dominant plants within this community are creosote bush and white burr-sage. Other occasional components include indigo bush (*Psorothamnus* spp.), white rhatany (*Krameria bicolor*), Anderson's desert thorn (*Lycium andersonii*), Saltbush (*Atriplex* spp,), and a rich annual flora. Past anthropogenic disturbances within the vicinity of the Project site have resulted in a substantial presence of invasive plant species within the creosote bush scrub community. The I-10 and associated diversion dykes located south of I-10 may contribute to the overall sparse vegetative cover and low diversity of creosote bush scrub due to alteration of historical alluvial flows (BLM 2011). As a result, the majority of surface flow has been modified from occurring within the broader fan and is presently concentrated within more narrow channels as they cross under the I-10.

2.6.1.2 Stabilized and Partially Stabilized Desert Dunes

Stabilized and partially stabilized desert dunes are considered sensitive by the state of California, and are classified as S3 in the California Natural Diversity Database (CNDDB 2016; CEC 2010), by the BLM (NECO Plan) and within the DRECP (CEC 2014d). This community is synonymous with *Dicoria canescens - Abronia villosa* Desert Dunes alliance (Sawyer et. al 2009) and *North American Warm Desert Dunes and Sand Flats* (NVCS).

These dune systems consist of sand accumulations in the desert that have stabilized or partially stabilized as evergreen and/or deciduous shrubs and scattered, low grasses have colonized. These dunes retain water just below the sand surface. Water availability allows deep-rooted, perennial vegetation to survive during longer drought periods (Holland 1986). This community occurs within the margins of Palen Dry Lake and extends into the eastern edge of the Project study area. Dominant plants within this community included creosote bush, big galleta grass (*Hilaria rigida*), desert twinbugs (*Dicoria canescens*), desert sand verbena (*Abronia villosa*) and dyebush (*Psorothamnus emoryi*). Desert sand dunes provide unique habitats that often support plants, mammals, reptiles and insects that are restricted to sand dunes.

2.6.1.3 Desert Dry Wash Woodland

Desert dry wash woodland is a sensitive vegetation community recognized as S4 by the CNDDB and the BLM (NECO Plan) and the DRECP (CEC 2014d). As described in supporting documentation for PSPP (BLM 2011; CEC 2010), desert dry wash woodland habitat is likely regulated by CDFW as State waters. This community is synonymous with blue palo verde (*Parkinsonia florida*) - ironwood (*Olneya tesota*) (microphyll) woodland alliance (Sawyer et. al 2009) and *Sonoran - Coloradan Semi Desert Wash Woodland / Scrub* (NVCS). Desert dry wash woodland was mapped consistent with the *Vegetation Survey and Classification for the Northern & Eastern Colorado Desert Coordinated Management Plan* (CNPS 2007). Holland (1986) describes this community as an open to relatively densely covered, drought-deciduous, microphyll (small compound leaves) riparian scrub woodland. These habitats often are supported by braided wash channels that change patterns and flow directions following every surface flow event (CEC 2010). Desert dry wash woodland provides habitat for common and special status wildlife species.

Within the Project site, this vegetation community is dominated by an open tree layer of ironwood (*Olneya tesota*), with occasional blue palo verde, and smoke tree (*Psorothamnus spinosus*). Ironwood, palo verde, and smoke tree are desert phreatophytes (deep-rooted plant that obtain water from a permanent ground supply or from the water table). The understory is a modified creosote scrub with big galleta grass (*Hilaria rigida*), cheesebush (*Ambrosia salsola*), desert lavender (*Hyptis emoryii*), and occasional Russian thistle (CEC 2010). Desert dry wash woodland is associated with the three wash systems that are channelized under the I-10. As the washes flow northeast, they become less defined within the flatter topography of the Project site. Desert dry wash woodland eventually is replaced by smaller washes of mixed creosote bush and big galleta grass, and a mixture of other upland and wash-dependent species (CEC 2010). Outside the three major wash systems, desert dry wash woodland appears to be declining, evidenced by a relative decrease in the cover, vigor, diversity, and overall habitat function, due to hydrological alterations associated with the I-10 freeway that likely resulted in reduced water supply to the broad network of channels that once crossed the Project site (CEC 2010).

2.6.1.4 Unvegetated Ephemeral Dry Wash

In the Project site, the smaller channels lacking desert dry wash woodland consist of a sparse to intermittent cover of shrubs and perennial herbs. These habitats are likely regulated as State waters. These smaller channels are subject to frequent channel avulsion and highly variable flow pathways contained within broad active alluvial fans. Vegetative cover typically occurs adjacent to the channels and consists largely of mixed upland and wash-dependent perennial herbs in a community of creosote bush and big galleta grass, occurring along the banks and within the desert dry wash woodland interfluves. To a lesser extent compared to desert dry wash woodland habitats, ephemeral dry washes may support wildlife use by small and large mammals as movement corridors; they also may provide a food and water source for many species of migrating songbirds, raptors, and reptiles (CEC 2010).

2.6.1.5 Agriculture

Agricultural land is not a natural vegetation community described by Holland (1986) or Sawyer and Keeler-Wolfe (2009). Areas of active and fallow agricultural fields occurred within the buffer of the Project site, within the biological survey area, and outside the Project disturbance area. The majority of the lands mapped as agriculture consist of date palm plantations located northwest of the proposed solar facility and south of the gen-tie alignment. A portion of the mapped agricultural land consisted of fallow fields where ruderal vegetation has recolonized with exotic plant species interspersed with sparse native vegetation (CEC 2010). Fallow and active agriculture fields may provide forage and cover for local and migratory wildlife, especially in areas that are actively irrigated (CEC 2010).

2.6.1.6 Developed/Disturbed

Developed and disturbed areas consist of existing roads including Interstate 10, Corn Springs Road, and unnamed dirt roads that are actively being used under current conditions.

2.6.2 Invasive and Noxious Weeds

Noxious and invasive weeds are species of non-native (exotic) plants included on the weed lists of the California Department of Food and Agriculture (CDFA), the California Invasive Plant Council (Cal-IPC), or those weeds of special concern identified by the BLM. They are of concern in wild lands because of their potential to degrade habitat and disrupt the ecological functions of an area (Cal-IPC 2016). Non-native plant species recorded as part of project botanical surveys during 2009, 2010, and 2016 were primarily located in the eastern and southern extent of the Project site (CEC 2010).

Sahara Mustard (*Brassica tournefortii)*

Sahara mustard is a dicot of the mustard family, native to the deserts of North Africa, the Middle East, and the Mediterranean regions of southern Europe (Bossard et al. 2000). Initial establishment of this species in California occurred through the importation of date palms from the Middle East to the Coachella Valley during the early 1900s (Bossard et al. 2000). Sahara mustard currently occurs across Riverside County, as well as all neighboring counties (Cal-IPC 2016). Sahara mustard is considered by Cal-IPC to have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure, as well as having reproductive biology and other attributes that are conducive to moderate to high rates of dispersal and establishment (Cal-IPC 2016). Sahara mustard is not listed on the California Department of Food and Agriculture (CDFA) Noxious Weed List (CDFA 2016). This species was found in disturbed areas throughout Sonoran creosote bush scrub habitat within the Project site (BLM 2011).

Russian Thistle (*Salsola tragus*)

Russian thistle is a dicot, annual herb that is found in open and disturbed areas in the Mojave Desert and throughout western North America (MacKay 2003). Otherwise known as tumbleweed, this annual becomes large and round with age, breaking off and rolling with the wind to aid in seed dispersal. Native to Eurasia, this plant was probably introduced around the turn of the century, is salt tolerant, and can be found in both dry and wetland habitats (CDFA 2016). Russian thistle has a Limited-to-Moderate rating by the Cal-IPC, indicating a species that is invasive but has an ecological impact that is minor on a statewide level, or there was not enough information to justify a higher score. Its reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but it may be locally persistent and problematic. Russian thistle is listed on the CDFA Noxious Weed List, making it subject to State laws and regulations regarding its spread and pollution of an area (CDFA 2016). Russian thistle was found in several habitat types in the Project site, including dune, desert scrub, desert dry wash woodland, and Sonoran creosote bush scrub (BLM 2011).

Tamarisk or Saltcedar (*Tamarix ramosissima*)

Tamarisk or saltcedar was observed interspersed throughout desert dry wash woodland within the Project site. This species continues to be a BLM weed species of concern, to have a Cal-IPC inventory rating of Highly invasive, and a CDFA “B” rated species, meaning it is a pest of known economic or environmental detriment of limited distribution.

Mediterranean grass (*Schismus* spp.)

Mediterranean grass is an annual monocot grass found in both central and southern California, particularly in disturbed areas and deserts, probably introduced at the turn of the century (CDFA 2016). Cal-IPC considers this plant to have limited invasive potential. *S. barbatus* and *S. arabicus* contribute to increased fire threat due to lack of decomposition during dry seasons. Because of its aid in the destruction of native shrub species by wildfire, both species contribute to the type-conversion of desert shrubland into annual grassland. Mediterranean grass has a Limited rating indicating it is invasive though its ecological impacts are minor on a statewide level, or there was not enough information to justify a higher score. These species' reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited. Spread may occur due to soil disturbance and vegetation cutting, which could disperse seeds, as well as from vehicle tires and footwear. Increase of these species is most likely to occur in areas where this species already exists. Mediterranean grass is not listed on the CDFA's Noxious Weed List (CDFA 2016). Mediterranean grass is prevalent throughout Sonoran creosote bush scrub within the Project site. BLM and other agencies recognize that because of the widespread distribution of Mediterranean grass, this species is not considered feasible to eradicate.

2.6.3 Cacti, Yucca, and Native Trees

Native cacti, succulents, and native trees are not special status plant species but the harvesting of these native plants is regulated under the California Native Plant Protection Act (Fish and Game Code §§1900-1913) and the California Desert Native Plant Act of 1981 (Food and Agricultural Code § 80001 et. seq.; Fish & Game Code §§1925-1926). A total of five species in the Cactaceae family were observed within the solar facility boundary, including hedgehog cactus, (*Echinocactus engelmannii*), teddybear cholla (*Cylindropuntia bigelovii*), silver cholla (*C. echinocarpa*), pencil cholla (*C. ramosissima*), and common fishhook cactus (*Mammillaria tetrancistra*). Two additional succulent species were observed along the gen-tie including California barrel cacti (*Ferocactus cylindraceus*) and cottontop cactus (*Echinocactus polycephalus*). Additionally, ocotillo (*Fouquieria splendens* ssp. *splendens)* and three species of native trees were found within the Project site, which included smoke tree, ironwood, and blue palo verde.

3 METHODS

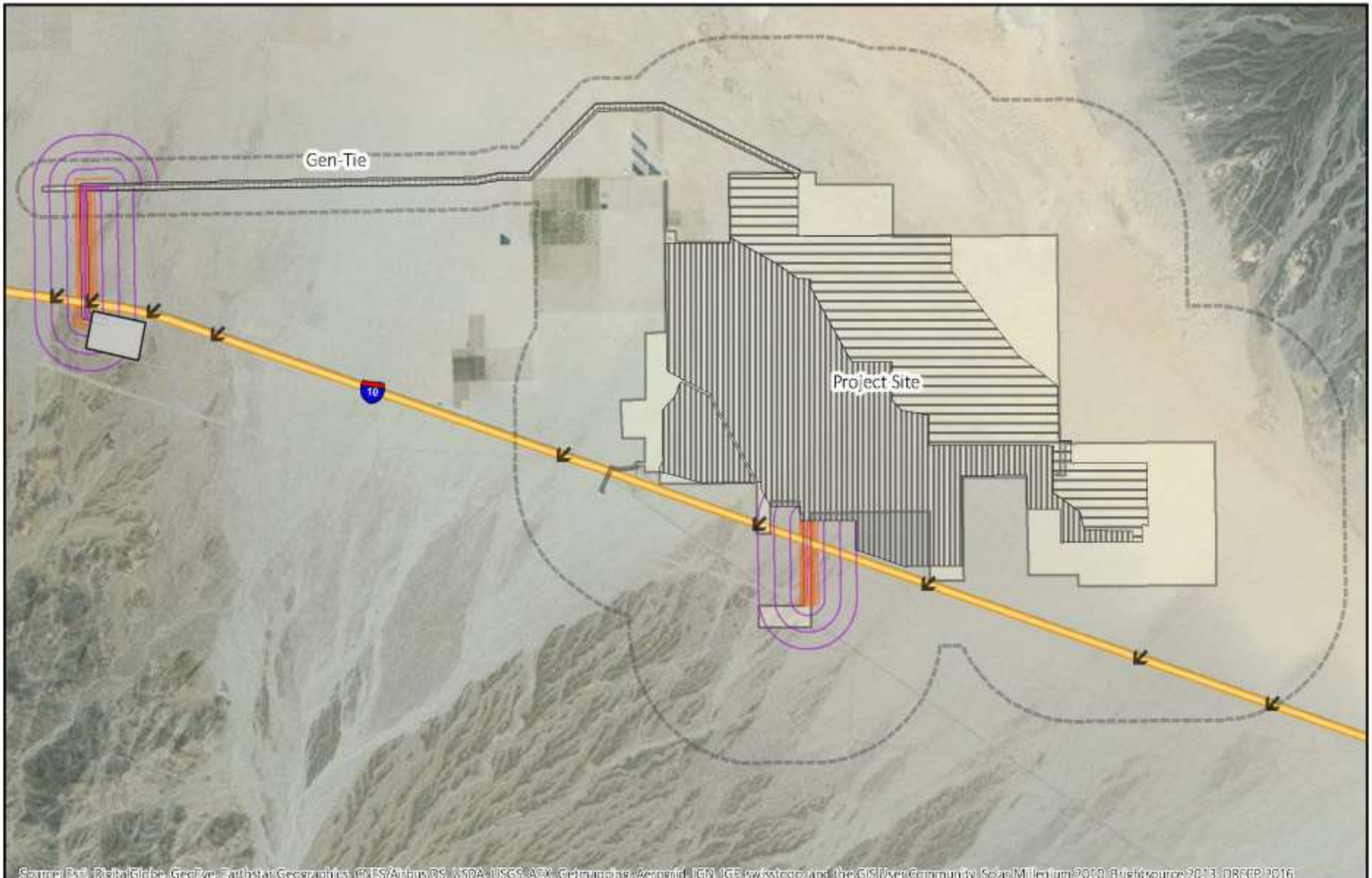
3.1 Special Status Species Definition

Special status species are those that have been afforded special recognition by federal, State, or local resource agencies or organizations, are often of relatively limited distribution, and typically require unique habitat conditions, which also may be in decline. Special status criteria have not changed since publication of the PSPP PA/FEIS (BLM 2011) and PSEGS DSEIS (BLM, 2013), which include:

- Officially listed, or candidate for listing, by California or the Federal Government as Endangered, Threatened, or Rare;
- Taxa which meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the California Environmental Quality Act (CEQA);
- BLM, USFWS, or U.S. Forest Service Sensitive Species;
- Taxa listed in the CNPS Inventory of Rare and Endangered Plants of California; and
- Protected under other statutes or regulations (e.g., Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, etc.).

3.2 Study Areas

The PSPP Biological Resources Study Area (BRSA) consisted of 14,771 acres that encompass the Project site and a surrounding buffer area (1,000-foot, 0.75-mile, and 1-mile intervals from and parallel to the edge of nonlinear portions of disturbance areas as well as at 1,000 feet from the edge of linear project components). The majority of the BRSA was surveyed in 2009, with supplemental surveys performed in 2010 to address new alternative layouts at the time resulting in an expanded BRSA. Surveys conducted for PSEGS addressed changes to proposed disturbance areas including the natural gas line extension, distribution yard, and gen-tie line reroute. Surveys performed in 2016 focused on the potential Palen Solar PV Project disturbance areas, which included the solar facility and 300-foot wide, 7-mile gen-tie line. The 2016 survey area encompasses the Palen Solar PV Project as well as a buffer (size dependent upon final facility design). The original BRSA and supplemental survey areas are shown in Figure 6.



Ironwood Consulting

0 1 2
Kilometers

Palen Solar PV - 2016

Focused Survey Area (10m)

Focused Survey Area (20m)

General Layers

SCE Red Bluff Substation

PSEGS 2013

Surveyed I-10 Underpass

Focused Survey Area (10m)

Wildlife Transects (200m)

Burrowing Owl Transects

PSPP - 2009/2010

Focused Survey Area (10m)

Full BRSA

I10

FIGURE 6

Study Areas
2009-2016

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 020317\BRTR Fig 06 - BSRA Study Areas.mxd | 2/3/2017

3.3 Wildlife Species

3.3.1 Agassiz's Desert Tortoise

Full coverage protocol desert tortoise surveys were conducted during the following periods:

- March 17 to May 22, 2009 (PSPP BRSA except substation)
- October 24 to 25, 2009 (PSPP substation and buffer)
- March 16 to May 16, 2010 (PSPP alternative disturbance areas and buffers)
- April 7 to April 29, 2013 (PSEGS modified linear facilities)
- April 30 to May 15, 2016 (Palen Solar PV Project)

The full coverage survey option described in the revised protocols (USFWS 2010a) was unchanged from the previous protocol (USFWS 1992). These surveys employed belt transects approximately 10 meters (32.8 feet) apart in order to provide 100 percent (full) coverage of the focused survey area (Figure 6; USFWS 2009). Surveys performed from 2009 to 2013 included additional transect-based sign surveys within the buffer zone at 1,000-foot, 0.75-mile, and 1-mile intervals from and parallel to the edge of nonlinear portions of disturbance areas as well as at 1,000 feet from the edge of linear portions of disturbance areas (e.g., gen-tie line) (Solar Millennium 2010a).

The Project site consists of two primary zones based on the soil conditions (see Sections 2.4 and 2.5) that correspond with potential habitat for certain species including desert tortoise. Previously documented distribution of desert tortoise sign, ammophilous special status plants, and Mojave fringe-toed lizard follow these zone boundaries with a slight degree of an intergrading ecotone. The eastern extent of the site is characterized by the presence of shallow sand sheets and dunes that support special status plants and Mojave fringe-toed lizard (Davis and Soong 2013). The eastern extent is mapped as "clearance survey area only" for desert tortoise and the western extent of the site is mapped as a "desert tortoise protocol survey area" per the DRECP (CEC 2014a, Figure H-6). The boundary of the DRECP desert tortoise survey zones correlate with the desert tortoise habitat modeled by Nussear et al. (2009) along the 0.4 model unit value, which is slightly more conservative than previous assessments that have used the threshold of 0.5 or greater as the predicted value that corresponds with suitable desert tortoise habitat (USFWS 2011 and 2012).

The 2016 desert tortoise surveys employed belt transects approximately 10 meters (32.8 feet) apart in order to provide 100 percent (full) coverage within 2,346 acres of the solar facility and within a 300-foot wide corridor along the 7-mile gen-tie line (USFWS 2009). Within 1,601 acres in the northern and eastern extent of the solar facility, surveys employed belt transects approximately 20 meters (65.6 feet) apart.

The survey crews during all desert tortoise surveys consisted of experienced desert tortoise surveyors. Surveys were conducted by slowly and systematically walking linear transects while surveyors visually search for desert tortoise and sign. Particular emphasis was placed on searching around the bases of shrubs and along the banks of shallow washes. All tortoise sign [e.g., live tortoises (all age classes), shell/bone/scutes, scats, burrows/pallets, tracks, egg shell fragments, and courtship rings] were recorded if present. The condition of sign was categorized per the following class designations (USFWS 2009):

1. currently active, with desert tortoise or recent desert tortoise sign;
2. good condition (no evidence of recent use) - definitely desert tortoise;
3. deteriorated condition (including collapsed burrows) - definitely desert tortoise;
4. good condition - possibly desert tortoise; and
5. deteriorated condition (including collapsed burrows) - possibly desert tortoise.

The location of all tortoise sign was recorded using a Global Positioning System (GPS) unit. In addition to recording sign with the GPS unit, standardized paper datasheets were completed. All data were digitally entered and used in GIS to determine approximate abundance and distribution of desert tortoise.

In August 2016, Ironwood biologists revisited fourteen desert tortoise burrows and twelve bone fragment locations that were previously identified during the 2009/2010 surveys. The GPS coordinates were used to navigate to the previously collected data points. The immediate area of each location was surveyed for any remaining sign, taking into consideration of potential variation in GPS accuracy.

3.3.2 Mojave Fringe-toed Lizard

Surveys for Mojave fringe-toed lizard were performed concurrently with desert tortoise transects in 2009, 2010, 2013, and 2016. As described in Section 3.3.1, suitable habitat for Mojave fringe-toed lizard is largely discrete from that of desert tortoise within the Project site apart from a narrow ecotone between the two. This distinction allowed for effective surveys for both species using belt transects during previous surveys. In 2016, surveys employed approximately 201 linear miles of belt transects averaging 20 meters (65.6 feet) apart within the eastern extent of the solar facility (within an area of 1,601 acres) and approximately 324 linear miles of belt transects averaging 10 meters (32.8 feet) apart within the western extent of the solar facility (within an area of 2,346 acres) and 300-foot wide corridor along the gen-tie line. The transects were walked systematically while surveyors visually searched for live Mojave fringe-toed lizards. All observations were noted in hardcopy datasheets. Location information was recorded using GPS. In areas of higher density of lizards sighting, groups of lizards were tallied and represented by a single data point.

3.3.3 Avian Species

The *Draft Bird and Bat Conservation Strategy (BBCS) for the Palen Solar Photovoltaic Project* (WEST 2016), which provides a thorough account of avian studies performed to date, has been summarized herein (Table 3). A suite of avian habitat assessments, focused surveys, and baseline sampling have been performed since 2009 to characterize existing and potential avian use of the Project site (WEST 2016). Beginning in 2009 in support of PSPP, focused surveys were performed for special status species and breeding season point count surveys were performed at 48 stations.

Initiating in 2013, extensive surveys and analysis were performed to evaluate avian risks related to the PSEGS technology including:

- Multi-season small bird count (SBC) surveys designed to provide a larger sample size than in in previous years;
- Multi-season bird use count (BUC) surveys to detect large birds over wider areas;
- Shorebird and waterfowl surveys at offsite agricultural ponds;
- Mist net surveys to detect species that may otherwise go undetected under other methods;
- Nocturnal radar surveys;
- Habitat evaluations for Elf Owl and Gila Woodpecker;
- Golden eagle nesting, winter, and prey abundance surveys; and
- Burrowing owl surveys.

Point counts were performed at a series of pre-determined points located along a survey route (EDAW and BBI 2009, BBI 2013a, BBI 2013b, Levenstein et al. 2014). Trained observers recorded all the birds seen and heard during a set period of time at each station. Point counts are effective for detecting small birds (visually or by their calls) located near the point location, but have limited effectiveness in detecting rare species, except as incidental observations. That said, point count data may be used to estimate avian species diversity, abundance, and richness, which can be filtered by season.

Bird use count (BUC) surveys were performed to primarily detect larger avian species, particularly raptors, which soar overhead and are visible from long distances (BBI 2013a, BBI 2013b; Levenstein et al. 2014). By design, BUCs consist of fewer sampling stations than the aforementioned point counts and are spaced more widely on the landscape with longer periods of observation time associated with each station.

Table 3 - Avian Studies Performed Since 2009

STUDY (TAXA)	PURPOSE	PROTOCOL	SURVEY AREA	SURVEY DATES
Bird Use Count (BUC) Surveys (medium large birds)	Estimate the spatial and temporal use of site by medium to large birds, particularly vultures and diurnal raptors	8 hrs/survey Point counts using 800-m (2,625-ft) radius circular plots (similar to those described by Reynolds et al. 1980, Bibby et al. 1992) 6 BUC observations points established throughout the PSEGS site and surrounding 0.6-mile (1.0-km) buffer	96 BUC surveys; 762 hrs	April 8– May 4, 2013
			24 BUC surveys; 192 hrs	May 5 – June 1, 2013
			414 BUC surveys; 3,234 hrs	August 20 – December 13, 2013
			2 stations; 666 hrs	March 24 – June 5, 2014
			2 stations; 785 hrs	March 9 – June 5, 2015
Small Bird Count (SBC) Surveys	Characterize use by migrant and resident birds, particularly songbirds, within the site and surrounding area during the spring and fall migration periods	10 min/survey Transects across solar facility footprint including 1-mile buffer	48 stations; 1,920 min; 6 transects	April 12 – May 8, 2009
			120 stations; 4,790 min; 14 transects	April 8 – May 4, 2013
			186 stations; 12,960 min; 14 transects	May 5 – June 29, 2013
			150 stations; 19,390 min; 14 transects	August 19 – November 14, 2013
			72 stations; 7,870 min; 14 transects	March 24 – June 5, 2014
			64 stations; 7,000 min; 14 transects	March 16 – June 5, 2014
Mist Net Surveys	Increase the probability of	12, 12x2.6m nets/survey	502.7 mist net hours	April 11 – May 4, 2013
			1,322.4 mist net hours	May 9 – June 14, 2013

STUDY (TAXA)	PURPOSE	PROTOCOL	SURVEY AREA	SURVEY DATES
	detecting inconspicuous birds that might otherwise go undetected		1,080 mist net hours	September 18 – October 30, 2013
Agricultural Pond Surveys (Shorebirds, Waterbirds, and Waterfowl)	Evaluate use of agricultural ponds adjacent to the northwest boundary of the site	3 stations 323 hours	Three agricultural ponds within the privately-owned land to the northwest of the site and just beyond the palm plantation	August 19 – December 10, 2013 March 27 – June 2, 2014 March 13 – June 3, 2015
Nocturnal Radar Surveys (migrants)	Document migration over the project area and to measure parameters of the migration	1, 3 km radius station 600 hours	PSEGs footprint and buffer	August 19 – October 31, 2013 March – June 2014
Gila woodpecker	Determine presence or absence of Gila Woodpecker	Concurrent with SBCs	Transects across solar facility footprint including 1-mile buffer 120 stations; 4,790 min	April 8 – May 4, 2013
			Transects across solar facility footprint including 1-mile buffer 186 stations; 12,960 min	May 5 – June 29, 2013
Elf Owl Surveys	Determine presence or absence of Elf Owl	143 callback stations 63 listening stations 10 – 14 min/station		May 18 – June 15, 2013
Habitat Evaluation for Elf Owl and Gila Woodpecker	Assess habitat suitability for Elf		29, 50-meter radius Habitat Suitability stations	July 2 – July 19, 2013

STUDY (TAXA)	PURPOSE	PROTOCOL	SURVEY AREA	SURVEY DATES
	Owl and Gila Woodpecker			
Winter Golden Eagle Surveys	Evaluate use of the site and surrounding region by wintering and resident golden eagles	Baited camera trapping (7 stations) and visual surveys	7 stations	January 23 – February 27, 2013
Golden Eagle Nest Surveys	Estimate number of territories within 10-mile buffer of project and determine if active nests occur.	Surveys by air and ground as per USFWS Guidelines (Pagel et al. 2010) All areas of suitable golden eagle nesting habitat and known eagle nest sites within the Palen Mountains and the Chuckwalla Mountains, including transmission structures along the Interstate 10 (I-10) power lines.	10-mile buffer Coxcomb Mountains Palen Mountains Chuckwalla Mountains, including transmission structures along the Interstate 10 (I-10) power lines	March 20 – April 15, 2013 Ground-based March 20, 21, and 22, 2013 in the Coxcomb Mountains Aerial April 6 and 7, 2013 Ground-based April 8 and April 15, 2013 in the Chuckwalla Mountains
			10-mile buffer Palen Mountains, and along a 20-mile (32-km) length of the DPV2, and Chuckwalla Mountains Coxcomb Mountains	May 24 – August 3, 2013 Aerial May 24 and 25, 2013 and August 2-3 Ground-based May 24 and 25, 2013, and June 9, 11, and 15, 2013.
			Same as above	April 8 to 12, July 1 to 3, 2014
			Same as above	March 10 to 19, 2015
Golden Eagle Prey Abundance Surveys	Obtain data on the presence and general abundance of rabbits on site.	Conducted as surveyors walked along transects between SBC	122 miles of transects between SBC points	April 9 to June 29, 2013

STUDY (TAXA)	PURPOSE	PROTOCOL	SURVEY AREA	SURVEY DATES
		survey points and recorded lagomorphs		
Burrowing Owl Surveys	Determine presence or absence of Burrowing Owl within the site.	per CBOC 1993 Protocol Guidelines and concurrent with desert tortoise survey	Throughout PSPP footprint and buffer	March 10 – June 14, 2009
		per CDFW 2012 Protocol Guidelines	Linear facilities only (gen-tie and gas line modifications)	April 7 – June 26, 2013

Mist nets were used to detect inconspicuous species that might have gone otherwise undetected during other surveys. This method uses fine-thread nets to capture birds for identification and release (BBI 2013a, BBI 2013b, Levenstein et al. 2014).

Nocturnal radar surveys were performed to provide estimates of the rate, intensity, flight altitudes, and timing of birds migrating through a given area (Levenstein and Nations 2013).

3.3.3.1 Western Burrowing Owl

The Project site is considered suitable habitat for western burrowing owl, with one exception being the northern end of the Project site that is densely covered in Sahara mustard (CEC 2010). Survey recommendations in both the 1993 CBOC Guidelines and 2012 CDFW Staff Report include baseline data collection and an assessment of site use. Surveys (consistent with Phase II of the CBOC 1993 Guidelines and the 2012 CDFW Staff Report) were conducted concurrently with surveys for desert tortoise and other fossorial species in 2009, 2010, 2013, and 2016 to provide details of burrowing owl occupancy and site use. Surveys included pedestrian transects spaced 10-to-20 meters apart, which provided a greater level of survey effort and coverage than the 30-meter spacing recommended in the 1993 Guidelines. The concurrent survey effort was successful in identifying all burrows that could support any special status species, including burrowing owl. Biologists were prompted to assess each burrow for burrowing owl sign when completing field datasheets. All sign, including the presence of individuals, feathers, tracks, white wash, pellets, and suitable burrows were recorded if present.

Occupancy of burrowing owl habitat is confirmed at a site when at least one burrowing owl, or its sign at or near a burrow entrance, is observed within the last three years (CDFW 2012; California Burrowing Owl Consortium 1993). Breeding season surveys (Phase III) were conducted in the project footprint and buffer during the peak of the 2009 breeding season and along linear facilities during the 2013 breeding seasons (CEC 2010; Karl 2013a).

In August 2016, Ironwood biologists revisited five locations of burrowing owl sign that were previously identified during the spring 2016 surveys. The GPS coordinates were used to navigate to the previously collected data points. Changes in the presence of burrowing owl sign were recorded.

3.3.3.2 Golden Eagle

<u>Nest Surveys</u>

Aerial and ground-based golden eagle nesting surveys were conducted in 2010, 2012, 2013, 2014 and 2015 following the *USFWS February 2010 Interim Golden Eagle Inventory and Monitoring Protocols* (Pagel et al. 2010). During surveys, all areas within the study area were searched for large stick nests used by golden eagles, other raptors, and ravens on cliff faces and transmission towers.

Spring 2010 aerial surveys for golden eagles were conducted by Wildlife Research Institute (WRI) covering the area within a 10-mile radius from the PPSP boundaries as well as three other proposed solar projects (CEC 2010). The surveys covered eleven mountain ranges between and around Blythe and Desert Center (BBI 2013b, BBI 2013c, BBI 2013d).

In 2012, the BLM contracted BioResource Consultants Inc. to collect updated field data and report current breeding status of golden eagles within the BLM's California Desert District and Northern California District. The objective of this effort was to survey all of the mountain ranges containing known and potential golden eagle nesting habitat. Aerial surveys (167 flight hours) and/or ground-based surveys (30,205 miles) were performed in the vicinity of 350 previously documented nest sites using methodology consistent with currently accepted guidelines (Pagel et al. 2010). The first phase of the survey effort included documentation of occupancy and condition of known and newly discovered golden eagle nests. The second phase focused on determining the breeding status and reproductive output of active golden eagle nests.

Spring and summer 2013 aerial and ground-based golden eagle nesting surveys were conducted by Bloom Biological Inc. (BBI) covering all areas of suitable golden eagle nesting habitat and known eagle nest sites within the Palen Mountains, Coxcomb Mountains, and Chuckwalla Mountains, including transmission structures along the I-10 power lines (BBI 2013c). Due to bighorn sheep (*Ovis canadensis*) lambing season flight restrictions, aerial surveys in the Chuckwalla Mountains were conducted from heights of greater than 1,500 ft (457 m) in all areas. Follow-up ground-based surveys were conducted on foot in the Chuckwalla Mountains in April 2013, to visit and observe potential golden eagle nest sites identified during aerial surveys. Three additional days of foot and vehicular surveys were conducted in March 2013 in the Coxcomb Mountains, which could not be surveyed by helicopter at any reasonable height due to flight restrictions in Joshua Tree National Park. Summer ground surveys were conducted in the Coxcomb Mountains in May and June 2013.

Spring and summer aerial and ground golden eagle nesting surveys were repeated from April 8 to 12 and July 1 to 3, 2014 (WEST 2016). Aerial surveys were conducted on April 9 and July 1 to 3, 2014 within a 10-mile buffer of the boundary for the PSEGS project. Ground based surveys were also conducted during the entire April survey period, during which all previously documented eagle nests were visited, and observers scanned for suitable habitat for new nests. As in other seasons, aerial surveys were limited due to restrictions for big horn sheep lambing.

Spring ground-based golden eagle nesting surveys were conducted from March 10 to 19, 2015 to obtain the status of previously documented golden eagle nests within a 10-mile buffer of the previously proposed project (WEST 2016). Aerial surveys were not performed during this time period due to flying restrictions as a result of desert bighorn sheep lambing activity.

Winter Surveys

Winter golden eagle surveys were conducted by BBI in January and February (BBI 2013e). The purpose of the surveys was to evaluate use of the Project site and surrounding region by wintering and resident golden eagles using a combination of baited camera traps and visual surveys (WEST 2016). Carcasses were placed as bait and infrared motion-activated cameras were used to capture all visiting predators and scavengers. Visual surveys for golden eagles and other avian predators were conducted at the location of each bait station and by driving all accessible roads and stopping at random locations and scanning the skyline and potential perch locations such as cliffs, rock outcroppings and trees with high powered binoculars and spotting scopes (WEST 2016).

Prey Abundance Surveys

Golden eagle prey abundance surveys were conducted concurrently with SBC surveys by BBI during the spring of 2013 (BBI 2013c). Prey abundance surveys were conducted as surveyors walked along transects between SBC survey points and recorded the number of lagomorphs [black-tailed jackrabbits (*Lepus californicus*) and desert cottontails (*Sylvilagus audubonii*)] detected incidentally since leaving the previous station (WEST 2016). Similar counts of lagomorphs were performed during the desert tortoise and other special status species transects walked in spring 2016.

3.3.4 Bat Species

A survey for bat roosts within the Project site and surrounding region (e.g., freeway underpasses, bridges, buildings) was conducted in 2009 and 2013 (WEST 2016). Potential bat roosts were surveyed within the Project site in 2016 during transect surveys. Emphasis was given to the desert dry wash woodland areas that support relatively larger vegetation (e.g., ironwood trees) that may support hollowed trunks.

Acoustic bat surveys were conducted in May 2013 and October through mid-December 2013 with the objective of assessing the potential for bat roosting and foraging habitat (WEST 2016). Passive acoustic monitors were stationed at 13 locations throughout the Project site, approximately 3 feet off the ground. The acoustic monitoring devices utilized in spring 2013 included two ranges of ultrasonic microphones to enhance the detection of species such as pallid bat (*Antrozous pallidus*), California leaf-nosed bat (*Macrotus californicus*), hoary bat (*Lasiurus cinereus*), western mastiff (*Eumops perotis*), and other larger free-tail bat calls (WEST 2016). The fall/winter acoustic survey consisted of ultrasonic detectors with standard microphones deployed at three of the stations previously surveyed in the spring and one additional station located at a pond associated with the adjacent agricultural property. Acoustic data were analyzed and call sequences were visually examined.

3.3.5 Other Special Status Wildlife Species

Surveys were performed in spring 2016 over the Project site by systematically walking linear transects while surveyors visually searched for burrows and other sign of special status fossorial species. In addition to sign of desert tortoise and western burrowing owl, presence of desert kit fox (e.g., dens, complexes, scat, and tracks) and American badger were recorded.

During all biological resource surveys, biologists recorded all wildlife species, regardless of status, that were encountered during the survey. All special status species recorded incidentally during all survey efforts were recorded by GPS and assigned a unique identifier. Common species were tallied at the end of each transect and recorded throughout each day by each crew. All data was entered from these datasheets and was incorporated into GIS.

In August 2016, Ironwood biologists revisited twenty locations of desert kit fox and two locations of American badger that were previously identified during the 2009/2010 surveys. The GPS coordinates were used to navigate to the previously collected data points. The presence or absence of sign was recorded.

3.4 Special Status Plants

Focused special status plant surveys (CDFW 2016c) were conducted during the following periods:

- February to April 2009 (PSPP BRSA)
- Spring 2010 (PSPP alternative disturbance areas)
- October 11 to 15, 2010 (PSPP BRSA)
- March 30, 2013 (PSEGS modified linear facilities)
- April 30 to May 15, 2016 (Palen Solar PV Project)
- March 22 to April 6, 2017 (selected areas of Palen Solar PV Project)

Survey methodology followed the intuitive controlled survey approach (Whiteaker 1998) as described in Survey Protocols Required for NEPA/ESA Compliance for BLM Special Status Plant Species (BLM 2009) and consistent with the following guidance documents: (1) Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants (USFWS 2000); (2) Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities (CDFG 2009); (3) CNPS Botanical Survey Guidelines (CNPS 2001); and (4) Survey Protocols for Survey and Manage Strategy 2:

Vascular Plants (Whiteaker 1998). CNPS List 3 and 4 may be considered regionally significant if, for example, the occurrence is located at the periphery of the species' range, or exhibits unusual morphology, or occurs in an unusual habitat/substrate (CDFG 2009). For these reasons, List 3 and 4 species were included in the literature search and targeted during field surveys.

Substantial rain events occurred in the Chuckwalla Valley in October 2010, which resulted in 0.72 inches (18 mm) of rain averaged between the Eagle Mt. and Blythe met stations. Surveys performed in October 2010 (AECOM 2010) targeted late-blooming special status plants including Abram's spurge (*Chamaesyce abramsiana*), flat-seeded spurge (*Chamaesyce platysperma*), glandular ditaxis (*Ditaxis claryana*), pink velvet mallow (*Horsfordia alata*), lobed ground cherry (*Physalis lobata*), California ditaxis (*Ditaxis serrata* var. *californica*), jackass clover (*Wislizenia refracta* ssp. *refracta*), and Palmer's jackass clover (*Wislizenia refracta* ssp. *palmeri*). Reference sites were visited prior to conducting focused surveys in fall 2010.

Surveys performed in spring 2016 included visual coverage across the entire Project site. Surveys employed belt transects approximately 10 meters apart in order to provide 100 percent coverage within 2,346 acres of the solar facility boundary and within a 300-foot wide corridor along the 7-mile gen-tie line (USFWS 2010c). Within 1,601 acres in the northern and eastern extent of the solar facility boundary, surveys employed belt transects approximately 20 meters apart. Transect spacing was adequate to detect the target species, if present. Plant surveys were performed with experienced lead botanists alongside the wildlife survey field crews. All surveyors were trained on diagnostic features, habitat notes, and location maps of targeted species. A cumulative list of all plant species observed during the surveys was maintained. Reference locations previously documented were revisited. The efficacy of 2016 plant surveys was limited due to the lack of preceding winter rainfall, and in an average rain year, the phenology of most desert annuals would be well past fruiting stage and drying-up by the time of the survey.

Rainfall during the 2016/2017 winter was above-average, which provided an opportunity to gain greater confidence in special status plant species occurrence. Additional surveys were performed in spring 2017 included a systematic survey of the following areas:

- 2,326 acres (corresponding with sandy soils within the solar facility study area);
- 227 acres (corresponding with sand sheets in Zone II and potential habitat for Harwood's eriastrum [*Eriastrum harwoodii*], if present); and
- 209 acres (associated with the gen-tie line).

Survey methods were consistent with accepted survey protocols (BLM 2009; USFWS 2000; CDFW 2009; CNPS 2001; and Whiteaker 1998). Nearby reference populations of target species including ribbed cryptantha (*Cryptantha costata*) and Harwood's eriastrum were visited to confirm germination and flowering status prior to conducting formal transects. Transects were spaced 10m apart within the 227-acre Zone II and 209-acre gen-tie line survey areas. Transects within the remaining survey area were spaced no greater than 100m apart. Additional intuitive controlled transects were performed within portions of Zone III that supported suitable habitat for target species.

4 SPECIAL STATUS SPECIES DISCUSSION

4.1 Special Status Wildlife

Sixty-three special status wildlife species were reviewed for their potential to occur within the Project site and its vicinity based on regional plans and database records (Table 4 and Appendix A). The status of each species has been updated to reflect any recent changes. Several species were determined to have a low probability of occurrence due to the absence of suitable habitat and are discussed in Appendix A. Special status wildlife species that were detected within the Project site, buffer, or have the potential to occur based on the presence of suitable habitat within the Project site are discussed further in this section. A comprehensive list of wildlife species observed during previous surveys is included in Appendix B.

4.1.1 Agassiz's Desert Tortoise

Background

The desert tortoise was State-listed in California as threatened on August 3, 1989. The Mojave population was listed as threatened under FESA on April 2, 1990 (USFWS 1990), and critical habitat was designated on February 8, 1994 (USFWS 1994). The Mojave population of the desert tortoise includes those animals living north and west of the Colorado River in the Mojave Desert of California, Nevada, Arizona, and southwestern Utah, and in the Sonoran (Colorado) Desert in California (USFWS 1990).

Desert tortoises are well adapted to living in a highly variable, and often harsh, desert environment (USFWS 2011). They spend much of their lives in burrows, even during their seasons of activity. In late winter or early spring, desert tortoises emerge from over-wintering burrows and typically remain active through fall. Activity does decrease in summer, is often crepuscular during the hottest times, and tortoises often emerge after summer rain storms. Activity and movement is generally influenced by temperature and precipitation, which correlate with potential food and water resources. Extreme temperatures, both high and low, and periods of drought typically result in reduced tortoise activity (Peterson, 1996). Mating occurs both during spring and fall. Tortoises are long-lived and grow slowly, requiring 13 to 20 years to reach sexual maturity [at approximately 180mm midline carapace length (MCL)]. Eggs are generally laid in friable soil near burrow entrances between April and June and occasionally September and October. Eggs hatch within three to four months (Rostal 1994).

Table 4 - Special Status Wildlife Species

Species	Status[1]			Potential to Occur on Project Site[2]
	State	Federal	WBWG	
REPTILES				
Agassiz's desert tortoise *Gopherus agassizii*	ST	FT	-	Low to Moderate
Mojave fringe-toed lizard *Uma scoparia*	SSC	BLMS	-	High
AMPHIBIANS				
Couch's spadefoot toad *Scaphiopus couchii*	SSC	BLMS	-	Low
MAMMALS				
Colorado Valley woodrat *Neotoma albigula venusta*	-	-	-	Low
Burro deer *Odocoileus hemionus eremicus*	CPGS	-	-	High
Desert bighorn sheep *Ovis canadensis nelsoni*	CFP	BLMS	-	Low
Yuma mountain lion *Puma concolor browni*	SSC	-	-	Low to Moderate
American badger *Taxidea taxus*	SSC	-	-	High
Desert kit fox *Vulpes macrotis arsipus*	CPF	-	-	High
BATS				
Pallid bat *Antrozous pallidus*	SSC	BLMS	H	Foraging - Moderate Roosting - Low
Townsend's big-eared bat *Corynorhinus townsendii*	SSC	BLMS	H	Foraging - Moderate Roosting - Low
Big brown bat *Eptesicus fuscus*	-	-	L	Low
Spotted bat *Euderma maculatum*	SSC	BLMS	H	Low
Western mastiff bat *Eumops perotis*	SSC	BLMS	H	Low
Hoary bat *Lasiurus cinereus*	-	-	M	Foraging - Moderate Roosting - Low
Western yellow bat *Lasiurus xanthinus*	SSC	-	H	Moderate
California leaf-nosed bat *Macrotus californicus*	SSC	BLMS	H	Low
California myotis *Myotis californicus*	-	-	L	Foraging - Moderate Roosting - Low
Arizona myotis *Myotis occultus*	SSC	-	-	Low
Cave myotis *Myotis velifer*	SSC	BLMS	M	Low
Yuma myotis *Myotis yumanensis*	-	BLMS	LM	Low
Pocketed free-tailed bat *Nyctinomops femorosaccus*	SSC	-	M	Low
Big free-tailed bat *Nyctinomops macrotis*	SSC	-	MH	Foraging - Moderate Roosting - Low

Species	Status[1]			Potential to Occur on Project Site[2]
Canyon bat *Parastrellus hesperus*	-	-	L	Foraging - Moderate Roosting - Low
Mexican free-tailed bat *Tadarida brasiliensis*	-	-	L	Foraging - Moderate Roosting - Low
Birds				
Golden eagle (Nesting and wintering) *Aquila chrysaetos*	CFP, WL	BCC, BLMS	-	Nesting/Wintering - Absent Foraging - Low
Short-eared owl (Nesting) *Asio flammeus*	SSC	-	-	Low
Western burrowing owl *Athene cunicularia hypugaea*	SSC	BCC, BLMS	-	High
Redhead (Nesting) *Aythya americana*	SSC	-	-	Low
Ferruginous hawk (Wintering) *Buteo regalis*	WL	BCC	-	Moderate
Swainson's hawk *Buteo swainsoni*	ST	BCC	-	Nesting - Low Migration - High
Costa's hummingbird (Nesting) *Calypte costae*	-	BCC	-	Moderate
Vaux's swift (Nesting) *Chaetura vauxi*	SSC	-	-	Nesting - Low Migration - High
Mountain plover (Wintering) *Charadrius montanus*	SSC	BCC, BLMS	-	Nesting - Low Migration - Moderate
Black tern *Chlidonias niger*	SSC	-	-	Low
Northern harrier (Nesting) *Circus cyaneus*	SSC	-	-	Nesting - Low Wintering/Migration - High
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	SE	FT, BCC, BLMS	-	Low
Gilded flicker *Colaptes chrysoides*	SE	BCC, BLMS	-	Low
Black swift (Nesting) *Cypseloides niger*	SSC	BCC	-	Low
Willow flycatcher (Nesting) *Empidonax traillii* Southwestern willow flycatcher *E. t. extimus*	SE SE	- FE	- -	Low Low
California horned lark *Eremophila alpestris actia*	WL	-	-	High
Prairie falcon (Nesting) *Falco mexicanus*	WL	BCC	-	Nesting - Low Foraging - High
American peregrine falcon (Nesting) *Falco peregrinus anatum*	CFP	BCC	-	Nesting - Low Foraging - Moderate
Sandhill crane (Wintering) *Grus canadensis*	SSC	-	-	Nesting - Low Migration - Moderate
Yellow-breasted chat (Nesting) *Icteria virens*	SSC	-	-	Low
Loggerhead shrike (Nesting) *Lanius ludovicianus*	SSC	BCC	-	High
Gila woodpecker *Melanerpes uropygialis*	SE	BCC, BLMS	-	Low
Elf owl *Micrathene whitneyi*	SE	BCC, BLMS	-	Low

Species	Status[1]			Potential to Occur on Project Site[2]
Long-billed curlew (Nesting) *Numenius americanus*	WL	BCC	-	Nesting - Low Migration - Moderate
Lucy's warbler (Nesting) *Oreothlypis luciae*	SSC	BCC, BLMS	-	Moderate
American white pelican (Nesting colony) *Pelecanus erythrorhynchos*	SSC	-	-	Nesting/Wintering - Low Migration - Moderate
Black-tailed gnatcatcher *Polioptila melanura*	WL	-	-	High
Vesper sparrow *Pooecetes gramineus*	SSC	-	-	Low
Purple martin *Progne subis*	SSC	-	-	Low
Vermilion flycatcher (Nesting) *Pyrocephalus rubinus*	SSC	-	-	Low
Ridgway's clapper rail *Rallus obsoletus yumanensis*	ST, CFP	FE	-	Low
Bank swallow (Nesting) *Riparia riparia*	ST	BLMS	-	Nesting/Wintering - Low Migration - Moderate
Sonora Yellow warbler (Nesting) *Setophaga petechia sonorana*	SSC	BCC	-	Nesting - Low Migration - Moderate
Lawrence's goldfinch (Nesting) *Spinus lawrencei*	-	BCC	-	Low
Bendire's thrasher *Toxostoma bendirei*	SSC	BCC, BLMS	-	Low
Crissal thrasher *Toxostoma crissale*	SSC	-	-	Low
Le Conte's thrasher *Toxostoma lecontei*	SSC	-	-	High
Arizona Bell's vireo *Vireo bellii arizonae*	SE	BCC, BLMS	-	Low
Least Bell's vireo *V. b. pusillus*	SE	FE		
Yellow-headed blackbird (Nesting) *Xanthocephalus xanthocephalus*	SSC	-	-	Low

[1] Status

Federal FE = Federally listed endangered: species in danger of extinction throughout a significant portion of its range
FT = Federally listed, threatened: species likely to become endangered within the foreseeable future
FCT = Proposed for federal listing as a threatened species
BCC = Fish and Wildlife Service: Birds of Conservation Concern:

State SSC = State Species of Special Concern
CFP = California Fully Protected
SE = State listed as endangered
ST = State listed as threatened
WL = State watch list
CPF = California Protected Furbearing Mammal
CPGS = California Protected Game Species

Bureau of Land Management
BLMS = BLM Sensitive

Western Bat Working Group (WBWG)
H = are imperiled or are at high risk of imperilment
M = warrant closer evaluation, more research, and conservation actions
L = most of the existing data support stable populations

[2] Species not detected during previous surveys may have the potential to occur on the Project site in the future.

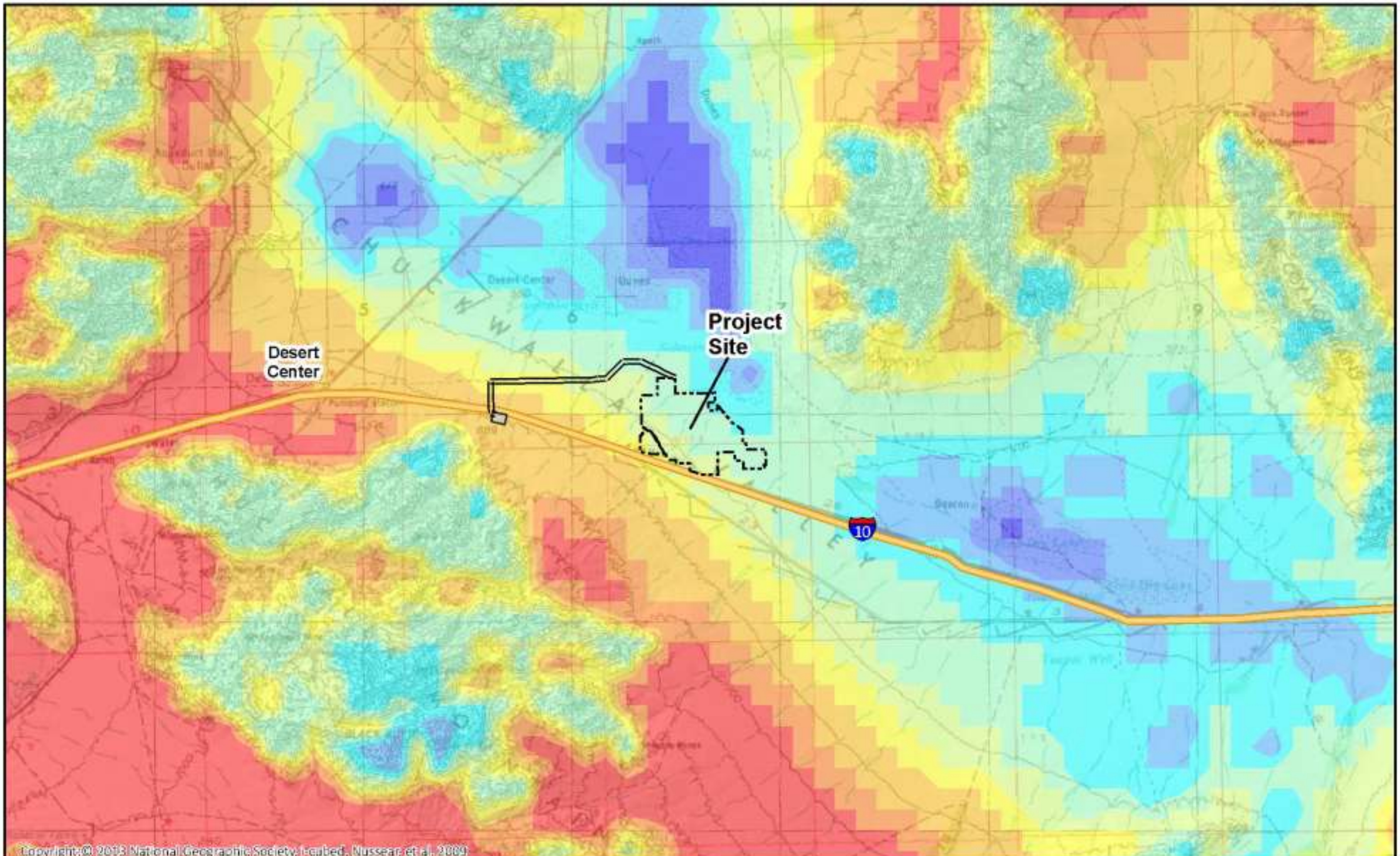
Desert tortoises inhabit a variety of habitats from flats and slopes dominated by creosote-white bursage communities, where a diversity of perennial plants is relatively high, to a variety of habitats in higher elevations. Tortoises are found most often on gentle slopes with sandy-gravel soils. Soils must be appropriately soft for digging burrows, but firm enough so that burrows do not collapse (Anderson et al., 2000). Tortoises typically prefer habitats with abundant annual forbs, grasses and cactus, which constitute its primary food sources. Current research has suggested that plant species that have high potential for potassium excretion (high-PEP) may be critical to the diet of desert tortoise (Oftedal 2002; Oftedal et. al 2002). Excess potassium can be detrimental to the health tortoises. When excreting potassium salts from their bladder, tortoises risk expelling valuable water and protein in the process.

Desert tortoises occupy home ranges, which are generally defined as the area traversed while carrying out a range of normal activities (e.g., foraging and mating) (USFWS 2011). The size of desert tortoise home ranges can vary with respect to sex, geographic location, substrate, topography, and year depending on climate factors such as rainfall and temperature. Tortoises are philopatric, establishing home ranges between 15 and 45 hectares (Barrett 1990, O'Connor et al., 1994, Harless et al. 2009) depending on region. Home ranges of females are generally smaller than those of males (Duda et al. 1999). Some tortoises have been known to travel great distances, although these movements may occur outside their usual home range (Berry 1986).

The Project is located within the Colorado Desert Recovery Unit. The highest desert tortoise densities within this recovery unit (Murphy et al. 2007) occur in Chemehuevi and Ward valleys (approximately 60 miles north of the project site), on the Chuckwalla Bench within the Chuckwalla Desert Wildlife Management Area (DWMA), and in Joshua Tree National Park (approximately 40 miles northwest of the project site).

<u>Project Surveys</u>

The Project site supports desert tortoise habitat with low predicted occupancy values, not accounting for habitat degradation resulting from existing anthropogenic features (Nussear et al. 2009). The Project site consists of two primary zones based on the soil conditions that correspond with suitable habitat for desert tortoise. The eastern extent of the site is characterized by the presence of shallow sand sheets and dunes that support ammophilous species and correlates with a predicted occupancy value (Nussear et al. 2009) of less than 0.4 (Figure 7). This value falls below the 0.5 threshold that has been used in previous assessments as corresponding with suitable desert tortoise habitat (USFWS 2011 and 2012).



Ironwood Consulting

0 2,750 5,500
Meters

Facilities
- Project Boundary
- Gen-Tie Line
- SCE Red Bluff Substation
- I10

Predicted Occupancy
- 0
- 0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.5
- 0.5 - 0.6
- 0.6 - 0.7
- 0.7 - 0.8
- 0.8 - 0.9

FIGURE 7

Desert Tortoise
Predicted Occupancy Model
Nussear, et. al., 2009

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 110816\BRTR Fig 07 - DETO Nussear Model.mxd | 11/8/2016

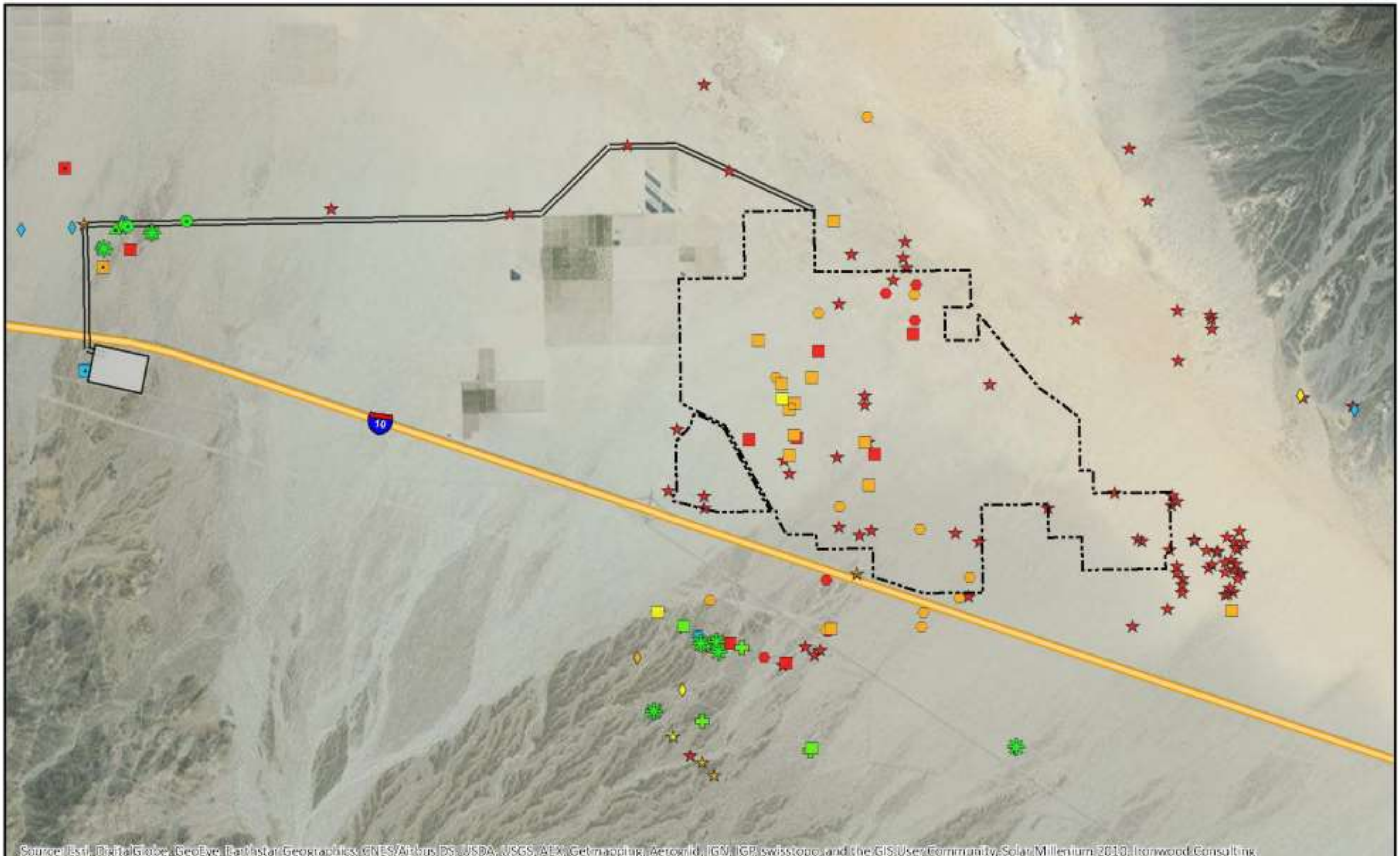
Prior surveys resulted in no live desert tortoises, seventeen burrows (Class 3–5), fifteen pallets (Class 4 or 5), and nineteen tortoise shell remains (Class 5) within the solar facility boundary of the Project site (Figure 8; CEC 2010). As described in Section 3.3.1, Class 4 and 5 sign is defined as not active and possibly, but not definitely, attributable to desert tortoise. Class 5 sign is in deteriorated condition. Active and recent tortoise use was not evident during the most recent surveys performed in spring of 2016, which identified no live desert tortoises, no active sign, and no deteriorated sign within the Project site. In August 2016 during the re-visitation of desert tortoise sign that was previously identified in 2009/2010, none of the previously identified burrows remained and only two locations of disarticulated bone fragments remained.

The portion of the Chuckwalla Critical Habitat Unit that overlaps the Project site did not exhibit notably higher quality tortoise habitat compared to elsewhere within the Project site.

Habitats with higher predicted occupancy values (Nussear et al. 2009) and documented sign of recent tortoise activity are associated with the western two miles of the gen-tie line. The 2009 surveys identified four live desert tortoises along the gen-tie line, three within the buffer and one within the proposed disturbance area. During spring 2013 surveys, two recent burrows were found within buffer zones along the gen-tie line reroute and one north of I-10 (Karl 2013a). During the 2016 surveys, active tortoise sign (one active burrow with tracks and scat and two records of scat) was found along the gen-tie line near the previous observations. Habitats with higher predicted occupancy values (Nussear et al. 2009) are found south of I-10 corresponding with higher elevation alluvial fan plant communities. Seven live tortoises (adult and juvenile) were found within the buffer surveys south of I-10 in 2010.

The lower amount of detectable sign found in 2016 versus in prior years within the solar facility boundary may be a result of several factors including natural erosion from wind and rain coupled with the low dispersal onto the site. Flood events have been documented occurring in the region since 2010. Such events may have washed away or buried the small amount of historical disarticulated shell remains. Alluvial processes would also be expected to transport similar sign onto the site from habitat upslope as surface flow is directed across the majority of the site from the southwest where the predicted occupancy values (Nussear et al. 2009) is relatively higher within the alluvial fans; however, there are existing anthropogenic features and private land uses that likely buffer the site from the adjacent habitat.

The agricultural properties adjacent to the solar facility’s western and northern boundary include a large-scale date palm farm. The farm supports a modern irrigation system and up to two large, open reservoirs. Since its development prior to 2009, the farm has likely subsidized wildlife that has been known to prey on desert tortoises, including canids and ravens.



Ironwood Consulting

0 650 1,300
Meters

Project Boundary
Gen-Tie Line
SCE Red Bluff Substation
I10

2009-2010
- Adult Tortoise
- Tracks
- Burrow
- Pallet
- Scat
- Carcass or Shell/Bone Fragment

2013
- Burrow
- Carcass or Shell/Bone Fragment

2016
- Burrow
- Scat

Class Key
- Class 1 (active)
- Class 2
- Class 3
- Class 4
- Class 5

FIGURE 8

Desert Tortoise Observations

2009-2016

Palen Solar PV Project

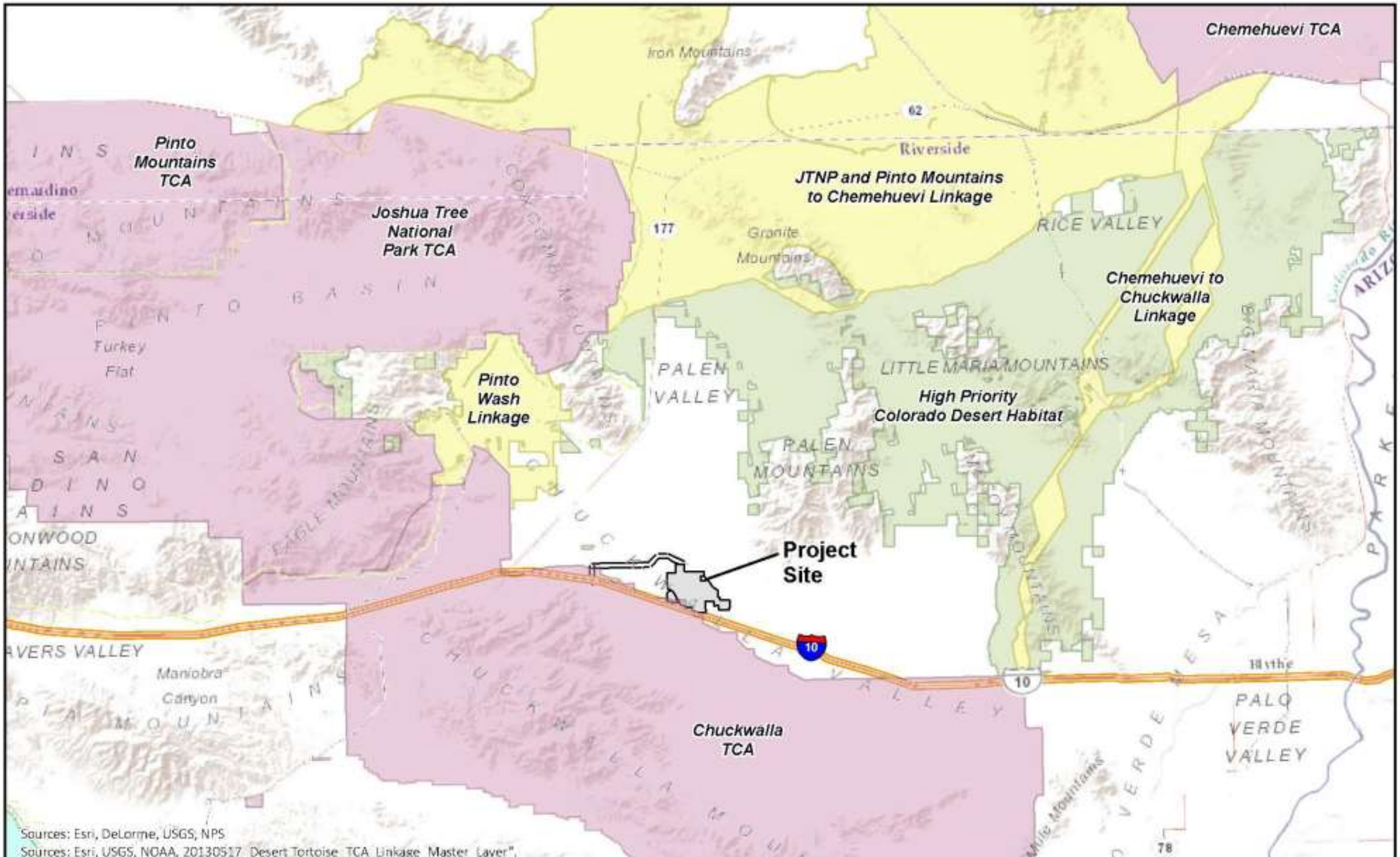
F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 110816\BRTR Fig 08 - DETO Observations.mxd | 11/8/2016

During the 2016 surveys, a substantial coyote presence was documented near the existing farm and throughout the Project site. An abundant amount of coyote tracks and scat were documented during the surveys. The majority of coyote scat contained palm fruit seeds. One active coyote den was located within the Project site. Three pups from this season were observed. Free-roaming domestic dogs were also observed during the surveys of the Project site in the vicinity of the agricultural land. The increased presence of coyotes over the last several years may have negatively affected the local population of desert tortoises.

Connectivity

The population structure of desert tortoise is characterized as isolation-by-distance, resulting in a genetic gradient across the Mojave Desert that is consistent with a continuous-distribution model of gene flow (USFWS 2011). Habitat connectivity for desert tortoise has become the subject of increased focus due to the unique demographic and genetic characteristics of the species. There remain challenges in creating an interconnected reserve that adequately links CHUs, or Tortoise Conservation Areas (TCAs), to meet the conservation metrics outlined in the Population Viability Assessment (PVA) of the 1994 Recovery Plan (USFWS 1994). The existing reserve for the Mojave population of desert tortoise may be limited due to its size and shape not meeting the recommendations in the PVA; therefore, the importance of preserving adequate linkages outside the periphery of the reserve has been emphasized (Averill-Murray et. al 2013). Identifying and evaluating the threat of barriers to gene flow on population viability is a critical factor in recovery (USFWS 2011). Preservation should aim at maintaining linkages that demonstrate that they are large enough for resident tortoises to persist within the linkage and continue to interact with tortoises within and outside the linkage.

On a regional scale, the Project site is situated outside priority habitat and linkages (Figure 9; CEC 2015). The layers associated with these features were developed from least cost pathway with the highest relative potential to support desert tortoises based on the predicted occupancy model (Nussear et al. 2009). Within the NECO plan area, the identified linkages are consistent with the least cost paths modeled by Hagerty et al. (2011). The predicted occupancy model (Nussear et al. 2009) and the resulting regional tortoise habitat linkage areas indicate that the site is located within an area of low predicted occupancy and outside modeled linkage areas. As previously noted, the Project site overlaps the Chuckwalla CHU, which is included in the TCA reserve. While the tortoise habitat within this portion of overlap may appear marginal, it may be important as dispersal habitat, especially in the desert dry wash woodlands. The value is also somewhat impaired with regard to local-scale connectivity due to the I-10 corridor located to the south of the Project site (Figure 10).



Ironwood
Consulting

0 5 10
Kilometers

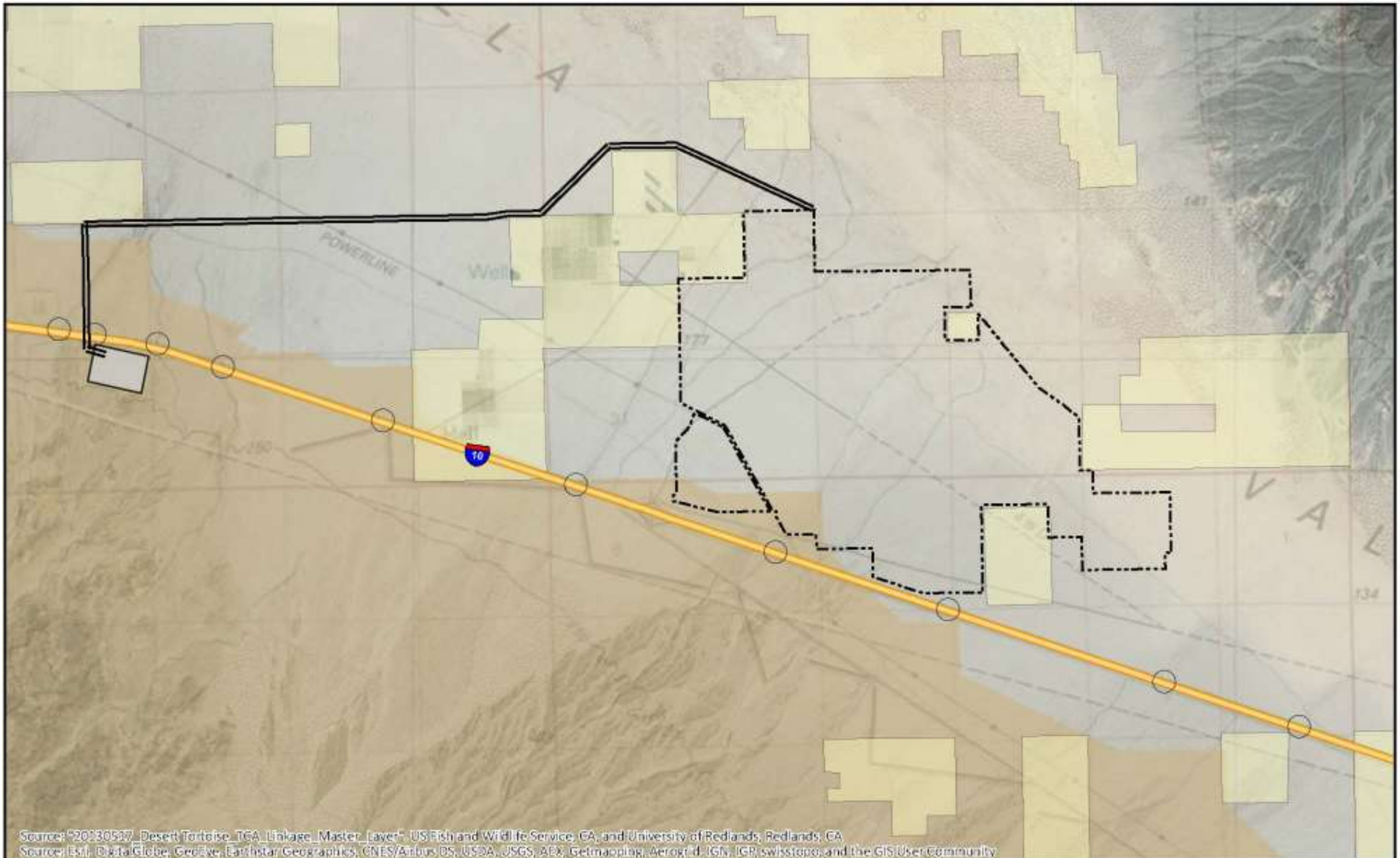
Project Boundary
Gen-Tie Line
I10
High Priority Habitat
Linkage
Tortoise Conservation Area

FIGURE 9

Desert Tortoise Conservation Areas (TCA) and Habitat Linkages

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 110816\BRTR Fig 09 - DETO TCA and Links.mxd | 11/8/2016



Ironwood Consulting

0 650 1,300
Meters

Project Boundary
Gen-Tie Line
SCE Red Bluff Substation
I10
2013 PSEGS I-10 Underpass Survey Areas
Private Land Ownership
Tortoise Conservation Area

FIGURE 10

Local Desert Tortoise Connectivity

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 110816\BRTR Fig 10 - DETO Local Connectivity.mxd | 11/8/2016

In addition to the I-10 corridor to the south, the Project site is bounded by private land to the west and sand dune habitat to the east and north (Figure 10). Approximately 1,600 acres of private lands are located west of the Project site, of which approximately 830 acres support active agricultural practices. On a local scale, this land conversion has eliminated suitable habitat for desert tortoises and created a semi-permeable barrier to tortoise movement from west-to-east. The Project site is located south of the margins of a sand transport zone, and south of Palen Dry Lake. While desert tortoises may be found in dunes and desert dry lake areas, these areas are generally not a regular part of tortoises' home ranges due to poor cover, low forage, and non-friable soils; however, desert tortoise sign has been documented within these habitats, which demonstrates that these areas are, in fact, used by the species.

To evaluate the degree of existing connectivity in the vicinity of the Project site, a survey effort was conducted in April 2010 (Solar Millennium 2010b) to locate culverts and bridges crossing I-10. This survey investigated fencing along I-10 and all potential wildlife underpasses along a 32-mile stretch of the interstate between the Desert Center and Wiley Wells Road exits.

This survey identified 24 crossings (oriented approximately in a north-south direction) that were further evaluated for suitability for use by large mammals, small mammals, and reptiles. For each of the crossings, data was collected on undercrossing type (box culvert, bridge, etc.) and dimensions (length, width, height), animal sign within the vicinity of the crossing, estimated degree of perennial vegetation cover at the approach and within the undercrossing, where criteria ranged from Bare-to-Dense (60 – 85% cover).

The survey additionally identified two types of fencing within the I-10 corridor, and concluded the fencing does not function to restrict wildlife access across the roadway. The fencing was often missing or in disrepair, and was not tethered to the underpasses, and does not function to funnel wildlife under the interstate.

Wildlife species and/or sign detected at the undercrossings included lizards, rodent (*Peromyscus* sp., *Dipodomys* sp., *Neotoma* sp.), rabbit (*Sylvilagus* sp.), roadrunner (*Geococcyx californianus*), ground squirrel (*Spermophilus* sp.), fox, coyote (*Canis latrans*), bobcat (*Lynx rufus*) and mule deer (*Odocoileus hemionus*).

Perennial vegetation type, typical of the Colorado (Sonoran) desert habitat was identified near the underpasses, and included *Psorothamnus* sp., cheesebush (*Ambrosia salsola*), ironwood (*Olneya tesota*), mesquite (*Prosopsis glandulosa*), and palo verde (*Cercidium floridum*), brickell bush (*Brickellia* sp.) scorpion weed (*Phacelia* sp.), *Psorothamnus* sp., cattle saltbush (*Atriplex polycarpa*), brittlebush (*Encelia farinosa*), white bursage (*Ambrosia dumosa*), creosote (*Larrea tridentata*).

It was concluded the underpasses provide connectivity and safe movement corridors between the habitat to the north and south of the I-10 interstate, and that current fencing does not prevent animals from accessing I-10, or funnel animals to the underpasses (Solar Millennium 2010b).

<u>Summary</u>

The PSPP PA/FEIS (Section 3.23) asserted that PSPP disturbance area consisted of lower predicted desert tortoise habitat north of I-10 and moderate habitat south of I-10, which is consistent with the current conditions of the Project. The potential for desert tortoises to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.2 Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard (*Uma scoparia*) is a California Species of Special Concern. The Mojave fringe-toed lizard is found in arid, sandy, sparsely vegetated habitats and is associated with creosote scrub throughout much of its range (Jennings and Hayes 1994). This species is restricted to aeolian sand habitats in the deserts of Los Angeles, Riverside, and San Bernardino Counties in California and La Paz County in Arizona (Hollingsworth and Beaman 1999; Stebbins 1985; Murphy et al. 2006). Within these regions, they are known to occur at more than 35 sand dune complexes in California and one in Arizona (Jarvis 2009). Nearly all records for this species are associated with present-day and historical drainages and associated sand dune complexes associated with three major river systems with blow sand: Amargosa River, Mojave River, and Mojave and Colorado Rivers (BLM 2015).

Mojave fringe-toed lizards normally hibernate from November to February, emerging from hibernation sites from March to April. The breeding season is April to July (Mayhew 1965). From May to September, they are active in mornings and late afternoon, but seek cover during the hottest parts of the day. It burrows in the sand for both cover from predators and protection from undesirable temperatures (Stebbins 2003), though it also will seek shelter in rodent burrows. Home ranges for Mojave fringe-toed lizards vary greatly between sexes with adult males typically holding large (0.10 hectare or 0.3 acre) home ranges that are on average three times that of females (BLM 2015). They are primarily insectivorous, but also eat plant food including leaves, seeds and buds (Stebbins 2003).

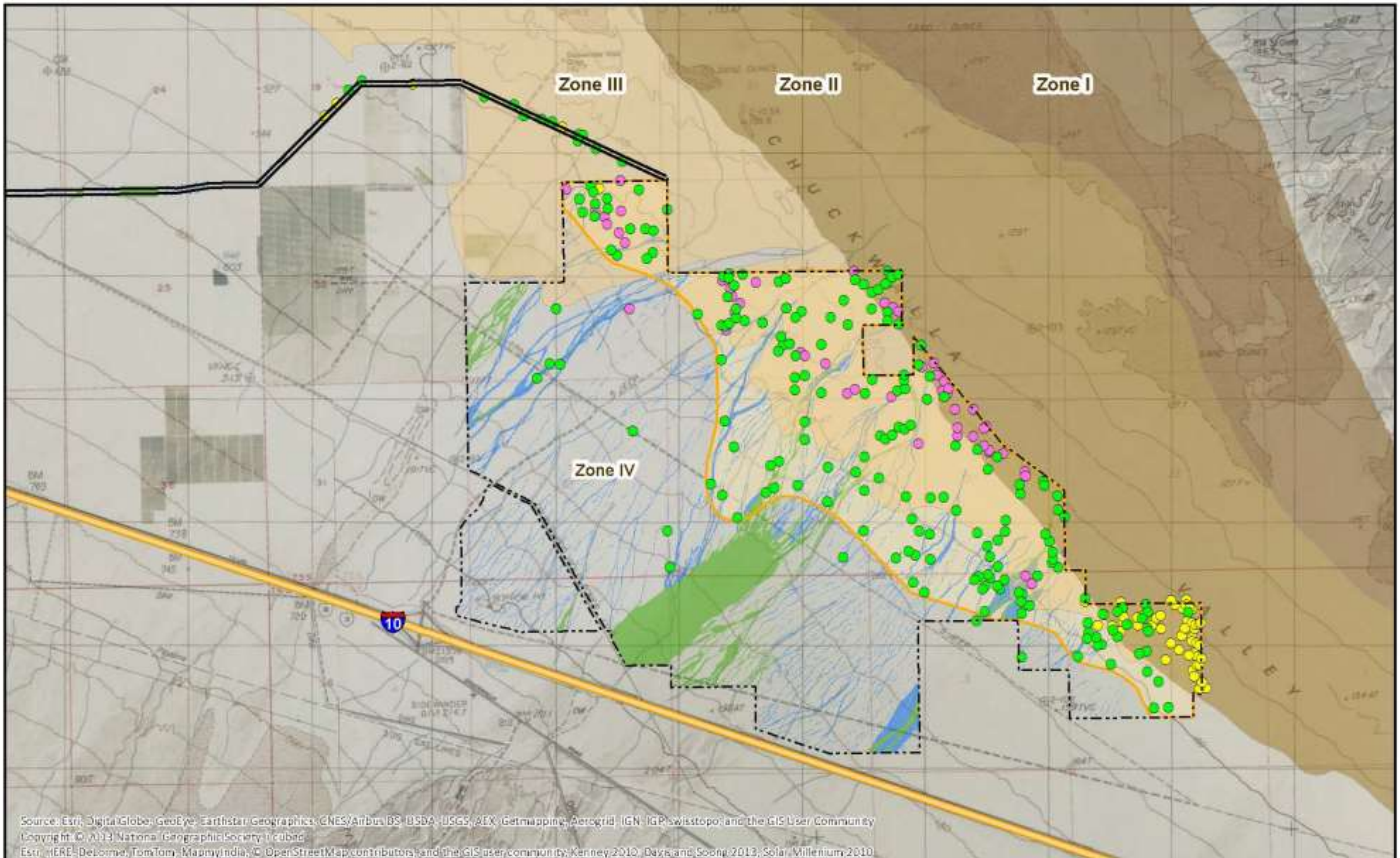
The assessment of the sand transport system (see Section 2.5) associated with the Project site and adjacent lands have assisted in characterizing suitable Mojave fringe-toed lizard habitat. As this species requires loose, wind-blown sand, its distribution within the survey areas is consistent with the presence of suitable soil conditions. The distribution of Mojave fringe-toed lizards resulting from the 2016 surveys was largely consistent with previously described suitable habitat, which primarily included all stabilized and partially stabilized sand dunes and also included contiguous wash habitat that supported appropriate soils (CEC 2010).

Wildlife surveys conducted in 2009 and 2010 identified highest concentrations within Zone II outside of the Project site (Figure 11). Zone II is characterized by vegetated active sand dunes (Kenney 2010). While the majority of Zone II occurs outside the Project site, approximately 6 percent of the Project site is located within Zone II. Within the Project site, surveys conducted in 2009, 2010, and 2016 had consistent results in that Zone II supported the highest density of observations compared to other portions of the Project site. In 2016, 34 observations were recorded within 228 acres within Zone II. In 2009 and 2010, a total of 66 observations were recorded within Zone II.

Approximately 23 percent (903 acres) of the Project site is located within Zone III. In 2016, 114 observations of Mojave fringe-toed lizards were recorded within Zone III and 65 observations in Zone IV (2,776 acres). In 2009 and 2010, a total of 26 observations were recorded within Zone III and 2 observations were recorded in Zone IV. Although a higher number of Mojave fringe-toed lizard observations were recorded in 2016 within Zone III and Zone IV than in previous years, they were located within habitat that was previously identified as suitable for this species (BLM 2011).

The variation in recorded observations between previous surveys and 2016 data may be most attributed to differences in survey timing, resulting in differences in temperature at time of surveys, and volume of existing data at the time of surveys. In spring 2009 when the majority of the PSPP site was surveyed, surveys began in mid-March when temperatures are often lower than optimal for Mojave fringe-toed lizards. Jones and Lovich (2009) noted that this species was most active starting in late spring, during the hotter periods of the day when temperatures reach optimum levels (greater than 99 degrees Fahrenheit), and were rarely active when air temperatures were less than optimum. In 2016, surveys occurred later in the spring season, commencing in late April and the survey effort was refined to survey suitable habitat for Mojave fringe-toed lizard when daily temperatures were high, increasing the likelihood for detection of Mojave fringe-toed lizards.

Additionally, each subsequent survey can be more focused and refined based on the information collected and analyzed during previous efforts, as well as considering new datasets and models that broaden the understanding of habitat suitability for target species. The surveys in 2009 were the first focused field effort at the site and Mojave fringe-toed lizard observations were largely incidental to those of other species. The 2016 surveys were performed with an enhanced understanding of species' potential occurrence due to previous records and newly available data sources including the desert tortoise probability of occurrence model (Nussear et al. 2010) and the DRECP species suitability models for both Mojave fringe-toed lizard and desert tortoise, which were not available in 2009.



Ironwood Consulting

0 0.5 1
Kilometers

Project Boundary
Gen-Tie Line
I10
SCE Red Bluff Substation

MFTL Observations
MFTL Observations (2016)
MFTL Observations (2010)
MFTL Observations (2009)
MFTL Estimated Suitable Habitat

Aeolian Sand Zones
Zone I
Zone II
Zone III

Wash Vegetation Type
Desert Dry Wash Woodland
Ephemeral Dry Wash

FIGURE 11
Mojave Fringe-Toed Lizard Observations within Project Site
2009-2016
Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 020317\BRTR Fig 11 - MFTL v2 alt.mxd | 2/3/2017

Separate from the Mojave fringe-toed lizard studies performed in 2010, PWA (2010) described the alluvial fan within Zones III and IV and characterized both minor and major wash systems across the site. The major washes, notably the central major wash, were described as supporting wide sandy zones (at times as broad as 1,500 feet) within one mile of Interstate 10 (Zone IV) that appeared suitable for Mojave fringe-toed lizards. This description is consistent with the observations of Mojave fringe-toed lizards recorded in 2016.

Observations in Zone IV appear to correlate with mapped washes, as previously described, that were contiguous with occupied habitat to the east (Figure 11). This may be due to the lower wash reaches supporting relatively unconsolidated, fine sediments at the time of surveys in 2016. The presence of suitable habitat within these washes likely fluctuates between years depending on recent surface flow and adequate sand deposition. The number of Mojave fringe-toed lizard observations associated with wash habitat was relatively lower than areas of more suitable habitat to the east and north.

Eighteen records (five in 2010 and thirteen in 2016) of Mojave fringe-toed lizards were associated within the eastern-most two miles of the gen-tie line. The western five miles of the gen-tie is located outside suitable habitat for this species.

The PSPP PA/FEIS (Section 3.23) asserted that nearly one-half (1,781 acres) of the PSPP disturbance area contained suitable habitat for Mojave fringe-toed lizards. The estimated boundary of suitable habitat was updated based on observations of Mojave fringe-toed lizards recorded in 2016 (95 percent of the total observations) resulting in approximately 1,622 acres within the Project site (Figure 11). The total acreage of estimated suitable habitat is consistent the description in the PSPP PA/FEIS.

4.1.3 American Badger

The American badger is a State Species of Special Concern associated with dry open forest, shrub, and grassland communities with an adequate burrowing rodent population and friable soils. Badgers generally are associated with treeless regions, prairies, parklands, and cold desert areas (Zeiner et al. 1990). Badgers inhabit burrows and often predate and forage on other small mammals that inhabit burrows, as evidenced by claw marks along the edges of existing burrows. Most of the CNDDB records from the Palo Verde Valley area of Riverside County are prior to 1960; the closest to the Project site is northwest of Palo Verde approximately 12 miles southeast of the project site (CNDDB 2016; CEC 2010).

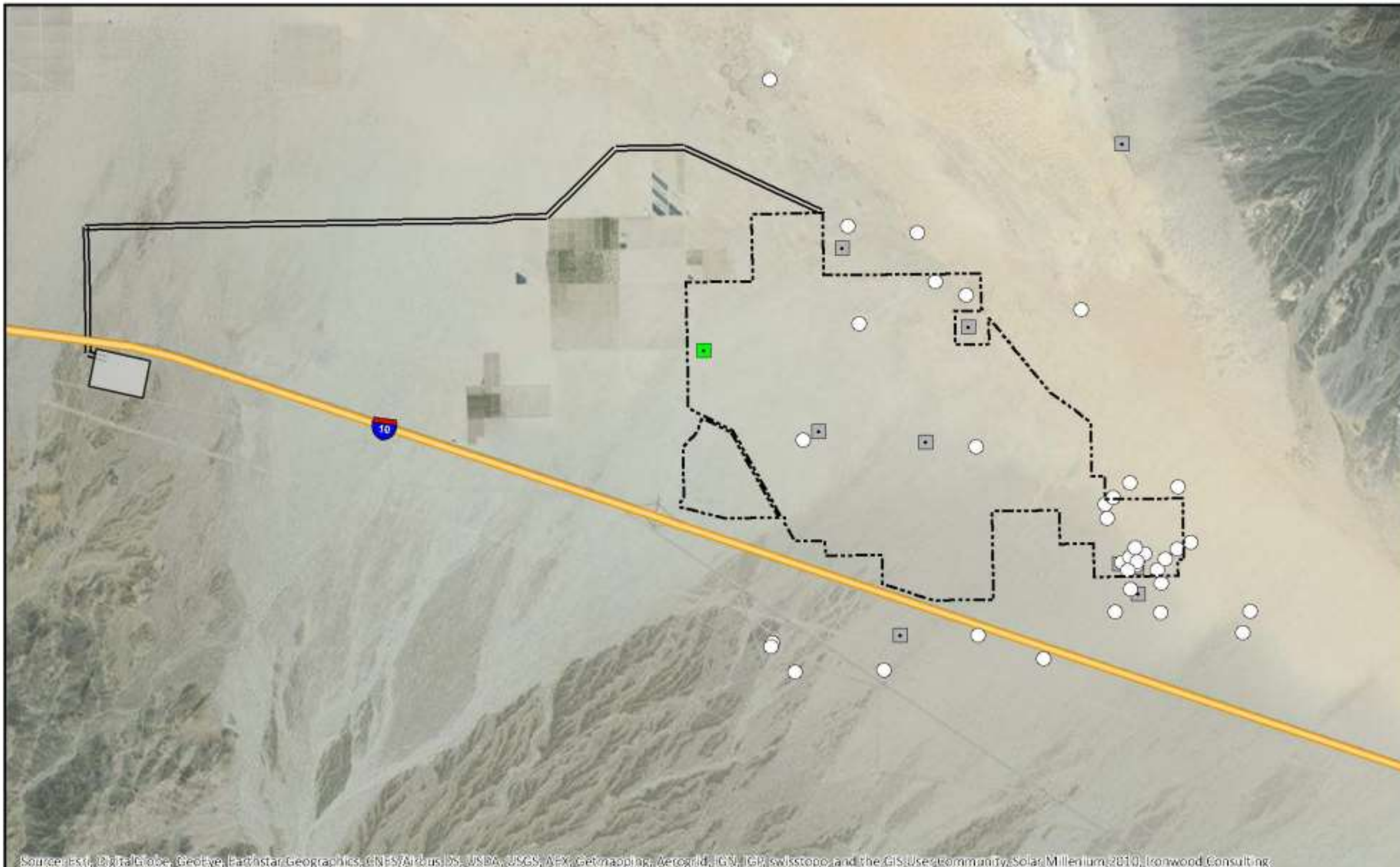
The entire Project site is considered suitable habitat for badgers. Badger sign was found during spring 2009 field surveys; burrow predation evidence by badgers was found throughout the Project site and buffer (Figure 12). Surveyors observed five badger dens and over 10 small mammal burrows showing evidence of predation by badgers, and a badger skull was observed within the buffer, south of I-10. No badgers were observed during 2013 surveys of the modified linear components. The 2016 surveys noted one den with indication of badger use near the western boundary of the solar facility.

The PSPP PA/FEIS (Section 3.23) asserted that the entire PSPP disturbance area contained suitable habitat for American badger, which is consistent with the current conditions of the Project. The potential for American badger to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.4 Desert Kit Fox

Desert kit fox (*Vulpes macrotis arsipus*) is protected by the California Code of Regulations (Title 14, CCR: §460) and Fish and Game Commission Section 4000 as a fur-bearing mammal. Title 14 of the California Code of Regulations, Section 460, stipulates that desert kit fox may not be taken at any time. Desert kit foxes are fossorial mammals that occur in arid open areas, shrub grassland, and desert ecosystems within the Mojave Desert. Desert kit fox typically occur in association with their prey base, which includes small rodents, primarily kangaroo rats, rabbits, lizards, insects, and in some cases, immature desert tortoises (Zeiner et al. 1990). Dens that support multiple entrances provide shelter, escape, cover, and reproduction, but desert kit fox may utilize single burrows for temporary shelter. Litters of one to seven young are typically born in February through April (McGrew 1979).

In 2011, the first known cases of canine distemper virus (CDV) were observed in desert kit foxes about 20 miles west of Blythe on public lands managed by the BLM for the Genesis Solar Energy Project. CDV is transmitted by contact with body fluids containing the virus, and can be transmitted among multiple carnivore species. The outbreak was thought to have originated from an infected host animal entering the site, possibly a wild or domestic dog, American badger, or other carnivore. Desert kit foxes were captured for disease testing at several project sites within the region (including Desert Sunlight, Genesis Ford Dry Lake, SCE’s Colorado River Substation, and PSPP) due to a concern that the spread of CDV within the kit fox population was facilitated by project-related displacement of infected animals. CDV was identified at the two latter sites, which span a distance of about 40 miles on the I-10 corridor within the Chuckwalla Valley (BLM 2010). The CDFW Wildlife Investigations Lab continues to monitor the health of desert kit foxes and is attempting to characterize the spread and significance of the disease on regional kit fox populations.



Ironwood Consulting

Project Boundary
Gen-Tie Line
SCE Red Bluff Substation
I10

American Badger Den (2016)
American Badger Den (2009-2010)
American Badger Predation Burrow (2009-2010)

0 750 1,500
Meters

FIGURE 12

American Badger Observations
2009-2016

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 110816\BRTR Fig 12 - American Badger.mxd | 11/8/2016

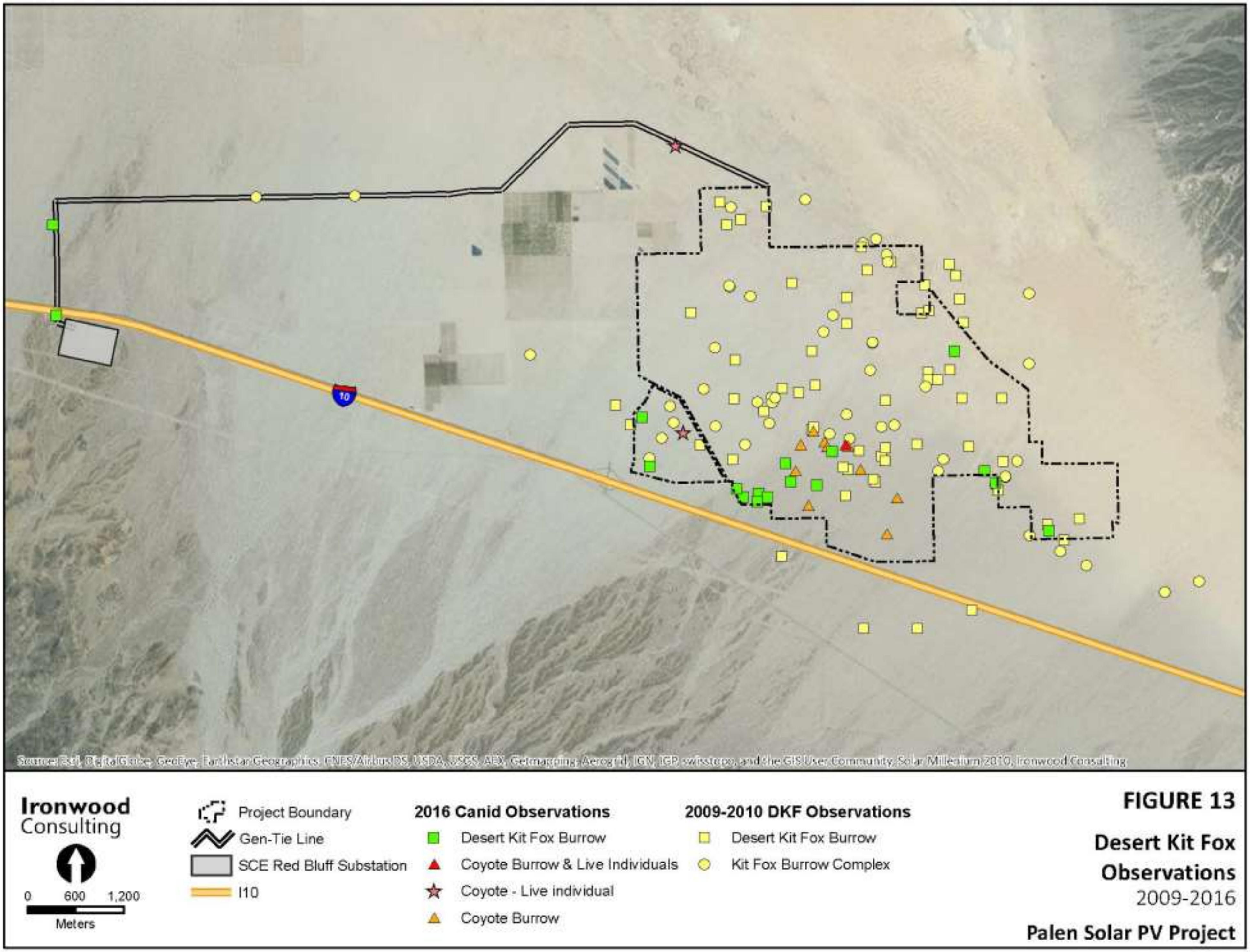


FIGURE 13

Desert Kit Fox Observations
2009-2016

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 110816\BRTR Fig 13 - Desert Kit Fox.mxd | 1/20/2017

During spring 2009 surveys, desert kit fox burrows, burrow complexes, and scat were observed throughout the Project site and buffer. There were approximately 71 burrows and burrow complexes recorded. In fall 2009, Desert kit fox scat and a burrow were observed along the gen-tie line (Figure 13; CEC 2010). During spring 2010 field surveys, two kit fox complexes were found in the Project site and four burrow complexes were found in the buffer area. No kit fox dens were observed during spring 2013 surveys of the modified linear features (Karl, 2013a). Spring 2016 surveys were performed to update site conditions and recorded 14 desert kit fox burrows/complexes, 20 pieces of scat, and 18 sets of desert kit fox tracks within the Project site. One additional active kit fox complex was recorded approximately 30 m outside the southeast Project boundary in August 2016. Spring 2016 surveys along the gen-tie yielded 4 desert kit fox burrows, 3 scat, and 3 tracks.

The reduction in the number of observations from the 2009/2010 recorded data could be a result of changing conditions on the Project site. Desert kit fox distribution is dynamic and would be expected to change over time under natural conditions due to available prey and other environmental factors. As noted in Section 4.1.1, the existing date palm farm may have subsidized the local coyote population allowing it to flourish more than under natural conditions. The presence of coyotes could dissuade desert kit fox from their previous recorded activity areas. Coyotes are known to prey on young kit fox pups.

Recent trapping and radio tracking efforts of desert kit fox in the region by CDFW indicate that foxes were using the region below I-10 and the Southern California Edison Devers-Palo Verde #2 (DPV2) transmission corridor and utilizing the Project site (Magdelena Rodriguez, CDFW, pers. comm.). During this program, seven dens that exhibit varying level of activity have been documented within the Project site.

The PSPP PA/FEIS (Section 3.23) asserted that the entire PSPP disturbance area contained suitable habitat for desert kit fox, which is consistent with the current conditions of the Project. The potential for desert kit fox to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.5 Desert Bighorn Sheep

The Desert Bighorn Sheep (*Ovis canadensis nelsoni)* is a BLM Sensitive Species. The desert bighorn sheep is found from the Transverse Ranges through most of the desert mountain ranges of California, Nevada, and northern Arizona to Utah. Essential habitat for bighorn sheep includes steep, rocky slopes of Desert Mountains, and areas where surface water is available for foraging. In the spring, when annual plants are available, bighorn tend to disperse downhill to bajadas and alluvial fans to forage (CEC 2010).

Over the past 140 years, bighorn sheep have suffered considerable population declines throughout their range. One contributing factor to this is that meta-populations have been fragmented by roads and other barriers, with a resulting decline in genetic diversity (Bleich et al., 1996, Epps et al., 2005). Disease (possibly resulting from contact with domestic sheep) drought, predation, anthropogenic factors, and loss of surface water sources may contribute to the viability of existing sheep populations (Wehausen 2005).

Two metapopulations of bighorn sheep occur within the NECO planning area, the Southern Mojave and Sonoran. Within these metapopulations, there are smaller, isolated subpopulations of bighorn sheep known as demes. Nine demes occur in the Sonoran metapopulation (BLM CDD 2002 as cited in CEC 2010). The NECO Plan addresses the conservation of the bighorn sheep through the designation of Bighorn Sheep Wildlife Habitat Management Areas (WHMAs), which overlay the entire range of their occurrence and movement corridors (CEC 2010). Bighorn sheep metapopulations have been fragmented by highways, roads, railroads, and aqueducts. The I-10 and Interstate 40 represent major obstacles to bighorn sheep movements. Transportation corridors associated with Highways 66, 62, 177, 95, and 78, the AT&SF Railroad (parallel to Old Highway 66) and the Eagle Mountain Railroad (proposed for reactivation) inhibit bighorn sheep movements between demes. Nevertheless, bighorn sheep are known to successfully cross these and other linear features such as transmission lines and fences (CEC 2010).

The project site is located south of occupied bighorn sheep WHMAs in the Palen, Granite, and Coxcomb Mountains (CEC 2010). Recent surveys suggest that bighorn sheep may occur in the Little Maria Mountains, further to the northeast of the Project site (Wehausen, 2009). Desert bighorn sheep have been documented in the Chuckwalla Mountains southwest of the project site and the Palen, Granite, Coxcomb, and Eagle mountain ranges to the north, west, and east. Six rams were observed in the Coxcomb Mountains during Phase 2 golden eagle surveys performed jointly for various energy projects during 2010 (CEC 2010). The Project site is located over 3 miles southwest from suitable mountainous habitat in the Palen Mountains and over 4 miles from suitable habitat in the Chuckwalla Mountains (CEC 2014a). Bighorn sheep may disperse through these mountain ranges typically whenever forage and water conditions are suitable (CEC 2010).

No sign or evidence of desert bighorn sheep were found during field surveys; however, scat is often difficult to distinguish from burro deer. While the Project site supports possible intermountain habitat for desert bighorn sheep, the 7-mile wide potential linkage situated between suitable bighorn sheep mountainous habitat supports a low-intactness value near the I-10 due to restricted movement opportunities associated with the freeway (CEC 2014a).

The PSPP PA/FEIS (Section 3.23) asserted that the entire PSPP disturbance area did not support evidence of desert bighorn sheep and does not occur within a known movement corridor, which is consistent with the current condition of the Project. The potential for desert bighorn sheep to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.6 Burro Deer

Burro deer (*Odocoileus hemionus eremicus*) is a subspecies of mule deer (*Odocoileus hemionus*) that inhabits desert dry wash woodland communities in the Colorado region of the Sonoran Desert near the Colorado River. Some burro deer are resident along the Colorado River, while others are transient and move into desert areas in response to seasonal increases in water and forage. During hot summers burro deer concentrate along the Colorado River or the Coachella Canal where water developments have been installed and where microphyll woodland is dense and provides good forage and cover. With late summer thundershowers and cooler temperatures, burro deer move away from the Colorado River and Coachella Canal into larger washes or wash complexes in the foothills and nearby mountains (BLM CDD 2002).

During 2009 field surveys, burro deer scat and tracks were observed in rocky substrate and deep washes including the western, central, and eastern desert washes that transect the project site. Deer sign was found within the washes and 150-foot-wide box culverts that convey the washes underneath I-10 (CEC 2010). Burro deer are also known to use a culvert associated with the western-most Project site wash to access a water source at the adjacent agricultural property (CEC 2010). The full Project site supports suitable habitat for burro deer. Surveys conducted in 2013 found burro deer scat and tracks in washes east of the proposed gen-tie alignment and adjacent to I-10, and tracks were observed in the natural gas line extension buffer zone proposed for PSEGS (Karl, 2013a). Surveys conducted in spring 2016 found scat and tracks throughout the Project site.

The PSPP PA/FEIS (Section 3.23) asserted that the entire PSPP disturbance area contained suitable habitat for burro deer and sign of burro deer was detected within the larger washes within the study area, which is consistent with the current conditions of the Project. The potential for burro deer to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.7 Bats

Bat roosts are known to occur in the vicinity of the Project site in the McCoy Mountains, Eagles Nest Mine (Little Maria Mountains), and Paymaster Mine located within 16km of the Project site (Larry LaPre, BLM, pers. comm.; CEC 2010). During roost surveys performed in 2009 and 2013, one roost site was recorded under the I-10 bridge across Corn Springs Road and no other bat roosts were identified (WEST 2016). Bridges surveyed in the Project vicinity tended to be smooth cement and provided minimal to negligible roosting habitat (Pat Brown, pers. comm.). No active bat roosts were documented on the Project site; however, roosting opportunities for several bat species (e.g., canyon bat and California myotis) are available in tree cavities, soil crevices and rock outcroppings primarily within dry desert wash woodland habitats (CEC 2010). Surveys performed in 2016 noted many large ironwood trees that had the potential to serve as roost sites; however, no sign of bats were detected. It is not expected that any special status bat species would have a substantial roost on the Project site because habitat features most associated with these species (e.g. rock ledges, cliffs, large tree hollows, mine shafts) do not occur on site. The possibility exists for incidental observations for these species.

Several common and special status bat species were detected during acoustic monitoring and likely utilize habitats within the Project site for foraging especially when water is present within the desert washes and insects are more abundant (Table 5; CEC 2010; WEST 2016; Brown and Rainey 2013). Seven species of bats were detected during the spring and fall 2013 acoustic surveys. Seven additional species have the potential to occur on the Project site (Table 5). Two bat species (California leaf-nosed bat and Townsend's big-eared bat) typically have low intensity echolocation signals and may not have been acoustically detectable. Several call sequences were associated with either hoary or pocketed free-tailed bats; however, the calls lacked features for confirmation of species (WEST 2016).

Table 5 - Bat Species

COMMON NAME	SCIENTIFIC NAME	STATUS[1] (FEDERAL/STATE/WBWG)	DOCUMENTED PRESENCE[2]
High Frequency (> 40 kHz)			
California myotis	*Myotis californicus*	- / - /L	Detected during acoustic surveys
California leaf-nosed bat	*Macrotus californicus*	BLMS/SSC/H	Not detected
canyon bat	*Parastrellus hesperus*	- / - /L	Detected during acoustic surveys
cave myotis	*Myotis velifer*	BLMS/SSC/M	Not detected
Yuma myotis	*Myotis yumanensis*	BLMS/- /L	Not detected
Mid Frequency (30 - 40 kHz)			
western yellow bat	*Lasiurus xanthinus*	- /SSC/H	Detected during acoustic surveys
Low Frequency (< 30 kHz)			
big brown bat	*Eptesicus fuscus*	-/- /L	Not detected
big free-tailed bat	*Nyctinomops macrotis*	-/SSC/M	Detected during acoustic surveys
hoary bat	*Lasiurus cinereus*	-/- /L	Possibly detected during acoustic surveys

COMMON NAME	SCIENTIFIC NAME	STATUS[1] (FEDERAL/STATE/WBWG)	DOCUMENTED PRESENCE[2]
Mexican free-tailed bat	*Tadarida brasiliensis*	-/-/L	Detected during acoustic surveys
pallid bat	*Antrozous pallidus*	BLMS/SSC/L	Detected during acoustic surveys
pocketed free-tailed bat	*Nyctinomops femorosaccus*	-/SSC/M	Possibly detected during acoustic surveys
Townsend's big-eared bat	*Corynorhinus townsendii*	BLMS/SSC/H	Not detected
Very Low Frequency (< 15 kHz)			
western mastiff bat	*Eumops perotis*	BLMS/SSC/M	Detected during acoustic surveys

[1]Status

BLMS = Bureau of Land Management Sensitive Species (BLM 2010b)
SSC = CDFW Species of Special Concern (CDFW 2016)
WBWG = Western Bat Working Group (WBWG 2016)
H = are imperiled or are at high risk of imperilment
M = warrant closer evaluation, more research, and conservation actions
L = most of the existing data support stable populations

[2] Species not detected during previous surveys may have the potential to occur on the Project site in the future. Some bat species (e.g., Townsend's big-eared bat) are difficult to detect with acoustic surveys.

In spring 2013, a total of 989 identified bat call minutes were recorded for the four nights across the 12 detector locations (WEST 2016). The highest number of call minutes (443) was recorded at the site located in the northernmost station located next to a large palo verde tree. Canyon bats were the most common species detected at all stations, followed closely by California myotis (WEST 2016). Pallid and Mexican free-tailed bats were detected less frequently and not detected at all stations (WEST 2016). In fall 2013, the highest number of call minutes and species were recorded at the artificial pond located in the agricultural land outside the northwestern boundary of the Project site (WEST 2016).

4.1.7.1 Special Status Bats

Seven special status bat species that may forage on or near the Project site and were detected or possibly detected during acoustic surveys in 2013; therefore, are discussed further below. Suitable, but limited, roosting habitat may occur for several of these species within the dry wash woodland habitat on the Project site. Other special status bat species known from the region typically inhabit rocky sites and would not be expected to use the Project site for roosting.

Two special status species (e.g., cave myotis and Yuma myotis) were described in the PSPP PA/FEIS (Section 3.23) as having the potential to occur in the PSPP disturbance area; however, these species were not detected during acoustic surveys in 2013. The potential for these species to occur within the Project site has not changed from, and are likely less than, the description in the PSPP PA/FEIS.

Townsend's Big-Eared Bat

Townsend's big-eared bat (*Corynorhinus townsendii*) is a CDFW Species of Special Concern, BLM Sensitive Species, and was a recent candidate for state listing prior to CDFW recommending that listing was not warranted in a status review it prepared for the Fish and Game Commission in June 2016 (CDFW 2016b). This species roosts in caves, mines, abandoned dwellings, and large basal hollows of large trees (e.g., redwoods). Townsend's big-eared bat has been recorded occurring from sea level to approximately 9,000 feet elevation within a range of various habitats. This species typically forages along streams and within woodlands habitats.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging habitat, but lacked suitable roosting habitat, for Townsend's big-eared bat. Townsend's big-eared bat was not detected during acoustic surveys in 2013 and this species typically has low intensity echolocation signals thus may not have been acoustically detectable (WEST 2016). Townsend's big-eared bat may forage within the Project site but it is not expected to roost due to absence of suitable structures (e.g., abandoned buildings) and natural features (e.g., caves and large hollowed trees). The potential for Townsend's big-eared bat to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

California Leaf-Nosed Bat

California leaf-nosed bat (*Macrotus californicus*) is a CDFW Species of Special Concern and BLM Sensitive Species. This species occurs in the deserts of California, southern Nevada, Arizona and south to northwestern Mexico. In California, they are currently known from eastern San Bernardino, Riverside, and San Diego counties and all of Imperial County (CEC 2012). California leaf-nosed bat relies on caves and mines for roosting habitat. Foraging habitat typically consists of riparian and desert wash habitats.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable habitat for California leaf-nosed bat. California leaf-nosed bat was not detected during acoustic surveys in 2013 and this species typically has low intensity echolocation signals thus may not have been acoustically detectable (WEST 2016). This species may forage within the Project site but it is not expected to roost due to absence of suitable caves and mines. The potential for California leaf-nosed bat to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

Pallid Bat

The pallid bat (*Antrozous pallidus*) is a CDFW Species of Special Concern and BLM Sensitive Species. It is a locally common species throughout California, and a year-round resident in most of the range. This species occupies a wide variety of habitats at elevations less than 6,000 feet including grasslands, shrublands, woodlands, and forests, and is most common in open, dry habitats with rocky areas for roosting; pallid bat roosts in cliffs, caves, crevices, mines, hollow trees, and various human-made structures (Zeiner 1990).

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging and roosting habitat for the pallid bat. The pallid bat was detected during acoustic surveys in 2013 (WEST 2016). This species may forage and roost, primarily within the dry wash woodland, within the Project site. The potential for pallid bat to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

Western Mastiff Bat

The western mastiff bat (*Eumops perotis californicus;* greater bonneted bat) is a CDFW Species of Special Concern and BLM Sensitive Species. This species is widespread through the southwest U.S. and into Mexico. Its distribution in California is widespread, with year-round occurrence data primarily in central and southern California (Zeiner 1990). The western mastiff bat is found in a range of habitats, including coastal, forests, woodland, and desert scrub areas that are associated with roosting sites (Pierson and Rainey 1998). Roosting habitat typically consists of rocky crevices in canyons and cliffs with vertical or nearly vertical walls. The majority of roost sites are at least two meters above the ground (e.g., on cliff faces) and lacking obstructions.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging habitat for the western mastiff bat, but that suitable roosting habitat for this species was absent. The western mastiff bat was detected during acoustic surveys in 2013, but relatively less frequently than other species (WEST 2016). The potential for western mastiff bat to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

Western Yellow Bat

The western yellow bat (*Lasiurus xanthinus*) is a CDFW Species of Special Concern. It is found in Arizona, New Mexico, Mexico, and year-round in California. It is found in arid regions, in riparian, desert riparian, desert wash and palm oasis habitat. The western yellow bat is insectivorous, and roosts and feeds in palm oases and riparian habitats (Zeiner 1990).

The PSPP PA/FEIS (Section 3.23) did not address the western yellow bat. This species was detected during acoustic surveys in 2013, but only at the artificial pond located near the date palm farm outside the northwestern boundary of the Project site (WEST 2016). The Project site lacks typical foraging and roosting habitat for western yellow bat; however, this species may be found on the Project site due to the proximity of the existing offsite date palm farm.

<u>Big Free-Tailed Bat</u>

The big free-tailed bat (*Nyctinomops macrotis*) is a CDFW Species of Special Concern. Its distribution is south west U.S., and northern South America, generally from sea level to 8,000 feet in elevation. It is rare in California, prefers rocky terrain, and roosts in tree cavities and man-made structures. It is known to wander in autumn, out of its normal range (Zeiner 1990).

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging and roosting habitat for the big free-tailed bat. This species was detected during acoustic surveys in 2013, but with the lowest detection rate of all species (WEST 2016). The big free-tailed bat may forage and roost, primarily within the dry wash woodland, within the Project site. The potential for this species to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

<u>Pocketed Free-Tailed Bat</u>

The pocketed free-tailed bat (*Nyctinomops femorosaccus*) is a CDFW Species of Special Concern. This species occurs but is less common in western North America, from southern California, central Arizona, southern New Mexico, western Texas, and more common in Mexico (WBWG 2016). The pocketed free-tailed bat has been documented in Riverside, San Diego, and Imperial counties. Typical habitats include pinyon-juniper woodlands, desert scrub, desert succulent shrub, desert riparian, desert wash, alkali desert scrub, Joshua tree, and palm oasis and roosting habitat typically includes rock crevices associated with granite boulders, cliffs, or rocky canyons at a height suitable for approach and takeoff (CNDDB 2016). Pocketed free-tailed bats are known to occur in the desert from March through August, when they then migrate out of the area (BLM 2011).

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging and roosting habitat for the pocketed free-tailed bat. This species was possibly detected during acoustic surveys in 2013; several call sequences were associated with either hoary or pocketed free-tailed bats and lacked features for confirmation of species (WEST 2016). The potential for pocketed free-tailed bat to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.8 Western Burrowing Owl

The Western burrowing owl *(Athene cunicularia hypugaea)* is a California Species of Special Concern, and a Federal Bird of Conservation Concern. Western burrowing owls inhabit arid lands throughout much of the western United States and southern interior of western Canada (Haug et al. 1993). Suitable habitat for western burrowing owl includes open habitat with available burrowing opportunities, including agricultural fields (active and fallow), creosote scrub, desert saltbush, ephemeral washes, and ruderal areas.

Burrowing owls are unique among the North American owls in that they nest and roost in abandoned burrows, especially those created by ground squirrels, kit fox, desert tortoise, and other wildlife. Burrowing owls have a strong affinity for previously occupied nesting and wintering habitats and will often return to previously-used burrows, particularly if they had successful reproduction in previous years (Gervais et al. 2008). The southern California breeding season (defined as from pair bonding to fledging) generally occurs from February to August, with peak breeding activity from April through July (Haug et al. 1993).

In the Colorado Desert, burrowing owls generally occur at low densities in scattered populations, but they can be found in much higher densities near agricultural lands where rodent and insect prey tend to be more abundant (Gervais et al. 2008). Burrowing owls tend to be opportunistic feeders, and a large portion of their diet consists of mainly beetles and grasshoppers, and other larger arthropods and consumption of insects increases during the breeding season (Haug et al. 1993). Small mammals, especially mice and voles (*Microtus* and *Peromyscus* spp.) are important food items, and other prey animals include herpetofauna, young cottontail rabbits, bats, and birds such as sparrows and horned larks.

Phase I through III protocol-level surveys conducted in spring and summer 2009 identified two nesting pairs with juveniles and four active burrows (Figure 14; CEC 2010). One pair with juveniles was observed using two burrows near the center of the site, and a second pair with juveniles was observed using two burrows near the northwest corner of the site (WEST 2016).

Survey results from 2009 indicated that a total of 4 burrowing owls with active burrows within the Project site (CEC 2010). Surveys performed in 2016 identified five burrows with sign (e.g., whitewash, pellets, and/or feathers) within the Project site. Based on the results of several years of surveys, the Project site supports resident burrowing owl in low densities. Breeding season surveys were not performed in 2016 because the total number of burrows with sign was consistent with surveys performed in 2009, which included breeding season surveys that resulted in two pairs of reproducing burrowing owls on the Project site. The potential for burrowing owl occupancy within the Project did not vary substantially between 2009 and 2016 based on the number of burrows containing sign recorded during surveys.

Ironwood Consulting

0 550 1,100
Meters

Project Boundary
Gen-Tie Line
SCE Red Bluff Substation
I10

2016
Burrow with Sign

2013 PSEGS WBO Observations
Adult Individual

2010 AECOM WBO Observations
Burrow with Sign

2009 AECOM WBO Observations
Active Burrow (Natal)
Burrow with Sign

FIGURE 14

Western Burrowing Owl Observations
2009-2016

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 110816\BRTR Fig 14 - Western Burrowing Owl.mxd | 11/8/2016

The PSPP PA/FEIS (Section 3.23) asserted that the majority of the PSPP disturbance area contained suitable habitat for western burrowing owl and may support approximately four active burrows, which is consistent with the current conditions of the Project. The potential for western burrowing owl to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.9 Golden Eagle

<u>Background</u>

Golden eagles are a Federal bird species of conservation concern and are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668a - d, as amended), and are typically year-round residents throughout most of their western United States range. They breed from late January through August with peak activity March through July (Kochert et al. 2002). Migratory patterns are usually fairly local in California where adults are relatively sedentary, but dispersing juveniles sometimes migrate south in the fall. Habitat for golden eagles typically includes rolling foothills, mountain areas, and deserts. Golden eagles need open terrain for hunting and prefer grasslands, deserts, savanna, and early successional stages of forest and shrub habitats. Golden eagles primarily prey on lagomorphs and rodents but will also take other mammals, birds, reptiles, and some carrion (Kochert et al. 2002). This species prefers to nest in rugged, open habitats with canyons and escarpments, often with overhanging ledges and cliffs or large trees used as cover.

Recent data analysis and population modeling suggest the status of the golden eagle population in the western United States is gradually declining towards a new lower equilibrium of about 26,000 individuals, down from an estimated 34,000 in 2009 and 2014 (USFWS 2016). The future population estimate relies on the continuation of current ecological and biological conditions. The authors estimate 3,400 golden eagles die annually from anthropogenic causes in the United States (USFWS 2016), and suggest a level of sustainable take is approximately 2,000 individuals annually. The authors add that additional unmitigated mortality will steepen the rate of decline that the golden eagle population is presently undergoing (USFWS 2016).

In the absence of interference from humans, breeding density is determined by either prey density or nest site availability (CEC 2010) of breeding season home ranges from several western United States studies showed an average home range of 20–33 square kilometers (7.7 to 12.7 square miles) that ranged from 1.9 to 83.3 square kilometers (0.7 to 32.2 square miles). In San Diego, a study of 27 nesting pairs found breeding ranges to be an average of 36 square miles with a range from 19 to 59 square miles (CEC 2010). Other studies from within and outside the United States include ranges from 9 to 74.2 square [range of 14.7 to 26.1 pairs per 1,000 square kilometers, or 386 square miles]) (CEC 2010).

Nest Surveys

There is no suitable eagle nesting habitat on the Project site. The site supports suitable foraging habitat, albeit low potential (WEST 2016). Nest surveys performed in 2010, 2012, 2013, 2014, and 2015 encompassed a 10-mile radius of the Project site with the objective of identifying and characterizing golden eagle occurrences proximate to the Project site.

In spring 2010, aerial surveys found two active golden eagle nests within one territory, approximately 7 miles southwest of the Project site in the Chuckwalla Mountains. Additionally, three inactive nests were located approximately 6 miles southwest of the Project site in the Chuckwalla Mountains; two of these nests were associated with the aforementioned active territory, the other was likely associated with a territory located further south (Solar Millennium, 2010c).

The 2012 golden eagle surveys performed by BioResource Consultants Inc. investigated 397 golden eagle nesting sites in the BLM California Desert District (CDD). Within the entire CDD, 74 sites were determined occupied (as indicated by courtship, a pair present, or the nest being maintained), of which 44 were active (as evidenced by incubation, eggs, brooding, chicks, and fledglings). No nest sites within 10 miles of the Project site were found to be occupied. Two golden eagle observations to the Project site were located greater than 14 miles north within the Little Maria and Granite Mountains, both of which had unknown status with no nesting observed.

In spring and summer 2013, aerial and ground-based surveys identified no active golden eagle within the 10-mile radius of the Project site, including the Palen Mountains. A single golden eagle observation was recorded: a third-year golden eagle flying around the cliffs in the southwestern portion of the Palen Mountains (WEST 2016). Twelve inactive golden eagle nests were recorded (WEST 2016).

Three potential golden eagle nests were identified in the Palen Mountains; two nests were inactive while the third was recently active by red-tailed hawks, which over the decades probably has alternated usage between red-tailed hawks and golden eagles with most recent use associated with red-tailed hawks (Bloom Biological, 2013c). Several active and inactive red-tailed hawk territories were identified, all in cliffs (Bloom Biological, 2013c). No physical signs of active golden eagle nesting activity (e.g., eagles, eagle white wash, fresh nest material, etc.) was observed at any of the previously known nest sites in the Chuckwalla Mountains; however, the altitude that aerial surveys were flown in this region (above 1,500 ft) limited the certainty of aerial survey results (BBI 2013c). Follow-up ground-based surveys were conducted on foot in the Chuckwalla Mountains in April 2013, to visit and observe potential golden eagle nest sites identified during aerial surveys. No eagle nests were identified during ground-based surveys in the Coxcomb Mountains within the 10-mile radius of the Project site (BBI 2013c). No eagle nests were identified during aerial surveys of the approximately 22-mile length of east-west trending DPV2 power lines within the 10-mile radius of the Project site; however, several active red-tailed hawk nests were recorded (BBI 2013c).

Under ideal environmental conditions, the 10-mile radius around the Project site might support up to eight golden eagle territories (WEST 2016). In 2013, none of the eight approximated territories were active or exhibited sign of activity. The observed low numbers of golden eagles within the Project study area was consistent between several years of surveys and typical of the California deserts in that there is a relatively high probability that golden eagle nesting territories are vacant or contain inactive nests due to low prey availability (WEST 2016).

During the 2014 surveys, all previously described golden eagle nests were monitored, as well as a number of additional nests. In total, 35 eagle nests were documented during the April and July surveys. None of the nests newly identified in 2014 showed signs of recent activity. Moreover, no golden eagles were observed during aerial or ground-based surveys (WEST 2016). During the spring 2015 ground-based surveys, 20 previously observed golden eagle nests and one newly discovered nest were monitored. Sixteen nests showed no signs of occupancy, three nest territories were occupied by red-tailed hawks in early stages of visiting/refurbishing nests, and two nests were being actively occupied by red-tailed hawks incubating or raising. The newly identified nest did not show signs of recent activity. In summary, none of the previously-identified golden eagle territories, which were visited in spring 2015, were determined to be occupied by golden eagles (WEST 2016).

<u>Winter Surveys</u>

Surveys were performed in January and February 2013 that involved visual surveys and six baiting stations. A single sub adult was present all five weeks at bait station 6 located in the Palen Mountains north of the site, feeding on the carcass 2-3 days each week. No other golden eagles were observed during any of the six full-length survey sessions (BBI 2013e).

<u>Prey Abundance Surveys</u>

In 2013, 196.5 km (122 miles) of transects were performed within and adjacent to the solar facility area, which resulted in seventeen black-tailed jackrabbits and one desert cottontail observations. Observations were concentrated in two general areas: southeast extent of the Project site near the I-10 and smaller cluster in the north-central part of the Project site. Fewer lagomorph observations were noted in 2016 than in 2013 during the 1,273 km (791 miles) of transects performed at more variable daily time periods. The low abundance of lagomorphs may have been further reduced over the recent several years due to the presence of a local coyote population that is likely subsidized by the nearby agricultural lands. Although the site remains suitable for foraging by golden eagles, it supported a relatively low density of lagomorphs during 2013 surveys under conditions similar to those of 2016, a year in which low densities of lagomorphs also appear to persist.

Summary

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area was located more than one mile from suitable nesting habitat for golden eagles and the nearest active nest was approximately seven miles from the site. The potential for golden eagles to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.10 Loggerhead Shrike

The Loggerhead shrike (*Lanius ludovicianus*) is currently considered a CDFW Bird Species of Special Concern (nesting), and a USFWS Bird of Conservation Concern. Loggerhead shrikes are small predatory birds that are uncommon residents throughout most of the southern portion of their range, including southern California. In southern California, they are generally much more common in interior desert regions than along the coast (Humple 2008). This species can be found within lowland, open habitat types, including creosote scrub and other desert habitats, sage scrub, non-native grasslands, chaparral, riparian, croplands, and areas characterized by open scattered trees and shrubs. Fences, posts, or other potential perches are typically present. Loss of habitat to agriculture, development, and invasive species is a major threat; this species has shown a significant decline in the Sonoran Desert (Humple 2008). Loggerhead shrikes initiate their breeding season in February and may continue with raising a second brood as late as July; they often re-nest if their first nest fails or to raise a second brood (Yosef 1996). In general, loggerhead shrikes prey upon large insects, small birds, amphibians, reptiles, and small rodents over open ground within areas of short vegetation, usually impaling prey on thorns, wire barbs, or sharp twigs to cache for later feeding (Yosef 1996).

The Project site contains suitable habitat for loggerhead shrike (CEC 2010). Loggerhead shrikes were observed within the Project site during spring 2009 and 2010 surveys (Figure 15; CEC 2010). The species also was observed during spring 2013 avian field survey along the gen-tie line. Loggerhead shrike was also recorded during the 2016 surveys.

The PSPP PA/FEIS (Section 3.23) asserted that the entire PSPP disturbance area contained suitable nesting and foraging habitat for loggerhead shrike, which is consistent with the current conditions of the Project. The potential for loggerhead shrike to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

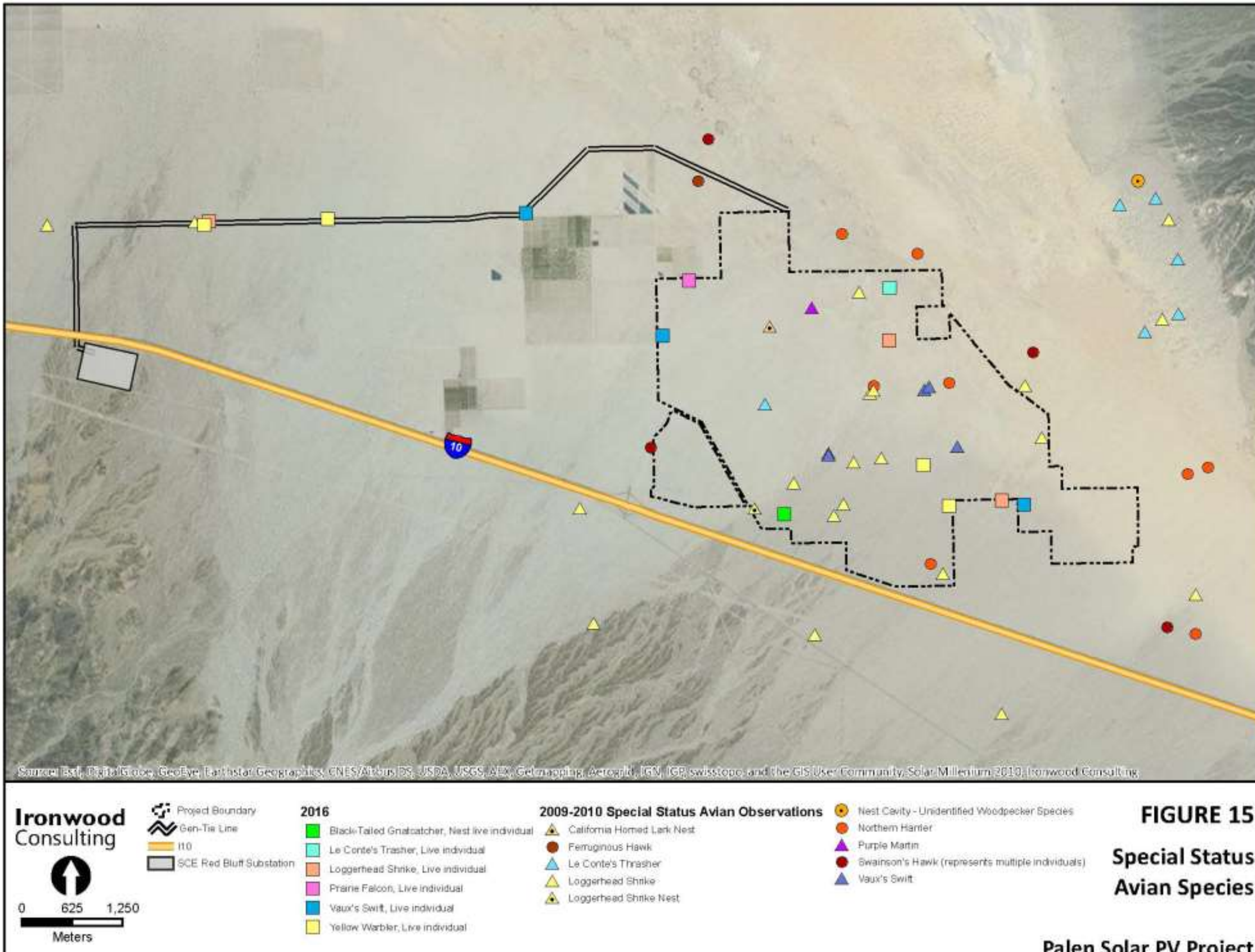


FIGURE 15

Special Status Avian Species

Palen Solar PV Project

F:\Ironwood-Server\Share\GIS\Projects\Palen EDF - Maverick\Updated 110816\BRTR Fig 15 - Other Special Status Avian.mxd | 11/8/2016

4.1.11 Le Conte's Thrasher

In California, Le Conte's thrasher (*Toxostoma lecontei*) is a resident in the San Joaquin Valley and the Mojave and Colorado Deserts (Weigand and Fitton 2008). This pale gray bird occurs in desert flats, washes and alluvial fans with sandy and/or alkaline soil and scattered shrubs. Preferred nest substrate includes thorny shrubs and small desert trees, and nesting rarely occurs in monotypic creosote scrub habitat or Sonoran Desert woodlands (Prescott 2005). Breeding activity occurs from January to early June, with a peak from mid- March to mid-April. Le Conte's thrashers forage for food by digging and probing in the soil. They eat arthropods, small lizards and snakes, and seeds and fruit; the bulk of their diet consists of beetles, caterpillars, scorpions, and spiders.

Suitable habitat for Le Conte's thrasher is located in the Project site, primarily within desert dry wash woodland. This species was observed during 2009 surveys, including avian-specific surveys conducted between 2010 and 2013 (CEC 2010; WEST 2016), as well as in spring 2016 (Figure 15).

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable habitat for Le Conte's thrasher primarily within desert dry wash woodland, which is consistent with the current conditions of the Project. The potential for Le Conte's thrasher to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.12 California Horned Lark

The California horned lark (*Eremophila alpestris actia*) is currently on the CDFW watch list. It is found throughout California except the north coast, and is less common in mountainous areas. This species prefers open areas that are barren or with short vegetation including deserts, brushy flats, and agricultural areas, and includes creosote scrub. Eggs are laid March to early June, and this species frequently lays a second clutch (Zeiner 1990). There are numerous records for this species in western Riverside County (CNDDB 2016). The Project site contains suitable habitat for this species, and it was observed frequently on the Project site, including the gen-tie line, during 2009 and 2010 surveys and during spring 2013 avian field surveys (Figure 15; WEST 2016).

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable habitat for California horned lark primarily within creosote bush scrub, which is consistent with the current conditions of the Project. The potential for California horned lark to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.13 Prairie Falcon

The prairie falcon (*Falco mexicanus*) is currently on the CDFW watch list, and a USFWS Bird of Conservation Concern. It inhabits dry environments in the North American west from southern Canada to central Mexico. It is found in open habitat at all elevations up to 3,350 m, but is associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. They require cliffs or bluffs for nesting though will sometimes nest in trees, on power line structures, on buildings, or inside caves or stone quarries. Ground squirrels and horned larks are the primary food source, but prairie falcon will also prey on lizards, other small birds, and small rodents (Zeiner 1990).

Prairie falcons were observed several times during Project surveys both as flyovers and perched in the Project site (Figure 15). The entire Project site contains suitable foraging habitat for this species. The Project site does not contain suitable nesting habitat, although mountains located over 3 miles away may provide nesting habitat. There are numerous CNDDB records in the region for this species, including eight records from Little Maria Mountains to the northeast (CEC 2010) and the Chuckwalla Mountains to the southwest (CEC 2010). During golden eagle Phase 2 nest surveys performed jointly for neighboring proposed energy projects, a pair of prairie falcons was documented to be nesting on the same cliff on which the golden eagle nest was located in the Palen Mountains (CEC 2010)

The PSPP PA/FEIS (Section 3.23) asserted that the entire PSPP disturbance area contained suitable foraging habitat and no nesting habitat for prairie falcon, which is consistent with the current conditions of the Project. The potential for prairie falcon to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.14 Gila Woodpecker

Gila woodpecker is designated as endangered in California, a BLM Sensitive Species, and a USFWS Bird of Conservation Concern. Gila woodpecker is predominantly a permanent resident across its range in areas of southeast California, southern Nevada, central Arizona, extreme southwest New Mexico, and parts of Mexico. The Gila woodpecker is an uncommon to fairly common resident in Southern California along the Colorado River, and locally near Brawley, Imperial County (Garrett and Dunn 1981). Suitable habitats include riparian woodlands, uplands with concentrations of large columnar cacti, old- growth xeric-riparian wash woodlands, and urban or suburban residential areas (Rosenberg et al. 1987; Edwards and Schnell 2000). Gila woodpeckers prefer large patches of woody riparian vegetation for nesting (greater than 49 acres), but others have documented the species in various habitat types, such as desert washes (McCreedy 2008) and residential areas (Mills et al. 1989). Suitable habitat within the Project site would be in desert washes, but would be expected to more readily use off-site palm trees than on-site palo verde or ironwood trees. Surveys conducted in 2013 reported one incidental Gila woodpecker during point count surveys (WEST 2016). The probability of this species nesting on the Project site is low because the site supports sparse riparian woodland habitat and is located on the periphery of the geographic range for this species.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area did not support suitable nesting habitat for Gila woodpecker and that this species was not expected to occur in the project site. One observation of Gila woodpecker was recorded greater than 1 mile from the Project in 2013 during avian point count surveys, which represents a change in potential for this species to occur within the Project site since the description in the PSPP PA/FEIS; however, Gila woodpecker is still not expected to nest within the Project site due to lack of typical nesting habitat.

4.1.15 Black-tailed Gnatcatcher

Black-tailed gnatcatchers (*Polioptila melanura)* are currently on the CDFW watch list. They are permanent residents from southeastern California and Arizona to southern Texas and northern Mexico. They are found in arid scrublands, desert brush, and dry washes amongst creosote bush, ocotillo, mesquite, paloverdes, and cactus. They live pairs all year-round, defend their territory, and forage for small insects amongst low shrubs and trees. Black-tailed gnatcatchers were observed in 2013 and 2016 on the Project site. The Project site contains suitable foraging and potential nesting habitat for this species.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area did not support dense scrub suitable as nesting habitat for black-tailed gnatcatchers. This species was commonly detected during 2013 avian surveys and an active nest was observed in the dry wash woodland in 2016, which represents a change in potential for black-tailed gnatcatchers to occur within the Project site since the description in the PSPP PA/FEIS.

4.1.16 Sonora Yellow Warbler

The Sonora yellow warbler (*Setophaga petechia sonorana*) is currently considered a CDFW Bird Species of Special Concern (breeding), and a USFWS Bird of Conservation Concern. It occurs principally as a migrant and summer resident from late March through early October, and breeds from April to late July (Dunn and Garrett 1997). The Sonora yellow warbler breeds only along the lower Colorado River in California, and from southern Arizona and southwest New Mexico to north-central Mexico and possibly the Colorado River Delta. It arrives to breed on the lower Colorado River in early April and nests mainly from mid-May through July (Rosenberg et al. 1991). They generally occupy riparian shrubs and trees close to water. Its diet includes ants, bees, wasps, caterpillars, beetles, true bugs, flies, and spiders (Beal 1907, Shuford 2008). Sonora yellow warblers were observed during small bird count surveys in 2013 (WEST 2016).

The Project site contains suitable foraging habitat (during migration) and no suitable nesting habitat.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area did not support suitable nesting habitat for Sonora yellow warbler and that this species was not observed during surveys. This species was detected during avian surveys in 2013 and in 2016 and may be present during migration; however, Sonora yellow warbler is not expected to nest within the Project site due to lack of typical nesting habitat, which is consistent with the description in the PSPP PA/FEIS.

4.1.17 Short Eared Owl

The short-eared owl (*Asio flammeus*) is a California Species of Special Concern. It is a widespread winter migrant in central and western California, and generally present from September through April. It is an uncommon winter migrant in southern California. Habitat requirements include grasslands, prairies, dunes, meadows, irrigated lands, and wetlands, and Short-eared owls generally require dense vegetation for roosting and nesting (Shuford 2008). One short-eared owl was detected on site during surveys in 2013 (WEST 2016). The Project site does not provide suitable nesting habitat, although short-eared owls may be found on site incidentally during migration or foraging events.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable wintering habitat and lacked suitable nesting habitat for short-eared owl. One observation of short-eared owl was recorded during avian surveys in 2013; however, this species is not expected to nest within the Project site due to lack of typical nesting habitat, which is consistent with the description in the PSPP PA/FEIS.

4.1.18 Ferruginous Hawk

The ferruginous hawk (*Buteo regalis*) is a California Watch List species, and a USFWS Bird of Conservation Concern. It is an uncommon winter resident and migrant at lower elevations and open grasslands in the Central Valley and Coast Ranges, and a fairly common winter resident of grasslands and agricultural areas in southwestern California (Garrett and Dunn 1981). There are no breeding records from California. This species frequents open grasslands, sagebrush flats, and desert scrub. Prey items include lagomorphs, small mammals, reptiles and amphibians (Zeiner 1990). This species was observed during surveys small bird surveys in 2013 (WEST 2016). The project site provides potential wintering and migration habitat, and does not provide suitable nesting habitat.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable wintering habitat and lacked suitable nesting habitat for ferruginous hawk. Two observations of ferruginous hawks were recorded during avian surveys in 2013; however, this species is not expected to nest within the Project site due to geographic restrictions, which is consistent with the description in the PSPP PA/FEIS.

4.1.19 Swainson's Hawk

Swainson's hawk (*Buteo swainsoni*) is listed as Threatened by CDFW, and a Bird of Conservation Concern by the USFWS. The Swainson's hawk occurs as a breeding species in open habitats throughout much of the western United States and Canada, and in northern Mexico. In California, breeding populations of Swainson's hawks occur in desert, shrub and grasslands, and agricultural habitats; however, most of the state's breeding sites are in the Great Basin and Central Valley (Woodbridge 1998). These birds favor open habitats for foraging, and are near-exclusive insectivores as adults, but may also forage on small mammals and reptiles. This species was observed during surveys small bird surveys in 2013 (WEST 2016). The project site provides potential migration habitat, and does not provide suitable nesting habitat.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging habitat during migration and lacked suitable nesting habitat for Swainson's hawk, which is consistent with the current condition of the Project site. The potential for Swainson's hawk to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.20 American Peregrine Falcon

The American peregrine falcon (*Falco peregrinus anatum*) is listed as CDFW Fully Protected species, and considered a USFWS Bird of Conservation Concern. It is distributed worldwide. In California, range is primarily central to northern California, with wintering habitat located in southern California. Migrants occur along the coast and in the western Sierra Nevada in spring and fall. It breeds mostly in woodland, forest, and coastal habitats, and favors open landscapes with cliffs as nest sites. Their diet consists primarily of birds and bats (Zeiner 1990). This species was located during bird-use count surveys in 2013 (WEST 2016). The project site provides suitable foraging habitat, and no suitable nesting habitat occurs on site.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging habitat and no nesting habitat for American peregrine falcon, which is consistent with the current conditions of the Project. The potential for prairie falcon to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.21 Vaux's Swift

Vaux's swift (*Chaetura vauxi*) is a CDFW Species of Special Concern. It is a summer resident of northern California and a fairly common migrant throughout most of the state in spring and fall. It roosts in hollow trees and snags, and often in large flocks. Vaux's swifts feed exclusively on flying insects (Shuford 2008). This species was observed during small bird count surveys that were completed in 2013 (WEST 2016). Vaux's swift was also detected during spring 2016 surveys. The project site provides suitable habitat during migration, and no suitable nesting habitat.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging habitat during migration and lacked suitable nesting habitat for Vaux's swift, which is consistent with the current condition of the Project site. The potential for Vaux's swift to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.22 Mountain Plover

Mountain plover (*Charadrius montanus)* is a CDFW Species of Special Concern, and a USFWS Bird of Conservation Concern. They are found in semi-arid plains, grasslands, and plateaus. They use open grasslands, plowed fields with little vegetation, and open sagebrush areas. Winter habitats include desert flats, and plowed fields. Mountain plovers are insectivores, feeding primarily on large ground-dwelling insects, including grasshoppers, beetles, and crickets (Shuford 2008). This species' distribution was modeled as occurring in the Chuckwalla Valley (CEC 2014a). One mountain plover was observed during bird use count surveys in 2013 (WEST 2016). The project site provides suitable habitat during migration, and is not likely to support suitable nesting habitat.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging habitat during migration/winter and lacked suitable nesting habitat for mountain plover, which is consistent with the current condition of the Project site. The potential for mountain plover to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.23 Northern Harrier

Northern harrier (*Circus cyaneus)* is a CDFW Species of Special Concern. It inhabits most of California at various times of the year, found in elevations up to 3000m. Northern harriers frequent meadows, grasslands, open rangelands, desert sinks, fresh and saltwater emergent wetlands. They are a widespread winter resident and migrant in suitable habitat. They primarily feed on small mammals, birds, frogs, small reptiles, crustaceans, and insects (Zeiner 1990).

Northern harriers were found on site during previous surveys on the Project site (WEST 2016). There is suitable foraging, and no suitable nesting habitat on the Project site.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area contained suitable foraging habitat during migration/winter and lacked suitable nesting habitat for northern harrier, which is consistent with the current condition of the Project site. The potential for northern harrier to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.24 Yellow-breasted Chat

The yellow-breasted chat (*Icteria virens*) is a CDFW Species of Special Concern. It is an uncommon summer resident and migrant in coastal California, in foothills of the Sierra Nevada, and within the Colorado Desert is known only from the Salton Sea and Colorado River. In southern California, chats breed locally on the coast, and very locally inland (Garrett and Dunn 1981). During migration, they may be found in lower elevations of mountains in riparian habitat (McCaskie et al. 1979; Shuford 1990). Yellow-breasted chat was recorded during small bird count surveys that were conducted in 2013, likely during migration (WEST 2016). The yellow-breasted chat may be found incidentally on site during migration, but suitable nesting habitat is not present.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area did not contain suitable habitat for yellow-breasted chat. One observation of yellow-breasted chat was recorded during avian surveys in 2013; however, this species is not expected to nest within the Project site due to lack of typical nesting habitat, which is consistent with the description in the PSPP PA/FEIS.

4.1.25 Crissal's Thrasher

Crissal's thrasher (*Toxostoma crissale*) is a CDFW Species of Special Concern. This species is a resident of southeastern deserts, occupying dense shrubs in desert riparian and desert wash habitats, including mesquite, ironwood, and acacia. This thrasher primarily forages on the ground, feeding on invertebrates, berries, and seeds (Bent 1948; Shuford 2008). One observation of Crissal's thrasher was recorded during small bird count surveys in 2013 (WEST 2016). The project site provides limited but suitable nesting and foraging habitat primarily associated with dry wash woodlands.

The PSPP PA/FEIS (Section 3.23) asserted that the PSPP disturbance area supported limited dense scrub suitable as nesting habitat for Crissal's thrasher, which is consistent with the current condition of the Project site. The potential for Crissal's thrasher to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.1.26 Other Listed Bird Species

No suitable breeding or wintering habitat for State or Federal listed bird species occurs within or near the Project; however, incidental detections of listed bird species including western yellow-billed cuckoo, willow flycatcher, Bell's vireos, and Ridgeway's [Yuma Ridgway's] rail have been recorded at existing utility-scale solar projects in California. Thus, an assessment of the Project's potential effects to these species was performed (Appendix E). Western yellow-billed cuckoo, willow flycatcher, and Bell's vireo breed in riparian habitats in California, winter south of the United States-Mexico border, and migrate though the Colorado Desert between breeding and wintering habitats. Yuma Ridgway's rail nests in freshwater marshes and is distinct from the other listed bird species in that they are not known to regularly migrate between areas of breeding habitat. Additional information is provided in Appendix E.

4.2 Special Status Plant Species

Forty-one special status plant species were reviewed for their potential to occur within the Project site and its vicinity based on regional plans and database records (Table 6; CNDDB 2016, CEC 2014c). The status of each species has been updated (CNPS 2016). Special status species that were detected within the Project site, buffer, or have moderate potential to occur based on the presence of suitable habitat within the Project site are discussed further in this section. Species that were determined to have a low probability of occurrence due to the absence of suitable habitat, differences in elevation range, or significant distance from known geographic range are detailed in Appendix C. A cumulative list of all plant species observed during previous surveys in included in Appendix D.

Two special status plant species were observed within the Project site during spring 2009, 2010, and 2017 surveys: Harwood's milk-vetch and ribbed cryptantha (Figure 16). Other sensitive plants recorded outside the project site or along the gen-tie were Harwood's eriastrum, California ditaxis, and Utah vining milkweed. In spring 2017, Harwood's eriastrum was recorded within the far eastern edge of the Project site, primarily within Zone II (Figure 16). A relatively new taxon of *Atriplex* was documented on the saline lake margin approximately 650m north of the Project site (Andre, pers. comm.). The previous locations of this species were relocated and populations were reconfirmed during the 2016 surveys.

No special status plant species were detected within the Project site during fall surveys in October 2010 botanical surveys. This fall survey was considered effective for late-season blooming species given that summer/fall annual plant species were detected in bloom and/or fruit within and in the vicinity. Eight common annual species were observed in bloom and/or fruit, and 17 common perennial species were observed in bloom and/or fruit, including 8 previously undocumented common species that were added to the floral inventory.

Table 6 - Special Status Plant Species

COMMON NAME	*SCIENTIFIC NAME*	STATUS STATE/FED/CRPR/BLM/ GLOBAL RANK/STATE RANK	BLOOMING PERIOD	POTENTIAL TO OCCUR ON THE PROJECT SITE
Chaparral sand verbena	*Abronia villosa* var. *aurita*	__/__/1B.1/BLM Sensitive_/G5T2T3/S2	Jan-Sep	Low. Not observed.
Angel trumpets	*Acleisanthes longiflora*	__/__/2B.3/__/G5/S1	May	Low. Not observed
Desert sand parsley	*Ammoselinum giganteum*	__/__/2B.1/__/G2G3/SH	Mar-Apr	Low. Not observed
Small-flowered androstephium	*Androstephium breviflorum*	__/__/2B.2/__/G4/S2	Mar-Apr	Low. Not observed
Harwood's milkvetch	*Astragalus insularis* var. *harwoodii*	__/__/2B.2/__/G5T3/S2	Jan-May	**Present.** Recorded within solar facility study area
Coachella Valley milkvetch	*Astragalus lentiginosus* var. *coachellae*	__/FE/1B.2/BLM Sensitive/G5T1/S1	Feb-May	Low. Not observed
California ayenia	*Ayenia compacta*	__/__/2B.3/__/G4/S3	Mar-Apr	Low. Not observed
Pink fairy duster	*Calliandra eriophylla*	__/__/2B.3/__/G5/S3	Jan-Mar	Low. Not observed
Sand evening-primrose	*Camissonia arenaria*	__/__/2B.2/__/G4?/S2S3	Nov-May	Low. Not observed
Crucifixion thorn	*Castela emoryi*	__/__/2B.2/__/G3G4/S2S3	Apr-Oct	Low. Not observed
Abram's spurge	*Chamaesyce abramsiana*	__/__/2B.2/__/G4/S2	Aug-Nov	Moderate. Not observed
Arizona spurge	*Chamaesyce arizonica*	__/__/2B.3/__/G5/S3	Mar-Apr	Low. Not observed
Flat-seeded spurge	*Chamaesyce platysperma*	__/__/1B.2/ BLM Sensitive / G3/S1	Feb-Sep	Low. Not observed
Las Animas colubrina	*Colubrina californica*	__/__/2B.3/__/G4/S2S3	Apr-Jun	Low. Not observed
Spiny abrojo	*Condalia globosa* var. *pubescens*	__/__/4.2/__/G5T4/S3	Mar-Nov	**Present**. Recorded within the southwestern terminus of the gen-tie
Foxtail cactus	*Coryphantha alversonii*	__/__/4.3/__/G3/S3	Apr-Jun	Low. Not observed
Ribbed cryptantha	*Cryptantha costata*	__/__/4.3/__/G4G5/S3.3	Feb-May	**Present.** Recorded within the northern and eastern portions of the

COMMON NAME	***SCIENTIFIC NAME***	**STATUS** STATE/FED/CRPR/BLM/ GLOBAL RANK/STATE RANK	**BLOOMING PERIOD**	**POTENTIAL TO OCCUR ON THE PROJECT SITE**
				solar facility study area
Winged cryptantha	*Cryptantha holoptera*	__/__/4.3/__/G4G5/S4	Mar-Apr	Low. Not observed
Wiggins' cholla	*Cylindropuntia wigginsii* [=*Opuntia wigginsii*]	__/__/3.3/__/G3?Q/S1?	Mar	Low. Not observed
Utah milkvine	*Cynanchum utahense (*syn=[=*Funastrum utahense*]	__/__/4.2/__/G4/S4	Mar-Oct	Low. Recorded offsite
Glandular ditaxis	*Ditaxis claryana*	__/__/2B.2/__/G3G4/S2	Oct-Mar	Moderate. Not observed
California ditaxis	*Ditaxis serrata* var. *californica*	__/__/3.2/__/G5T3T4/S2?	Mar-Dec	**Present.** Recorded along western extent of the gen-tie
Cottontop cactus	*Echinocactus polycephalus* var. *polycephalus*	__/__/ CBR /__/__/__	Mar-Aug	Low. Recorded offsite
Harwood's Eriastrum	*Eriastrum harwoodii*	__/__/1B.2/BLM Sensitive_/G2	Mar-Jun	**Present.** Recorded within eastern edge of solar facility study area
California satintail	*Imperata brevifolia*	__/__/2B.1__/G3/S3	Sep-May	Low. Not observed
Pink velvet mallow	*Horsfordia alata*	__/__/4.3/__/G5/S4	Feb-Dec	Low. Not observed
Bitter hymenoxys	*Hymenoxys odorata*	__/__/2B.1/__/G5/S2	Feb-Nov	Low. Not observed
Spearleaf	*Matelea parvifolia*	__/__/2B.3/__/G5?/S3	Mar-May	Low. Not observed
Argus blazing star	*Mentzelia puberula*	__/__/2B.2/__/G5/S2	Mar-May	Low. Not observed
Slender cotton-heads	*Nemacaulis denudata* var. *gracilis*	__/__/2B.2/__/G3G4T3?/S2	Mar-May	Low. Not observed
Lobed cherry	*Physalis lobata*	__/__/2.B3/__/G5/S1S2	May-Jan	Moderate. Not observed
Desert portulaca	*Portulaca halimoides*	__/__/4.2/__/G5/S3	Sep	Low. Not observed
Desert unicorn plant	*Proboscidea althaeifolia*	__/__/4.3/__/G5/S4	May-Oct	Moderate. Not observed
Orocopia sage	*Salvia greatae*	__/__/1B.3/BLM Sensitive/G2G3/S2S3	Mar-Apr	Low. Not observed

COMMON NAME	***SCIENTIFIC NAME***	**STATUS** STATE/FED/CRPR/BLM/ GLOBAL RANK/STATE RANK	**BLOOMING PERIOD**	**POTENTIAL TO OCCUR ON THE PROJECT SITE**
Desert spikemoss	*Selaginella eremophila*	__/__/2B.2/__/G4/S2S3	May-Jul	Low. Not observed
Cove's cassia	*Senna covesii*	__/__/2B.2/__/G5/S3	Mar-Aug	Low. Not observed
Mesquite nest straw	*Stylocline sonorensis*	__/__/2A/__/G3G5/SX	Apr	Low. Not observed
Dwarf germander	*Teucrium cubense ssp. depressum*	__/__/2B.2/__/G4G5T3T4/S2	Mar-Nov	Low. Not observed
Jackass clover	*Wislizenia refracta ssp. refracta*	__/__/2B.2/__/G5T5?/S1	Apr-Nov	Moderate. Not observed
Palmer's jackass clover	*Wislizenia refracta ssp. palmeri*	__/__/2B.2/__/G5T2T4/S1	Jan-Dec	Moderate. Not observed
"Palen Lake atriplex"	*Atriplex sp. nov. J. Andre (Atriplex canescens ssp.)*	__/_/_/BLM Sensitive_/_/	May-Jun	Low. Recorded offsite

Federal FE = Federally listed endangered: species in danger of extinction throughout a significant portion of its range

FT = Federally listed, threatened: species likely to become endangered within the foreseeable future

California Rare Plant Rank (CRPR)

CRPR 1A = Presumed extinct

CRPR 1B = Rare, threatened, or endangered in California and elsewhere

CRPR 2 = Rare, threatened, or endangered in California but more common elsewhere

CRPR 3 = Plants which need more information

CRPR 4 = Limited distribution – a watch list

CBR = Considered But Rejected

.1 = Seriously endangered in California (high degree/immediacy of threat; over 80% of occurrences threatened)

.2 = Fairly endangered in California (moderate degree/immediacy of threat; 20%-80% of occurrences threatened)

.3 = Not very endangered in California (low degree/immediacy of threats or no current threats known; <20% of occurrences threatened or no current threats known)

Bureau of Land Management

BLM Sensitive = BLM Manual §6840 defines sensitive species as"those species that are (1) under status review by the FWS/NMFS; or (2) whose numbers are declining so rapidly that Federal listing may become necessary, or (3) with typically small and widely dispersed populations; or (4) those inhabiting ecological refugia or other specialized or unique habitats. BLM, 2001

Global Rank/State Rank

Global rank (G-rank) is a reflection of the overall condition of an element throughout its global range. Subspecies are denoted by a T-Rank; multiple rankings indicate a range of values

G1 = Critically Imperiled.

G2 = Imperiled.

G3 = Vulnerable.

G4 = Apparently secure. This rank is clearly lower than G3 but factors exist to cause some concern; i.e., there is some threat, or somewhat narrow habitat.

G5 = Secure. Population or stand demonstrably secure to ineradicable due to being commonly found in the world.

State rank (S-rank) is assigned much the same way as the global rank, except state ranks in California often also contain a threat designation attached to the S-rank. An H-rank indicates that all sites are historical.

SX = Presumed Extirpated

SH = Possibly Extirpated

S1 = Critically Imperiled

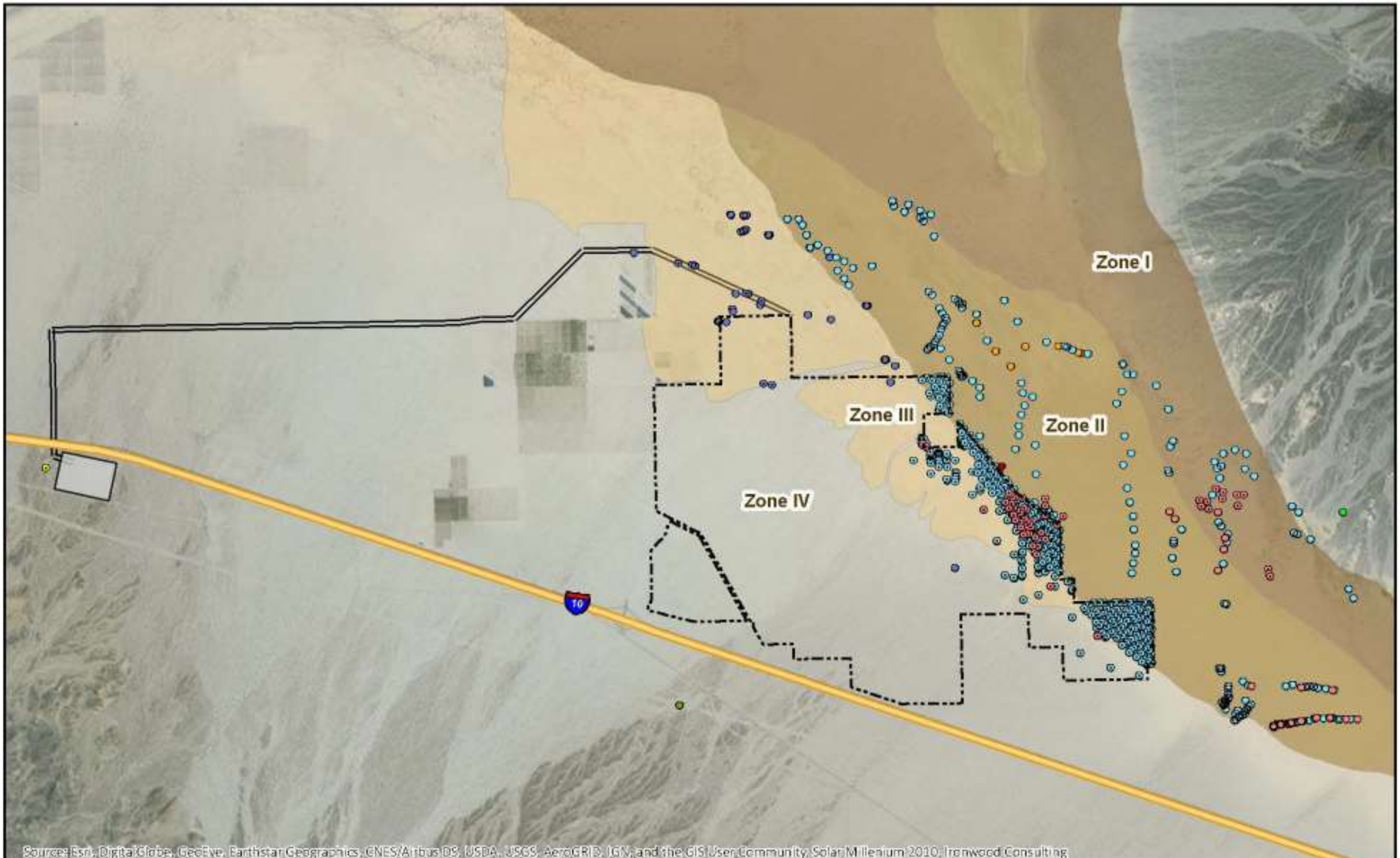
S2 = Imperiled

S3 = Vulnerable

.1 = undefined in new classification system; under old system, this meant very threatened in California

.2 = undefined in new classification system; under old system, this meant threatened in California

.3 = undefined in new classification system; under old system, this meant no current threats known in California



Ironwood Consulting

0 650 1,300
Meters

Project Boundary
SCE Red Bluff Substation
Gen-Tie Line

CRPR 1B and 2
- Harwood's eriastrum (2009-2010)
- Harwood's milkvetch (2009-2010)
- Harwood's eriastrum (2017)
- Harwood's milkvetch (2017)

CNPR List 4
- Four wing saltbush (2009-2010)
- Ribbed cryptantha (2009-2010)
- Utah milkvine (2009-2010)
- Ribbed cryptantha (2017)
- Spiny abrojo (2017)

BLM REQUESTED CACTUS SPECIES
- Cottontop cactus
- California barrel cactus

FIGURE 16

Special Status Plant Observations
2009-2017

Palen Solar PV Project

C:\Users\steven.hoerber\Documents\ArcGIS\Packages\BRTR Fig 16 - Special Status Plant Species_77BAF188-C45F-4FDA-86DE-9C9D0FDECF69\v10\BRTR Fig 16 - Special Status Plant Species.mxd | 4/12/2017

Floristic surveys conducted on the project site, buffers, and gen-tie from 2009 through 2016 identified a total number of 167 taxa. During the spring 2016 surveys, a combined total of 92 species of vascular plants were observed. Higher diversity along the gen-tie was a result of the presence of more varied habitat, topographical features, and possibly more localized precipitation and surface flow than the solar facility area. The solar facility supported 63 taxa and the gen-tie supported 73 taxa, including 16 new taxa not previously recorded. The original surveys from 2009 and 2010 reported 151 taxa. The variation in species richness between survey years is likely due to variations in winter rainfall (Section 2.4). Most of the taxa not observed in 2016 were common winter annuals, which likely did not receive enough precipitation to germinate this year. Additional species previously recorded in 2009 and 2010 were found within the 1-mile wide buffer, which included more varying habitats and associated species.

4.2.1 Harwood's Milkvetch

Harwood's milk-vetch (*Astragalus insularis* var. *harwoodii*) has a California Rare Plant Rank (CRPR) of 2B.2, is covered species under the NECO Plan, and has a NatureServe rank of G5T3/S2. This species is rare in California, but more common elsewhere. It is an annual herb that mainly occurs in Sonoran Desert scrub habitat throughout the Colorado Desert (BLM CDD 2002). This subspecies is found in desert dunes, sandy or gravelly areas, and ruderal swales throughout the Mojavean and Sonoran deserts covering portions of Imperial, Riverside, and San Diego counties (CNPS 2016). Historic and recent collections include Ogilby Road in Imperial County and three locales west of Blythe, the Pinto Basin, and Chuckwalla Basin in Riverside County. Harwood's milk-vetch has also been reported from Baja California, Sonora Mexico, and portions of Yuma County. There are several CNDDB records for this species within the Project vicinity (CNDDB 2016). Many new occurrences were documented in Chuckwalla Valley and the Palo Verde mesa during surveys for the Blythe Solar Power Project, the Genesis Solar Energy Project, the McCoy Solar Energy Project (Tetratech 2011) study areas. The Consortium of California Herbaria (CCH) lists 103 occurrences within California (CCH 2016).

The PSPP PA/FEIS (Section 3.18) asserted that Harwood's milk-vetch was present within the PSPP disturbance area. During the 2009 and 2010 surveys, a total of 146 Harwood's milk-vetch plants were documented in the survey area, 97% of which were located outside the Project site, and five records occurred within the Project site (Figure 16). Harwood's milkvetch was not observed during the March 2013 survey of the PSEGS' proposed natural gas line extension, distribution yard, and gen-tie line reroute (Karl 2013a). This species was observed in the 2017 surveys: a total of nine individual plants within the Project site and along the gen-tie. The potential for Harwood's milk-vetch to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.2 Ribbed Cryptantha

Ribbed cryptantha (*Cryptantha costata*) has a CRPR of 4.3 and a NatureServe rank of G4G5/S3.3, which suggested a limited distribution but it is not threatened in California. It typically occurs in loose friable soils, especially sand, in the eastern Mojave and Sonoran deserts in Imperial, Riverside, San Diego, and San Bernardino counties and into Arizona and south to Baja California, Mexico (CNPS 2016). It commonly occurs in stabilized and partially stabilized desert dunes and sandy areas of Sonoran and Mojave Desert creosote bush scrub. There are 258 records of this species from several locations throughout Riverside, Imperial, San Diego, and Imperial counties (CCH 2016). A large local population of ribbed cryptantha was identified during the 2010 surveys and ancillary surveys for other nearby projects (Tetratech 2011).

The PSPP PA/FEIS (Section 3.18) asserted that ribbed cryptantha was present within the PSPP disturbance area. Plant estimates of this species were made using sub-sampling methods and an estimate of 8,903 plants per acre was used (BLM 2011). Approximately 285 acres (18%) of occupied habitat were estimated to occur within the proposed PSPP disturbance area. The Project will likely avoid many of these previously recorded populations that occur off the boundary to the east. Ribbed cryptantha was not observed during a March 30, 2013 survey of the PSEGS' proposed natural gas line extension, distribution yard, and gen-tie line reroute (Karl 2013a). This species was not observed on the Project site during surveys performed in May 2016, although approximately 320 dried-up skeletons of ribbed cryptantha were identified approximately 1,500 meters east of the Project site during reference site visits in April 2016. Surveys performed in spring 2017 documented ribbed cryptantha within the eastern portions of the Project site, within Zone II, and occurredIII, occurring in densities similar to the estimates obtained through previous sampling. The potential for ribbed cryptantha to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.3 California Ditaxis

California ditaxis (*Ditaxis serrata* var. *californica*) has a CRPR of 3.2 and a NatureServe rank of G5T3T4/S2, which indicates more information is needed about the status of this species. California ditaxis may be a glabrous variety of the common *Ditaxis neomexicana* and appears to be a rare variety of the common species (CEC 2010). This species occupies Sonoran Desert scrub habitat, and prefers sandy washes and alluvial fans of the foothills and lower desert slopes, from 100 to 3,000 feet above mean sea level. Reports of this species are known from San Bernardino, Riverside, Imperial, San Diego, and Sonora, Mexico (CNPS 2016). There are 40 records of this species in California, primarily from Riverside County (CCH 2016).

The PSPP PA/FEIS (Section 3.18) asserted that California ditaxis was present within the PSPP disturbance area. A total of 22 California ditaxis plants were documented in the survey area during the 2010 surveys: 11 of the observations were located over 7 miles west of the gen-tie and 11 observations were located within a tight cluster along the gen-tie line alignment (Figure 16). California ditaxis was not observed during a March 30, 2013 survey of the PSEGS' proposed natural gas line extension, distribution yard, and gen-tie line reroute (Karl 2013a). This species was not observed during surveys performed on the Project site in 2016 or 2017; however, *D. neomexicana* was observed occasionally across the Project site and gen-tie, in flowering and fruiting condition. It is notable that several California ditaxis reference populations recorded in 2009 and 2010 along the gen-tie were revisited in 2016, and none of them keyed clearly to *D. serrata* var. *californica*, but keyed instead to *D. neomexicana*. Assuming that perennial plants and a viable seedbank of California ditaxis persists near previously documented records in 2010, then this species is presumed present on the gen-tie consistent with the quantities previously recorded. The potential for California ditaxis to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.4 Harwood's Eriastrum

Harwood's eriastrum (*Eriastrum harwoodii*), also commonly known as Harwood's phlox or woollystar, has a CRPR of 1B.2, has a NatureServe rank of G2/S2, and is a BLM sensitive species. This species is a spring annual and a California endemic with a global range restricted to San Diego, Riverside, and San Bernardino counties, typically in dunes associated with the margins around dry lakes such as Dale, Cadiz, and Soda lakes (CNPS 2016). Reports of this species are known from San Bernardino, Riverside, Imperial, San Diego, and Sonora, Mexico (CNPS 2016). There are 98 records of this species in California (CCH 2016). Surveys conducted in spring of 2010 for the Blythe Solar Power Project located this species primarily in the sandy areas south of I-10, where 2,134 plants were located and mapped. All of these plants were identified in the general vicinity of the proposed Southern California Edison Colorado River substation.

The PSPP PA/FEIS (Section 3.18) asserted that Harwood's eriastrum was not recorded within the PSPP disturbance area. Stabilized and partially stabilized dunes within the Project site were considered to be suitable habitat for this species (CEC 2010). During spring 2010 field surveys, over 150 Harwood's eriastrum plants were observed in the partially stabilized dunes outside of the Project site (between 0.5 mile and 1.5 miles to the east) (Figure 16). Harwood's eriastrum was not observed during a March 30, 2013 survey of the PSEGS' proposed linear modifications (Karl 2013a). This species was not observed in the 2016 surveys likely because of the lack of preceding winter rainfall. Offsite reference populations were successfully revisited in 2017 to confirm phenology prior to conducting formal surveys. During the 2017 surveys, 46 records of Harwood's eriastrum, consisting of approximately 940 individual plants in total, were identified within the Project site primarily within Zone II (Figure 16). Additional observations of Harwood's eriastrum were recorded incidentally within Zone I and II outside of the Project site during the

2017 surveys: 16 records consisting of approximately 867 individual plants in total. Suitable habitat for Harwood's eriastrum occurs within the un-surveyed portions of Zones I and II outside the Project site, where this species likely occurs in similar densities. Optimal growing conditions resulting from the above-average winter rainfall likely contributed to the number of observations in 2017.

In summary, stabilized and partially stabilized dune habitat, which is suitable for Harwood's eriastrum, was previously identified as occurring within the Project site as described in the PSPP PA/FEIS; however, Harwood's eriastrum was not observed within the Project site prior to 2017. In spring 2017, Harwood's eriastrum was found occupying approximately 50 acres of the Project site. Observations were located within and adjacent to mapped stabilized and partially stabilized dunes, primarily within Zone II; thus, the documented presence of Harwood's eriastrum within the Project site has changed from the description in the PSPP PA/FEIS.

4.2.5 Utah Milkvine

Utah milkvine (*Cynanchum utahense* [=*Funastrum utahense*]) has a CRPR of 4.2 and a NatureServe rank of G4/S4. This species occurs in San Diego, Imperial, Riverside, and San Bernardino counties and portions of Arizona, Nevada, and Utah (CNPS 2016). Utah milkvine is a twining perennial that occurs in sandy or gravelly soils in Mojavean and Sonoran desert scrub habitats or washes from approximately 500 feet to 4,300 feet in elevation (CNPS 2016). This species was documented on the Palo Verde Mesa (CEC 2010). There are 140 records of this species from the Consortium of California Herbaria database primarily from San Bernardino and San Diego counties; there is one record from the Big Maria Mountains from wash and stabilized dune habitat at approximately 1,200 feet elevation (CCH 2016).

The PSPP PA/FEIS (Section 3.18) asserted that Utah milkvine was not recorded within the PSPP disturbance area. Utah milkvine was not found during 2009 field surveys; however, this plant was observed incidentally at a single location east of Palen Lake and approximately 1.5 miles east of the Project site. Utah milkvine was not observed within the Project site or buffer area during 2009 or 2010 field surveys (Figure 16; Solar Millennium 2010d). Utah milkvine was not observed during March 2013 surveys of the PSEGS linear features (Karl 2013a). Due the absence of suitable habitat within the Project site and negative results of previous surveys, this species is not expected to occur within the Project site. The potential for Utah milkvine to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.6 Salton Saltbush (Palen Lake Saltbush)

During the 2010 botanical surveys, an undescribed variety of *Atriplex canescens* was found outside the Project site on the saline margins of Palen Lake. This taxon was provisionally named *Atriplex* sp. *nov*. This species has been observed in other saline (but non-playa) habitats on remnants of the lower Colorado River flood plain (Andre, Silverman, pers. comm. 2010). It resembles the common four-wing saltbush (*Atriplex canescens* var. *linearis*), a common plant of dunes which has very linear leaves, but the new taxon has obovate leaves that distinguish it from all *Atriplex canescens* and its subspecies (Andre, pers. comm.). The "new" species was first collected in 2005 at the dry lake just northeast of the Interstate 15 and Highway 95 junction, approximately 35 miles east and northeast of Las Vegas, Nevada and the first voucher/observation of it in California was on the saline playa margins of Palen Dry Lake in 2009 by a botanist with the U.C. Reserve System (CEC 2010).

In 2012, a new edition of the *Jepson Manual of Vascular Plants of California* was published, which resurrected the taxon named *Atriplex canescens* var. *macilenta*, the Salton saltbush. These plants are distinguished by shorter stature, smaller fruits, and wider oblanceolate leaves, preference for saline habitat, polyploidy, and are probably of hybrid origin (Baldwin et al. 2012). The *Atriplex* sp. *nov*. plants observed outside the Project site appear to conform to this resurrected variety of *Atriplex canescens* var. *macilenta*. The California Consortium of Herbaria lists 20 occurrences of this taxon in Southern California (CCH 2016). Three occurrences are in Chuckwalla Valley including one that was collected on Palen Dry Lake in 2010 as part of the original surveys (D. Silverman, #7829, 24 March 2010 [UCR; CAS]). The plants observed during the spring 2016 survey also conform to this newly re-recognized variety. *Atriplex canescens* var. *macilenta* was first collected in California in 1912 near Calexico (CCH 2016). Since then it has been occasionally documented scattered across saline habitats in the Salton sink, Imperial Valley, Rice Valley, and Chuckwalla Valley (CCH 2016). There could be some taxonomic dispute about the accepted name of this saltbush; however, because the plants in the Chuckwalla Valley tend to conform to a recognized variety, *A. canescens* var. *macilenta*, this is likely the most parsimonious assignment of nomenclature. Given that a formal taxonomic analysis has yet to be performed, the conservative approach would be to consider this species as having special status, and the BLM State Botanist indicated in 2013 that potential new taxa may be treated as BLM Sensitive species (CEC 2010).

The PSPP PA/FEIS (Section 3.18) asserted that *Atriplex* sp. *nov.* was not recorded within the PSPP disturbance area. Several *Atriplex* sp. *nov.* plants were found within in the buffer area, northeast of the Project site during spring 2010 field surveys (Solar Millennium 2010d). No *Atriplex* sp. *nov.* were found within the Project site or gen-tie during the surveys conducted from 2009 through 2016. This species was relocated in April 2016, during reference site visits, where it was found flowering and fruiting, at the same locality as originally documented in 2010. It was not observed on the Project site during surveys performed in May 2016, likely due to lack of appropriate dry lakeshore habitat; therefore, this species is not expected to occur within the Project site. The potential for *Atriplex* sp. *nov.* to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.7 Spiny Abrojo

Spiny abrojo (*Condalia globosa* var. *pubescens*) has a CRPR rank of 4.2, a NatureServe rank of G5T4/S3, and is covered under NECO. This species is a spiny deciduous shrub in the buckthorn family known from gravelly soils in low elevations of Sonoran desert scrub. It is considered fairly endangered in California, but is apparently secure because of larger established populations in Arizona and Mexico. There are 24 CNDDB occurrence records for this shrub in California, most of which are in the Chocolate Mountains and Chuckwalla Bench of Imperial and Riverside counties. Scattered individuals have been documented elsewhere. The closest record to the project site is in the Corn Springs area south of I-10.

The PSPP PA/FEIS (Section 3.18) asserted that spiny abrojo was not recorded in the PSPP disturbance area. Spiny abrojo was not found during the 2009 to 2013 surveys. The majority of the Project site occurs below the elevation where this species typically occurs. A solitary shrub in the Rhamnaceae family about 1.75m tall, in sparsely leafing condition, was found in spring of 2016 in an open flat area about 0.3 miles inside the western site boundary Project site. Close reconnaissance of the surrounding area produced no additional occurrences, implying that this individual was probably a waif. This plant was not in identifiable condition during surveys in May 2016; it had barely leafed-out and held no flowers or fruits required for identification. Vegetative characters alone are insufficient for a clear determination. It was likely *Ziziphus obtusifolia* var. *canescens*, a more common low desert shrub with no rarity status. During the 2017 surveys, one location of spiny abrojo, consisting of three individual plants, was recorded along the gen-tie line approximately 800 feet west of the Red Bluff Substation, south of the I-10. The southern terminus of the gen-tie occurs at a higher elevation than all other project components and the isolated record of spiny abrojo likely occurs near the lower elevation limits of the species. The presence of this record indicates that the potential for spiny abrojo to occur within the Project site, specifically within the southernmost limits of the gen-tie, has changed from the description in the PSPP PA/FEIS.

4.2.8 Desert Unicorn Plant

Desert unicorn plant (*Proboscidea althaeifolia*) has a CRPR of 4.3 and a NatureServe rank of G5/S3.3. Its status indicates that it has limited distribution, but is not very threatened in California. This is a low-growing, perennial species that occurs in sandy washes within Sonoran desert scrub habitats in San Bernardino, Imperial, Riverside, and San Diego counties of California. There are 13 records known from the NECO planning area in Milpitas Wash, Chuckwalla Valley, and Chemehuevi Valley (BLM CDD 2002). This species has been identified in the region of other solar projects (CEC 2010). It is a late-season bloomer (May to August) but it has large and distinctive seed pods that can be detected during the spring season and fleshy root structure that can remain dormant in dry years (BLM 2011). There are 86 records in the

Consortium of California Herbaria, several of which are from the Chuckwalla Mountains and Desert Center area (CCH 2016).

The PSPP PA/FEIS (Section 3.18) asserted that desert unicorn plant was not recorded in the PSPP disturbance area. This species was not observed during 2009, 2010 (including late-season), 2016, or 2017 field surveys. The potential for desert unicorn plant to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.9 Abram's Spurge

Abram's spurge (*Chamaesyce abramsiana*) [=Euphorbia abramsiana] has a CRPR of 2B.2 and a NatureServe rank of G4/S2. It is not covered under the draft DRECP. This species is fairly rare in California but more common elsewhere (CNPS 2016). Abram's spurge is a late-season, ephemeral annual that responds to summer monsoonal rains, typically blooms from September through November following precipitation (greater than 0.10 inch), but dries quickly and cannot be detected during routine spring surveys (CEC 2010). Typical habitat consists of silty swales and flats in creosote bush scrub habitat from approximately 600 to 2,700 feet above mean sea level. This summer annual occurs in halophytic (saline-alkaline) scrub flats, playas, and along inlets and floodplains of playas and always seems to prefer the lower floodplain ecotone but can also extend higher up in the floodplain drainages (Silverman, pers. comm.). There are 121 records in the Consortium of California Herbaria from San Bernardino County to Imperial and eastern San Diego counties to Arizona, Nevada, Mexico, and Baja California (CCH 2016).

The PSPP PA/FEIS (Section 3.18) asserted that Abram's spurge was not recorded in the PSPP disturbance area. This species was not observed during 2009, 2010 (including late-season), 2016, or 2017 field surveys. The potential for Abram's spurge to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.10 Glandular Ditaxis

Glandular ditaxis (*Ditaxis claryana*) has a CRPR of 2B.2 and a NatureServe rank of G3G4/S2. It is rare in California, but more common elsewhere. This plant species grows from sea level to approximately 1,400 feet above mean sea level in Mojavean and Sonoran desert scrub habitat, in the sandy soils of dry washes and rocky hillsides. Glandular ditaxis (an annual or short-lived perennial) blooms from October through March (CNPS 2016); while it can be detected during spring surveys, it is easier to detect in fall following the start of the rainy season (Silverman pers. comm.). There are 43 occurrences in the Consortium of California Herbaria (CCH 2016), the nearest from the Arica Mountains, about 28 miles from the project site. CNDDB lists 26 occurrence elements, two within the general vicinity of the project (Corn Springs and Sidewinder Well quads).

The PSPP PA/FEIS (Section 3.18) asserted that glandular ditaxis was not recorded in the PSPP disturbance area. This species was not observed during 2009, 2010 (including late-season), 2016, or 2017 field surveys. The potential for glandular ditaxis to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.11 Lobed Ground Cherry

Lobed ground cherry (*Physalis lobata*) has a CRPR of 2B.3 and a NatureServe rank of G5/S1S2. It is a late season perennial that blooms from September to January (CNPS 2016). This species occurs in Mojavean desert scrub on decomposed granite soils, playas, and alkaline dry lake beds. This species occurs from approximately 1,500 feet to 2,400 feet above mean sea level. There are 36 occurrences in the Consortium of California Herbaria (CCH 2016), all to the north in Mojavean habitat. The nearest collection is approximately 29 miles northwest of the project site.

The PSPP PA/FEIS (Section 3.18) asserted that lobed ground cherry was not recorded in the PSPP disturbance area. This species was not observed during 2009, 2010 (including late-season), 2016, or 2017 field surveys. The potential for lobed ground cherry to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.12 Jackass Clover

Jackass clover (*Wislizenia refracta* ssp. *refracta*) has a CRPR of 2B.2 and a NatureServe rank of G5T5/S1. It is rare in California, but more common elsewhere. This species occurs in desert dunes, Mojavean desert scrub, playas, or Sonoran desert scrub and is commonly associated with sandy washes, roadsides, or alkaline flats, of elevations from 425 to 2,630 feet (CNDDB 2016). There are 29 occurrences in the Consortium of California Herbaria (CCH 2016). Jackass clover was also documented at several locations from the northern to southern end of Palen Lake in dune habitats during a detailed vegetation mapping and classification project conducted by CNPS Vegetation Program for BLM (Evens & Hartman 2007). The populations of jackass clover at Palen Lake are considered to be unique stands and are included in this analysis as a sensitive natural community (PSPP PA/FEIS 2010).

The PSPP PA/FEIS (Section 3.18) asserted that jackass clover was not recorded in the PSPP disturbance area. Jackass clover was not observed during spring 2009 or 2010 botanical surveys, or during fall surveys completed in October 2010 (CEC 2010; AECOM 2010). A reference population was observed flowering in Twentynine Palms in October 2010, but this locality is 50 miles northwest of the Project site, with different habitat and climatic characteristics. The potential for jackass clover to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

4.2.13 Palmer's Jackass Clover

Palmer's jackass clover (*Wislizenia refracta* ssp. *palmeri*) has a CRPR of 2B.2 and a NatureServe rank of G5T2T4/S1. Its status indicates that global populations of *Wislizenia refracta* are secure, but ssp. *palmeri* varies from imperiled to secure based on location and is considered critically imperiled in California. Palmer's jackass clover is a perennial herb that occupies sandy washes, and Sonoran desert scrub habitat from sea level to 650 feet. There are 29 occurrences in the Consortium of California Herbaria (CCH 2016).

The PSPP PA/FEIS (Section 3.18) asserted that Palmer's jackass clover was not recorded in the PSPP disturbance area. Palmer's jackass clover was not observed during spring 2009 or 2010 botanical surveys, or during fall surveys completed in October 2010; although the reference population on the Palen Sand Dunes near the BLM Desert Lily Sanctuary was observed flowering in October 2010 (CEC 2010; AECOM 2010). This species was not observed during 2009, 2010 (including late-season), and 2016 field surveys. The potential for Palmer's jackass clover to occur within the Project site has not changed from the description in the PSPP PA/FEIS.

5 REFERENCES

AECOM. 2009. Palen Solar Power Project Biological Technical Report. Riverside County, California. Submitted to Solar Millennium, LLC, Berkeley, California, and Chevron Energy.

AECOM. 2010. Fall Botanical Surveys. Palen Solar Power Project. CEC Docket No. 09-AFC-7. TN 58879. May 17, 2010.

Andersen, M. C., J. M. Watts, J. E. Freilich, S. R. Yool, G. I. Wakefield, J. F. McCauley and P. B. Fahnestock. 2000. Regression-tree modeling of desert tortoise habitat in the central Mojave Desert. Ecological Applications 10(3): 890-900.

Andre, Silverman, pers. comm. 2010. As cited in CEC Revised Staff Assessment, Palen Solar Project, Part 2.

Averill-Murray, Roy C., C. Darst, N. Strout, and M. Wong. 2013. Conserving Population Linkages for The Mojave Desert Tortoise (*Gopherus agassizii*). Herpetological Conservation and Biology 8(1):1-15. Published: 30 April 2013.

Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken, editors. 2012. The Jepson manual: vascular plants of California, second edition. University of California Press, Berkeley.

Barrett, S. L. 1990. Home range and habitat of the desert tortoise (Xerobates agassizii) in the Picacho mountains of Arizona. Herpetologica 46(2): 202-206.

Beal, F. E. L. 1907. Birds of California in relation to the fruit industry, part 1. U.S. Dept. Agri. Biol. Surv. Bull. 30.

Bent, A. C. 1948. Life histories of North American nuthatches, wrens, thrashers, and their allies. U.S. Natl. Mus. Bull. 195. 475pp.

Berry, K.H. 1986. Desert tortoise (*Gopherus agassizii*) relocation: Implications of social behavior and movements. Herpetological 42:113-125.

Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough, editor. Metapopulations and wildlife conservation. Island Press, Washington D.C., USA.

Bloom Biological, Inc. (BBI). 2013a. (TN 200010) Palen Solar Electric Generating Facility Spring 2013 Avian Survey Results. Prepared for Palen Solar Holdings, Inc., Oakland, California. Prepared by BBI, Lake Forest, California. July 2013.

Bloom Biological, Inc. (BBI). 2013b. Palen Solar Electric Generating Facility Summer 2013 Avian Survey Results. Prepared for Palen Solar Holdings, Inc., Oakland, California. Prepared by BBI, Lake Forest, California. August 2013.

Bloom Biological, Inc. (BBI). 2013c. Palen Solar Electric Generating System 2013 Golden Eagle Nesting Survey Results. Prepared for Palen Solar Holdings, Inc., Oakland, California. Prepared by BBI, Lake Forest, California. October 2013.

Bloom Biological, Inc. (BBI). 2013d. Palen Solar Electric Generating System Winter 2013 Golden Eagle Survey Results. Prepared for Palen Solar Holdings, Inc., Oakland, California. Prepared by BBI, Lake Forest, California. March 2013.

Bloom Biological, Inc. (BBI). 2013e. (TN 70242) PSEGS Winter 2013 Golden Eagle Survey Results. Prepared for BrightSource Energy, Inc. March 2013.

Bureau of Land Management California Desert District (BLM CDD) and California Department of Fish and Game Inland, Desert, and Eastern Sierra Region. 2002. Proposed Northern and Eastern Colorado Desert Coordinated Management Plan and Final EIS, July 2002.

Bureau of Land Management (BLM). 2010b. Special Status Animals in California, Including BLM Designated Sensitive Species.

Bureau of Land Management (BLM). 2011. Plan Amendment and Final EIS for the Palen Solar Power Project. Palm Springs -South Coast Field Office. May 2011.

Bureau of Land Management (BLM). 2012. Results of 2012 Golden Eagle Nesting Surveys of the California Desert and Northern California Districts. Prepared by BioResource Consultants, November 2012.

Bureau of Land Management (BLM). 2013. Draft Supplemental EIS for the Palen Solar Electric Generating System. Palm Springs -South Coast Field Office. July 2013.

Bureau of Land Management (BLM). 2015. Desert Renewable Energy Conservation Plan: Proposed Land Use Plan Amendment and Final Environmental Impact Statement. Prepared by U.S. Bureau of Land Management in partnership with U.S. Fish and Wildlife Service, California Energy Commission, and California Department of Fish and Wildlife. BLM/CA/PL-2016/03+1793+8321. October 2015.

Bossard, C.C. J.M Randall and M.C. Hoshovsky, 2000. Invasive Plants of California's Wildlands. University of California Press, Berkeley, CA.

Brown, P. E., and W. E. Rainey. 2014. Bat Habitat Assessment for Palen Solar Electric Generation System. Conducted for Alice E. Karl and Associates. Conducted by Brown-Berry Biological Consulting. May 17, 2014.

California Burrowing Owl Consortium (CBOC). 1993. Burrowing Owl Survey Protocol and Mitigation Guidelines. Prepared by the California Burrowing Owl Consortium. April 1993.

California Invasive Plant Council (Cal-IPC. 2016. California Invasive Plant Inventory Database. Available at: <http://www.cal-ipc.org/paf.> (Accessed May 2016).

California Department of Food and Agriculture (CDFA). 2016. Amend Section 4500. Noxious Weed Species. http://www.cdfa.ca.gov/plant/ipc/encycloweedia/encycloweedia_hp.htm

California Department of Fish and Game (CDFG). 2000. Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened and Endangered Plants and Natural Communities.

California Department of Fish and Wildlife. (CDFW). 2012. Staff Report on Burrowing Owl Mitigation. March 7.

California Department of Fish and Wildlife. (CDFW). 2016a. Natural Diversity Database. July 2016. Special Animals List. Periodic publication. 51 pp.

California Department of Fish and Wildlife. (CDFW). 2016b. A Status Review of Townsend's Big-Eared Bat (*Corynorhynus townsendii*) in California.

California Department of Fish and Wildlife. (CDFW). 2016c. Natural Diversity Database Special Vascular Plants, Bryophytes, and Lichens List. Quarterly Publication. 73 pp. July 2016.

California Energy Commission (CEC). 2010. RSA (Revised Staff Assessment). Palen Solar Project, Part 2. September 2010. (TN 58497)

California Energy Commission (CEC), California Energy Commission, California Department of Fish and Wildlife, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service. 2014a. Draft Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement. August 2014. www.drecp.org.

California Energy Commission (CEC), California Energy Commission, California Department of Fish and Wildlife, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service. 2014b. Draft Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement. Appendix Q, Baseline Biological Report.

California Energy Commission (CEC), California Energy Commission, California Department of Fish and Wildlife, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service. 2014c. Draft Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement. Appendix B, Species Profiles.

California Energy Commission (CEC), California Energy Commission, California Department of Fish and Wildlife, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service. 2014d. Draft Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement. Volume III Section 7, Environmental Setting/Affected Environment, Biological Resources.

California Geological Survey. 2015. Comments and Additional Information for Incorporation into the Draft Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement (EIR/EIS). February 5, 2015.

California Native Plant Society (CNPS). 2007. Vegetation Survey and Classification for the Northern & Eastern Colorado Desert Coordinated Management Plan (NECO).

California Native Plant Society (CNPS). 2016. CNPS Inventory of Rare and Endangered Plants, Riverside County. Available at: < http://www.rareplants.cnps.org/> Accessed 29 July, 2016.

California Natural Diversity Data Base (CNDDB). 2016. Aztec Mines, Corn Spring, East of Aztec Mines, East of Victory Pass, Ford Dry Lake, Palen Lake, Palen Mountains, Pilot Mountain, and Sidewinder Well 7.5 minute USGS quadrangles.

Consortium of California Herbaria (CCH). 2016. Search results for taxa from CNPS Inventory in Riverside County, retrieved July 29, 2016. Available at: http://ucjeps.berkeley.edu/consortium/

Davis, F. and Soong, O. 2013. Mojave fringe-toed lizard - Species Distribution Model, DRECP. Bren School of Environmental Science & Management. University of California, Santa Barbara Conservation Biology Institute. Jun 25, 2013 (modified Dec 3, 2013).

Desert Research Institute (DRI) 2013. Geomorphic Assessment of Sand Transport for the Modified Project (Palen Solar Electric Generating System). Draft Final Report. Prepared for Aspen

Environmental Group. Prepared by Dr. N. Lancaster and Dr. T. Bullard, Division of Earth and Ecosystem Sciences and Dr. J. Gillies Division of Atmospheric Sciences. July 23, 2013.

Duda, J. J., A. J. Krzysik and J. E. Freilich (1999). "Effects of drought on desert tortoise movement and activity." Journal of Wildlife Management 63(4): 1181-1192.

Dunn, J. L., and Garrett, K. L. 1997. A Field Guide to Warblers of North America. Houghton Mifflin, Boston.

EDAW AECOM. 2009. Palen Solar Power Project Burrowing Owl Technical Report. July 2009.

EDAW AECOM and Bloom Biological, Inc. (BBI). 2009. Palen Solar Power Project Avian Point Count Survey Technical Report. Prepared for Solar Millennium, LLC and Chevron Energy Solutions. August 2009.

Edwards, H.H., and G.D. Schnell. 2000. Gila Woodpecker (*Melanerpes uropygialis*). *The Birds of North America Online* (A. Poole, Ed.). Ithaca, New York: Cornell Lab of Ornithology; Accessed April 28, 2011. http://bna.birds.cornell.edu/bna/species/532.

Epps, C. W., P. J. Palsboll, J. D. Wehausen, R. R. Ramey II, and D. R. McCullough. 2005. Highways block gene flow and cause rapid decline in genetic diversity of desert bighorn sheep. Ecology Letters 8: 1029-1038.

Evens, JM and S.L. Hartman. 2007. Vegetation Survey and Classification for the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO). California Native Plant Society. Sacramento, CA.

Galati and Blek, LLP. 2010. Applicant‘s ground-based and field-verified delineation of desert dry wash woodland

Garrett, K., and J. Dunn. 1981. *Birds of Southern California: Status and Distribution*. Los Angeles, California: Los Angeles Audubon Society.

Gervais, J. A., D. K. Rosenberg, and L. A. Comrack. 2008. Burrowing owl (*Athene canicularia*). Pages 218-226 in California bird species of special concern: a ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California (W. D. Shuford and T. Gardali, editors). Western Field ornithologists and California Department of Fish and Game, Studies of Western Birds 1: 1-450.

Hagerty, B. E., K. E. Nussear, T. C. Esque and C. R. Tracy. 2011. Making molehills out of mountains: landscape genetics of the Mojave desert tortoise. Landscape Ecology 26(2): 267-280.

Harless, M. L., A. D. Walde, D. K. Delaney, L. L. Pater and W. K. Hayes.2009. Home range, spatial overlap, and burrow use of the desert tortoise in the West Mojave desert. Copeia(2): 378-389.

Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. Burrowing Owl (*Speotyto cunicularia*). In A. Poole and F. Gill, eds. The Birds of North America, No. 61. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists’ Union, Washington, D.C.

Hollingsworth, B. D., and K. R. Beaman. 1999. Mojave Fringe-Toed Lizards (*Uma scoparia*). Species Accounts – West Mojave Plan www.blm.gov/ca/pdfs/cdd_pdfs/fringe1.PDF

Holland, R.F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. The Resources Agency, Department of Fish and Wildlife, State of California.

Humple, D. 2008. Loggerhead Shrike (*Lanius ludovicianus*). In. Shuford, W. D., and Gardali, T., eds. California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Jarvis, J. M. 2009. The Natural History of the Mojave Fringe-Toed Lizard *Uma scoparia*: The Northern Lineage, Amargosa River, CA. Master's Thesis. California State University, Fullerton.

Jennings, M. R. and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. California Department of Fish and Game. Rancho Cordova 255 p.

Jepson, Willis Linn, and J. C. Hickman. 1993. The Jepson manual: higher plants of California. Berkeley, CA: University of California Press.

Jones, L.C., and R.E. Lovich. 2009. Lizards of the American Southwest. Tucson, Arizona: Rio Nuevo Publishers. September 30, 2009.

Karl, A. 2013a. Summary of Spring Wildlife and Plant Surveys. Letter report to California Energy Commission dated May 16, 2013.

Kenney, M. 2010. Geomorphic Evaluation of Potentially Affected Aeolian Sand Migration Regions for Reconfigured Alternatives 2 and 3 Associated with the Wind Fence, Palen Solar Power Project (PSPP), Chuckwalla Valley, Riverside County, CA. July 20, 2010.

Kochert, M.N., K. Steenhof, C.L. McIntyre, and E.H. Craig. 2002. Golden Eagle (Aquila chrysaetos). In The Birds of North America, No. 684, edited by A. Poole and F. Gill. The Birds of North America, Inc. Philadelphia.

Lancaster, J. T., Bedrossian, T. L., and Holland, P., 2014, Eolian System Mapping for the Desert Renewable Energy Conservation Plan, California Geological Survey, 54p., 4 plates (multiple map scales).

Levenstein, K., A. Chatfield, W. Erickson, and K. Bay. 2014. Fall 2013 Avian Field Surveys for the Palen Solar Electric Generating System, Riverside County, California. Prepared for Palen Solar Holdings, LLC. February 13, 2014.

Levenstein, K. and C. Nations. 2013. Fall 2013 Nocturnal Migration Surveys for the Palen Solar Electric Generating System, Riverside County, California. Final Report. Prepared for Palen Solar Holdings, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

MacKay, P. 2003. Mojave Desert wildflowers: a field guide to wildflowers, trees, and shrubs of the Mojave Desert, including the Mojave National Preserve, Death Valley National Park, and Joshua Tree National Park. A Falcon Guide. Guilford, CT: Falcon. 338 p. 65313.

Mayhew, W. W. 1965. Reproduction in the sand-dwelling lizard *Uma inornata*. Herpetologica 21, pp. 39-55.

McCaskie, G., P. De Benedictis, R. Erickson, and J. Morlan. 1979. Birds of northern California, an annotated field list. 2nd ed. Golden Gate Audubon Soc., Berkeley. 84pp.

McCreedy, C. 2008. Gila Woodpecker (*Melanerpes uropygialis*). In The Desert Bird Conservation Plan. California Partners in Flight. Accessed April 28, 2011. http://www.prbo.org/calpif/htmldocs/desert.html.

McGrew, J.C. 1979. *Vulpes macrotis*. Mammalian Species 123:1–6.

Mills, S.G., J.B. Dunning, Jr., and J.M. Bates. 1989 ."Effects of Urbanization on Breeding Bird Community Structure in Southwestern Desert Habitats." The Condor 91:416–428.

Muhs, D.R., Reynolds, R.R., Been, J., Skipp, G., 2003. Eolian sand transport pathways in the southwestern United States: importance of the Colorado River and local sources. Quaternary International, 104, 3-18.

Munz, Philip A, and David D. Keck, 1973. A California flora and supplement. Berkeley, CA: University of California Press.

Murphy, R. W., K.H. Berry, T. Edwards, A.M. McLuckie. 2007. A Genetic Assessment of the Recovery Units for the Mojave Population of the Desert Tortoise, *Gopherus agassizii*. Chelonian Conservation and Biology 6(2):229-251.

Murphy, R. W., T. L. Trepanier, and D. J. Morafka. 2006. Conservation genetics, evolution and distinct population segments of the Mojave fringe-toed lizard, *Uma scoparia*. Journal of Arid Environments 67:226–247.

Nussear, K.E., Esque, T.C., Inman, R.D., Gass, Leila, Thomas, K.A., Wallace, C.S.A., Blainey, J.B., Miller, D.M., and Webb, R.H. 2009. Modeling habitat of the desert tortoise (*Gopherus agassizii*) in the Mojave and parts of the Sonoran Deserts of California, Nevada, Utah, and Arizona: U.S. Geological Survey Open-File Report 2009-1102, 18 p.

O'Connor, M. P., L. C. Zimmerman, D. E. Ruby, S. J. Bulova and J. R. Spotila. 1994. Home range size and movements by desert tortoises, *Gopherus agassizii*, in the eastern Mojave Desert. Herpetological Monographs 8: 60-71.

Oftedal OT. 2002. Nutritional ecology of the desert tortoise in the Mohave and Sonoran deserts, Chapter 9. In Van Devender TR, editor. The Sonoran Desert Tortoise: Natural History, Biology, and Conservation. Tucson: The University of Arizona Press and Arizona-Sonora Desert Museum, pp. 194–241.

Oftedal OT, Hillard S, Morafka DJ. 2002. Selective spring foraging by juvenile desert tortoises (*Gopherus agassizii*) in the Mojave Desert: evidence of an adaptive nutritional strategy. Chelonian Conservation Biology 4: 341–352.

Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. Interim Golden Eagle inventory and monitoring protocols; and other recommendations. Division of Migratory Bird Management, U.S. Fish and Wildlife Service

Palen Solar Holdings, LLC. 2013. Final Sand Transport Study for the Palen Solar Electric Generating System. Prepared by Fred L. Nials, Geoarchaeological Consultant to Centerline. July 23, 2013.

Peterson, C. C. 1996. Ecological energetics of the desert tortoise (*Gopherus agassizii*): Effects of rainfall and drought. Ecology 77(6): 1831-1844.

Philip Williams and Associates (PWA). 2010. Geomorphic Assessment and Sand Transport Impacts Analysis of the Palen Solar Power Project, Appendix C Biology Report. August 2010.

Pierson, E.D., and W.E. Rainey. 1998. Western mastiff bat, *Eumops perotis*. In Terrestrial Mammal Species of Special Concern in California, edited by B.C. Bolster. www.dfg.ca.gov/wildlife/nongame/ssc/docs/ mammal/species/17.pdf.

Potter, C. and J. Weigand, 2016. Analysis of Desert Sand Dune Migration Patterns from Landsat Image Time Series for the Southern California Desert. Journal of Remote Sensing & GIS. May 16, 2016.

Prescott, B.G. 2005. Le Conte's Thrasher Species Account, West Mojave Plan, Bureau of Land Management. Final environmental impact report and statement for the West Mojave plan: a habitat conservation plan and California desert conservation area plan amendment. Moreno Valley (CA): U.S. Dept. of the Interior, Bureau of Land Management, California Desert District.

Rosenberg, K.V., S.B. Terill, and G.H. Rosenberg. 1987. Value of Suburban Habitats to Desert Riparian Birds. Wilson Bulletin 99(4):642–654.

Rosenberg, K. V., Ohmart, R. D., Hunter, W. C., and Anderson, B. W. 1991. Birds of the Lower Colorado River Valley. Univ. Ariz. Press, Tucson

Rostal, D. C., V. A. Lance, J. S. Grumbles and A. C. Alberts. 1994. Seasonal reproductive cycle of the desert tortoise (*Gopherus agassizii*) in the eastern Mojave Desert. Herpetological Monographs 0(8): 72-82.

Sawyer, J.O., Jr. and T. Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society, Sacramento, California.

Sawyer, J.O., Jr., T. Keeler-Wolf, and J. M. Evans. 2009. A Manual of California Vegetation. Second edition. California Native Plant Society Press, Sacramento, CA.

Shuford, W. D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Solar Millennium. 2010a. Spring Survey Protocols, Biological Resources. Palen Solar Power Project. CEC Docket No. 09-AFC-7. April, 22 2010.

Solar Millennium. 2010b. Wildlife Movement and Desert Tortoise Habitat Connectivity. Palen Solar Power Project. CEC Docket No. 09-AFC-7. May 17, 2010.

Solar Millennium. 2010c. (TN 58454). Palen Solar Power Project golden Eagle Survey Results. Dated September 13, 2010.

Solar Millennium. 2010d. (TN 58106). Palen Solar Power Project Application for Certification Responses to CEC Information Requests Reconfigured Alternatives 2 and 3 Biological Resources 09-AFC-7. Dated July 21, 2010.

Stebbins, R. C. 2003. Western reptiles and amphibians. Houghton Mifflin Company, New York, New York. 3rd ed.

Tetratech and A. E. Karl. 2011. Biological Resources Technical Report, McCoy Solar Energy Project, Riverside County, CA.

Turner, F. B., D. C. Weaver and J. C. Rorabaugh. 1984. Effects of reduction in windblown sand on the abundance of the fringe-toed lizard (*Uma inornata*) in the Coachella Valley, California. Copeia (2): 370-378.

U. S. Fish and Wildlife Service (USFWS). 1992. Field Survey Protocol for Any Federal Action that May Occur Within the Range of the Desert Tortoise.

U. S. Fish and Wildlife Service (USFWS). 1990. Endangered and threatened wildlife and plants: Determination of threatened status for the Mojave population of the desert tortoise. USFWS. Ventura, CA. 50 CFR Part 17.

U. S. Fish and Wildlife Service (USFWS). 1994. Endangered and threatened wildlife and plants: proposed determination of critical habitat for the Mojave population of the desert tortoise. 17: 45748-45768.

U.S. Fish and Wildlife Service(USFWS). 2009. Desert Tortoise (Mojave Population) Field Manual: (*Gopherus agassizii*). Region 8, Sacramento, California.

U.S. Fish and Wildlife Service (USFWS). 2010a. Revised pre-project survey protocols for the desert tortoise (*Gopherus agassizii*).

U. S. Fish and Wildlife Service (USFWS). 2010b. Mojave Population of the Desert Tortoise (Gopherus agassizii) 5- Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service. Desert Tortoise Recovery Office. Reno, Nevada. September 30, 2010.

U. S. Fish and Wildlife Service (USFWS). 2010c. Preparing for any action that may occur within the range of the Mojave desert tortoise (*Gopherus agassizii*).U. S. Fish and Wildlife Service (USFWS). 2011. Revised recovery plan for the Mojave population of the desert tortoise (*Gopherus agassizii*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. 222 pp.

U. S. Fish and Wildlife Service (USFWS). 2012. Biological Opinion for the K Road Moapa Solar Project, Moapa River Indian Reservation, Clark County, Nevada. File No. 84320-2011-F-0430 & 1-5-05-FW-536, Tier 5. March 7, 2012.

U.S. Fish and Wildlife Service (USFWS). 2016. Bald and Golden Eagles: Population demographics and estimation of sustainable take in the United States, 2016 update. Division of Migratory Bird Management, Washington D.C., USA.

Wehausen, J. D. 2005. Nutrient predictability, birthing seasons, and lamb recruitment for desert bighorn sheep. Pages 37-50 in J. Goerrissen and J. M. Andre, editors. Proceedings of the Sweeney Granite Mountains Desert Research Center 1978-2003: a quarter century of research and teaching. University of California, Riverside, USA.

Weigand, J. and S. Fitton. 2008. Le Conte's Thrasher (*Toxostoma lecontei*). In The Draft Desert Bird Conservation Plan: a strategy for reversing the decline of desert-associated birds in California. California Partners in Flight: http://www.prbo.org/calpif/htmldocs/desert.html

WEST, Inc. 2016. Draft Bird and Bat Conservation Strategy for the Palen Solar Photovoltaic Project. October 24, 2016.

Western Bat Working Group (WBWG). 2016. Species Account and status designations. http://wbwg.org/western-bat-species/. Accessed August 2, 2016.

Western Regional Climate Center. 2016. Blythe airport and Eagle Mountain. http://www.wrcc.dri.edu/. Accessed July 15, 2016.

Whiteaker, L.; Henderson, J.; Holmes, R.; Hoover, L.; Lesher, R.; Lippert, J.;Olson, E.; Potash, L.; Seevers J.; Stein M.; Wogen N. 1998. Survey Protocol for Survey and Manage Strategy 2 Vascular Plants. V 2.0.

Woodbridge, B. 1998. Swainson's Hawk (*Buteo swainsoni*). *In* The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. http://www.prbo.org/calpif/htmldocs/riparian_v-2.html

Yosef, R. 1996. Loggerhead Shrike (*Lanius ludovicianus*). In: The Birds of North America, No. 231 (A. Poole and F. Gill [eds.]). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Depart. of Fish and Game, Sacramento, California, in California Wildlife Habitat Relationships System, California Department of Fish and Wildlife, California Interagency Wildlife Task Group.

Zimbelman, JR; Williams, SH; Tchakerian VP. 1995. Sand transport paths in the Mojave Desert, southwestern United States. In: Tchakerian, VP, ed. Desert Aeolian processes. London: Chapman and Hall: pp 101-129.

APPENDIX A

Special Status Wildlife Species

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
REPTILES						
Agassiz's desert tortoise *Gopherus agassizii*	ST	FT	-	This species is widely distributed in the Mojave, Sonoran and Colorado deserts from below sea level to 2200 m (7220 ft) (Grover and DeFalco 1995). Most common in desert scrub, desert wash, and Joshua tree habitats, but occurs in almost every desert habitat except those on the most precipitous slopes. Desert tortoises occur in a wide variety of habitats in arid and semiarid regions. They require friable soil for burrow and nest construction. Highest densities are achieved in creosote bush communities with extensive annual wildflower blooms, such as occur in the western Mojave. However, tortoises can be found in areas of extensive lava formations, alkali flats and most other desert habitats.	Low to Moderate	Recent sign of desert tortoise was not detected (no live tortoises) within the proposed solar facility during 2016 surveys, where prior surveys detected only historical sign. The western extent of gen-tie likely supports occupied habitat based on the presence of recent, active sign in the vicinity.
Mojave fringe-toed lizard *Uma scoparia*	SSC	BLMS	-	It is restricted to fine, loose, wind-blown deposits in sand dunes, dry lakebeds, riverbanks, desert washes, sparse alkali scrub and desert shrub habitats. The CNDDB indicate 4 historic and 26 recent occurrences in Riverside County (CNDDB 2016).	High	Detected on site, with high potential to occur. There is suitable sand habitat with vegetative cover, which is typical of this species. Live individuals were observed on Project site, ranging from less dense in the mid-alluvial fan to denser in lower alluvial fan. Also present within the eastern extent of gen-tie.
AMPHIBIANS						
Couch's spadefoot toad *Scaphiopus couchii*	SSC	BLMS	-	This species frequents arid and semi-arid habitats of the southwest, occurring along desert washes, in desert riparian, palm oasis, desert succulent shrub, and desert scrub habitats. It is also found in cultivated cropland areas. It breeds in temporary pools within rocky streambeds, washes, at the edges of agricultural fields, in depressions adjacent to roads and railroad tracks, and cattle tanks. Pools of water need to persist for at least 7 to 8 days to facilitate eggs hatching and larvae fully transform. The CNDDB indicate 1 historic and 2 recent occurrences in Riverside County, all greater than 10 miles from the Project, near the Salton Sea and Colorado River (CNDDB 2016).	Low	Not expected to occur due to absence of essential breeding habitat and geographical distance from existing records. The Project site lacks potential for standing water. Washes onsite have high sand content and low silt and clay content, resulting in high percolation rates.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
MAMMALS						
Colorado Valley woodrat *Neotoma albigula venusta*	-	-	-	Variety of habitats including low desert, pinyon-juniper woodlands, and desert-transition chaparral. Suitable habitat elements for this species include washes where organic debris gathers, areas of prickly pear cactus and mesquite, rocky areas, and crevices in boulders which are used for cover and nest sites. The CNDDB indicate 7 historic and 1 recent occurrence in Riverside Co. The nearest CNDDB occurrence is a 2001 record near Corn Springs campground, located approximately 5.1 miles south of the project and another on Pilot Mountain (CNDDB 2016).	Low	Not detected on site, with low potential to occur. Project site does not support typical rocky wash habitat.
Burro deer *Odocoileus hemionus eremicus*	CPGS	-	-	Occur in early to intermediate successional stages of most forest, woodland, and brush habitats. Prefer a mosaic of various-aged vegetation that provides woody cover, meadow and shrubby openings, and free water.	High	Detected on site, with high potential to occur. There is suitable foraging habitat on site. Scat and tracks observed primarily within dry wash woodland.
Desert bighorn sheep *Ovis canadensis nelsoni*	CFP	BLMS	-	Habitats used include alpine dwarf-shrub, low sage, sagebrush, bitterbrush, pinyon-juniper, palm oasis, desert riparian, desert succulent shrub, desert scrub, subalpine conifer, perennial grassland, montane chaparral, and montane riparian (DeForge 1980, Monson and Sumner 1980, Wehausen 1980). Use rocky, steep terrain for escape and bedding. Remain near rugged terrain while feeding in open habitat. The CNDDB indicate 8 historical, and 0 recent record in Riverside Co. (CNDDB 2016).	Low	Not detected on site, with low potential to occur. Project site greater than 3 miles from suitable mountainous habitat. Project site provides low intact value.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Yuma mountain lion *Puma concolor browni*	SSC	-	-	In the NECO planning area, mountain lions primarily inhabit the low mountains and extensive wash systems in and around Chuckwalla Bench, Chuckwalla Mountains, Chocolate Mountains, Picacho Mountains, Milpitas Wash, Vinagre Wash, and other washes in that area. Mountain lions typically occur in habitat areas with extensive, well-developed riparian or shrubby vegetation interspersed with irregular terrain, rocky outcrops, and community edges. Mountain lions are restricted to the southern Colorado Desert from Joshua Tree National Park south and east to the Colorado River. Burro deer, the primary prey item, are known to spend the hot summer and fall in riparian areas along the Colorado River and in dense microphyll woodlands near the Coachella Canal.	Low to Moderate	Not detected on site, with low - moderate potential to occur. Project site provides suitable habitat and burrow deer (prey source) present on the Project site.
American badger *Taxidea taxus*	SSC	-	-	Suitable habitat for badgers is characterized by herbaceous, shrub, and open stages of most habitats with dry, friable soils. The CNDDB indicate 13 historic and 4 recent occurrences in Riverside Co. (CNDDB 2016).	High	Detected on site, with high potential to occur. There is suitable foraging habitat, and burrowing habitat on site.
Desert kit fox *Vulpes macrotis arsipus*	CPF	-	-	Lives in annual grasslands or grassy open stages of vegetation dominated by scattered brush, shrubs, and scrub. Cover provided by dens they dig in open, level areas with loose-textured, sandy and loamy soils.	High	Detected on site, with high potential to occur. Active dens/complexes with sign observed.
BATS						
Pallid bat *Antrozous pallidus*	SSC	BLMS	H	Inhabit low elevation (less than 6,000 feet) rocky, arid deserts and canyonlands, shrub/steppe grasslands. Day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, trees with exfoliating bark, and various human structures (WBWG, 2005). The CNDDB indicates there are 13 historical, and 2 recent records for this species in Riverside Co. The nearest CNDDB record is approximately 4.2 miles southeast of the project site (CNDDB 2016).	Foraging - Moderate Roosting - Low	Detected during Project acoustic sampling. Typical roosting habitat is not present within the Project site; however, roosting opportunities may exist outside the site in the Project vicinity.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Townsend's big-eared bat *Corynorhinus townsendii*	SSC	BLMS	H	This species has been reported in a wide variety of habitat types ranging from sea level to approximately 9,000 feet above MSL. Habitat associations include coniferous forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types. Foraging associations include edge habitats along streams, adjacent to and within a variety of wooded habitats. The CNDDB indicate there are 9 historical, and 4 recent records in Riverside Co. (CNDDB 2016).	Foraging - Moderate Roosting - Low	Not detected during Project acoustic surveys; however, this species is difficult to detect with acoustic surveys due to low intensity echolocation signals. Typical roosting habitat is not present within the Project site.
Big brown bat *Eptesicus fuscus*	-	-	L	This widespread and abundant species has been recorded in virtually every North American vegetation type. Common to abundant in most of its range, the big brown bat is uncommon in hot desert habitats, and is absent only from the highest alpine meadows and talus slopes. Vagrant individuals may be seen in any habitat. Uses buildings and other human-made structures for roosting to such an extent that natural roosting habits are under documented.	Low	Not detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
Spotted bat *Euderma maculatum*	SSC	BLMS	H	Arid, low desert habitats to high elevation conifer forests and prominent rock features appear to be a necessary feature for roosting.	Low	Not detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
Western mastiff bat *Eumops perotis*	SSC	BLMS	H	Variety of habitats, from desert scrub to chaparral to oak woodland and into the ponderosa pine belt and high elevation meadows of mixed conifer forests. The nearest CNDDB record is approximately 4.2 miles southwest of the Project site (CNDDB 2016).	Low	Not detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
Hoary bat *Lasiurus cinereus*	-	-	M	Highly associated with forested habitats in the west. Hoary bat roosts usually are located at the edge of a clearing, although more unusual roosting sites have been reported in caves, beneath rock ledges, woodpecker holes, squirrel nests, building sides, and in dried palm fronds on palm trees. The CNDDB indicate 5 historic, and 0 recent occurrences in Riverside Co. The closest CNDDB record is a historical 1919 occurrence approximately 23.6 miles east of the project area in the town of Neighbors. (CNDDB 2016).	Foraging - Moderate Roosting - Low	Not confirmed during Project acoustic surveys; several call sequences were associated with either hoary or pocketed free-tailed bats but lacked features for confirmation of species. Typical roosting habitat is not present within the Project site.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Western yellow bat *Lasiurus xanthinus*	SSC	-	H	Recorded below 600 m (2000 ft) in valley foothill riparian, desert riparian, desert wash, and palm oasis habitats. This species occurs year-round in California. The CNDDB indicate 22 historic and 2 recent occurrences in Riverside Co. (CNDDB 2016).	Moderate	Detected during Project acoustic surveys at the artificial pond located near the date palm farm outside the northwestern boundary of the Project site. The Project site lacks typical foraging and roosting habitat; however, this species may be found on the Project site due to the proximity of the existing offsite date palm farm.
California leaf-nosed bat *Macrotus californicus*	SSC	BLMS	H	Deserts of California, southern Nevada, Arizona and south to northwestern Mexico. This species depends on either caves or mines for roosting habitat. All major maternity, mating, and overwintering sites are in mines or caves (BLM CDD, 2002). Radio-telemetry studies of *Macrotus* in the California desert show that the California leaf-nosed bat forage almost exclusively among desert wash vegetation within 10 km of their roost (WBWG, 2005). The CNDDB indicate 13 historic and 4 recent occurrences in Riverside Co. The nearest record is from 1993 near the McCoy Mountains area approximately 14.0 miles northwest of the project, in creosote bush scrub habitat where approximately 300 adults were observed roosting in 1993 and 100 were observed during in flight in 1997 (CNDDB 2016).	Low	Not detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
California myotis *Myotis californicus*	-	-	L	Optimal habitats for this species include all desert, chaparral, woodland, and forest from sea level up through ponderosa pine, mixed conifer, and Jeffrey pine.	Foraging - Moderate Roosting - Low	Detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
Arizona myotis *Myotis occultus*	SSC	-	-	Commonly known from conifer forests from 6,000 to 9,000 feet in elevation, although maternity roosts are known from much lower elevations including areas along the Colorado River in California. The CNDDB indicate 2 historic and 0 recent occurrence in Riverside Co. The closest record is a historical occurrence from 1945 approximately ten miles south of the Study Area near the town of Ripley.	Low	Not detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Cave myotis *Myotis velifer*	SSC	BLMS	M	Found primarily at lower elevations (the Sonoran and Transition life zones) of the arid southwest in areas dominated by creosote bush, palo verde, and cactus. This species is a "cave dweller" and caves are the main roosts although this species may also use mines, buildings, and bridges for roosts. The CNDDB indicate 3 historic and 4 recent occurrences in Riverside Co. The nearest CNDDB record for this species is from 2002 near the I-15 bridge over the Colorado River in Blythe where individual bats of this species were detected acoustically during April 2002 (CNDDB 2016).	Low	Not detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
Yuma myotis *Myotis yumanensis*	-	BLMS	LM	Associated with permanent sources of water, typically rivers and streams, feeding primarily on aquatic emergent insects, but Yuma myotis also use tinajas (small pools in bedrock) in the arid west. It occurs in a variety of habitats including riparian, arid scrublands and deserts, and forests. The species roosts in bridges, buildings, cliff crevices, caves, mines, and trees. The CNDDB indicate 0 historic and 5 recent occurrences in Riverside Co. The nearest CNDDB record is from 2002 near the Blythe bridge over the Colorado River where individual bats of this species were detected acoustically during April 2002 (CNDDB 2016).	Low	Not detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
Pocketed free-tailed bat *Nyctinomops femorosaccus*	SSC	-	M	Known to occur in the desert from March through August, when they then migrate out of the area. In California, they are found primarily in creosote bush and chaparral habitats in proximity to granite boulders, cliffs, or rocky canyons. The CNDDB indicate 7 historic and 2 recent occurrence in Riverside Co. The nearest CNDDB record for this species is from 2002 near the I-15 bridge over the Colorado River in Blythe. Individual bats of this species were detected acoustically during April 2002 (CNDDB 2016).	Low	Not detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Big free-tailed bat *Nyctinomops macrotis*	SSC	-	MH	Found generally sea level to 8,000 feet in elevation. This species occurs in desert shrub, woodlands, and coniferous forests. It roosts mostly in the crevices of rocks although big free-tailed bats may roost in buildings, caves, and tree cavities. The CNDDB indicate 2 historic and 0 recent occurrence in Riverside Co. The nearest occurrences for this species in Riverside County are from the vicinity of Palm Springs and Joshua Tree National Park (CNDDB 2016).	Foraging - Moderate Roosting - Low	Detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
Canyon bat *Parastrellus hesperus*	-	-	L	The canyon bat (once known as the western pipistrelle) is a common to abundant resident of deserts, arid grasslands, and woodlands. Occupies all desert, brush, grassland, and woodland habitats up through mixed conifer forests. The most abundant bat in desert regions. Common in arid brushlands, grasslands, and woodlands, and uncommon in conifer forests. This species is a yearlong resident in California.	Foraging - Moderate Roosting - Low	Detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
Mexican free-tailed bat *Tadarida brasiliensis*	-	-	L	Overall, this species is common in California and may be locally abundant. All habitats up through mixed conifer forests are used, but open habitats such as woodlands, shrublands, and grasslands are preferred.	Foraging - Moderate Roosting - Low	Detected during Project acoustic surveys. Typical roosting habitat is not present within the Project site.
Birds						
Golden eagle (Nesting and wintering) *Aquila chrysaetos*	CFP, WL	BCC, BLMS	-	Typically rolling foothills, mountain areas, sage-juniper flats, desert. Nests on cliffs of all heights and in large trees in open areas. Rugged, open habitats with canyons and escarpments used most frequently for nesting. The CNDDB indicates there are 10 historical, and 6 recent detections within Riverside County, all greater than 10 miles from the Project site (CNDDB 2016).	Nesting/Wintering – Absent Foraging - Low	Surveys conducted in 5 separate years from 2010 to 2015 indicated no active nests within 10 miles of the Project site. The nearest suitable nesting habitat is approximately 3 miles from the proposed solar facility in the Palen Mts. The site may provide suitable foraging habitat; however, surveys indicate relatively few golden eagle observations near the Project and prey sources are limited. Eight eagle flight paths were recorded during the fall 2013 BUC surveys; one additional eagle was spotted incidentally, but no flight path was recorded; one (3rd year) eagle observation over the site was recorded during the spring 2013 eagle nest surveys; no other eagle observations were recorded at the site.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Short-eared owl (Nesting) *Asio flammeus*	SSC	-	-	Year-round residents in Northern California and may be found in other portions of California during wintering. Require open country that supports small mammal populations, and that also provides adequate vegetation to provide cover for nests. This includes salt- and freshwater marshes, irrigated alfalfa or grain fields, and ungrazed grasslands and old pastures. The CNDDB contained no records within Riverside County (CNDDB 2016).	Low	Detected in Project vicinity during avian surveys (3 observations in fall 2013). The Project site is not located within the geographic range for nesting habitat for this species. Short-eared owl is likely an uncommon migrant within the Project vicinity during the non-breeding season.
Western burrowing owl *Athene cunicularia hypugaea*	SSC	BCC, BLMS	-	A yearlong resident of open, dry grassland and desert habitats. Uses rodent or other burrows for roosting and nesting cover. In the Colorado Desert, western burrowing owls generally occur at low densities in scattered populations (BLM 2013).	High	Detected on site during wildlife and avian surveys. Western burrowing owl is likely a resident, in relatively low densities, within the Project vicinity. The Project site supports suitable foraging and nesting habitat. Focused surveys and subsequent habitat assessments indicate approximately 4 burrowing owls may occupy the proposed solar facility footprint. Suitable habitat is also found along the gen-tie line.
Redhead (Nesting) *Aythya americana*	SSC	-	-	During breeding season may be found along the Colorado River and Salton Sea. Also breeds locally in the Central Valley, coastal Southern California, eastern Kern County, and the Salton Sea. Nests in fresh emergent wetland bordering open water. The CNDDB contained no records within Riverside County (CNDDB 2016).	Low	Detected in Project vicinity during avian surveys (total of 16 observations in fall 2013); however, the Project site does not support typical foraging or nesting habitat. Occurrences are expected to be of migrants only.
Ferruginous hawk (Wintering) *Buteo regalis*	WL	BCC	-	Most common in grassland and agricultural areas in the southwest. Ferruginous hawks are found in open terrain from grasslands to deserts, and are usually associated with concentrations of small mammals. There are 3 historical and 9 recent CNDDB records for this species in Riverside County, and the nearest CNDDB record was more than 90 miles west of the project area (CNDDB 2016).	Moderate	Detected in Project vicinity during avian surveys (11 observations in fall 2013 and 3 in spring 2015). The DRECP species distribution model indicates low probability of suitable habitat within the Project site. The Project site does not support typical nesting habitat, is outside its typical nesting geographic range, and prey sources are limited. The site is within the non-breeding (wintering) range of this species.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Swainson's hawk *Buteo swainsoni*	ST	BCC	-	Require large areas of open landscape for foraging, including grasslands and agricultural lands that provide low-growing vegetation for hunting and high rodent prey populations. Swainson's hawks typically nest in large native trees such as valley oak, cottonwood, walnut, and willow, and occasionally in nonnative trees, such as eucalyptus within riparian woodlands, roadside trees, trees along field borders, isolated trees, small groves, and on the edges of remnant oak woodlands. The CNDDB indicates there are 3 historical and 0 recent records for Riverside Co (CNDDB 2016).	Nesting - Low Migration - High	Regularly detected in groups during migration over the Project vicinity during avian surveys. The Project site is outside the current geographic range for nesting. The DRECP species distribution model indicates low probability of suitable habitat within the Project site.
Costa's hummingbird (Nesting) *Calypte costae*	-	BCC	-	Primary habitats are desert wash, edges of desert riparian and valley foothill riparian, coastal scrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis.	Moderate	Detected in the Project vicinity during avian surveys (total of 8 observations from 2013 to 2015). The Project site supports suitable foraging habitat and nesting habitat within desert scrub and microphyll woodlands.
Vaux's swift (Nesting) *Chaetura vauxi*	SSC	-	-	This species is not known to breed in Riverside County or elsewhere in Southern California. Vaux's swifts prefer to nest in the hollows formed naturally inside of large old conifer trees, especially snags, which are entirely lacking from the project site.	Nesting - Low Migration - High	Regularly detected during migration in the Project vicinity during avian surveys. The Project site is outside the current geographic range for nesting. Occurrences are expected to be of migrants only.
Mountain plover (Wintering) *Charadrius montanus*	SSC	BCC, BLMS	-	Mountain plover habitat includes short-grass prairie or their equivalents, and in southern California deserts are associated primarily with agricultural areas. The CNDDB indicate 1 historical, and 1 recent occurrence in Riverside Co (CNDDB 2016). The closest CNDDB (2016) record for this species is in Imperial County at the southern end of the Salton Sea.	Nesting - Low Migration - Moderate	Detected in the Project vicinity during avian surveys (6 observations in fall 2013). The Project site is outside the geographical range for nesting. This species may use the dry lakebed and nearby agricultural areas as winter habitat. The DRECP species distribution model indicates no suitable habitat within the Project site and depicts the agricultural land within Chuckwalla Valley as potential wintering habitat.
Black tern *Chlidonias niger*	SSC	-	-	Although restricted to freshwater habitats while breeding, can be fairly common on bays, salt ponds, river mouths, and pelagic waters in spring and fall migration (Grinnell and Miller 1944, Cogswell 1977).	Low	Detected in the Project vicinity during avian surveys (2 observations in fall 2013 and 1 in spring 2014). The Project site is outside the geographical range for nesting. Black tern is likely an uncommon migrant within the Project vicinity during the non-breeding season.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Northern harrier (Nesting) *Circus cyaneus*	SSC	-	-	This species does not commonly breed in desert regions of California, where suitable habitat is limited, but winters broadly throughout California in areas with suitable habitat. Northern harriers forage in open habitats including deserts, pasturelands, grasslands, and old fields. The CNDDB indicate there is 1 historical, and 2 recent occurrence for this species in Riverside Co (CNDDB 2016). .	Nesting - Low Wintering/Migration - High	Regularly detected in the Project vicinity during avian surveys. Project site is outside the geographical range for nesting. The Project site supports suitable foraging habitat during wintering and migration.
Gilded flicker *Colaptes chrysoides*	SE	BCC, BLMS	-	Stands of giant cactus, Joshua tree, and riparian groves of cottonwoods and tree willows in warm desert lowlands and foothills. This species nests primarily in cactus, but also will use cottonwoods and willows of riparian woodlands. This species may be nearly extinct in California. The CNDDB indicate 5 historical, and 1 recent record from 2012 in Riverside Co (CNDDB 2016). The closest CNDDB records for this species are along the Colorado River.	Low	Not detected in the Project vicinity during avian surveys. Previous records are in close proximity to the Colorado River. Project site does not support typical foraging or nesting habitat.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	SE	FT, BCC, BLMS	-	Breeds along the major river valleys in southern and western New Mexico, and central and southern Arizona. In California, the western yellow-billed cuckoo's breeding distribution is now thought to be restricted to isolated sites in the Sacramento, Amargosa, Kern, Santa Ana, and Colorado River valleys.	Low	Not detected in the Project vicinity during avian surveys. The closest suitable habitat for this species is along the Colorado River approximately 35 miles to the east of the Project. Project site does not support suitable breeding or wintering habitat.
Black swift (Nesting) *Cypseloides niger*	SSC	BCC	-	Nests in moist crevice or cave on sea cliffs above the surf, or on cliffs behind, or adjacent to, waterfalls in deep canyons. Forages widely over many habitats. The CNDDB indicate there are 7 historical, and 0 recent records in Riverside Co (CNDDB 2016).	Low	Detected in the Project vicinity during avian surveys. The Project site is outside the geographical range for nesting. Black swift is likely an uncommon migrant within the Project vicinity during the non-breeding season.
Willow flycatcher (Nesting) *Empidonax traillii*	SE	-	-	All subspecies are State-listed and one subspecies (*E . t. extimus)* is Federal-listed. Most often occurs in broad, open river valleys or large mountain meadows with lush growth of shrubby willows (Serena 1982). Common spring (mid-May to early June) and fall (mid-August to early September) migrant at lower elevations, primarily in riparian habitats throughout the state exclusive of the North Coast. The CNDDB indicate there are 3 historical, and 6 recent records in Riverside Co. all greater than 10 miles from the Project site (CNDDB 2016).	Low	Detected in the Project vicinity during avian surveys (6 observations in fall 2013). The Project site does not support typical foraging or nesting habitat. Occurrences are expected to be of migrants only.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
California horned lark *Eremophila alpestris actia*	WL	-	-	A common to abundant resident in a variety of open habitats, usually where trees and large shrubs are absent. Found from grasslands along the coast and deserts near sea level to alpine dwarf-shrub habitat above treeline. In winter, flocks in desert lowlands and other areas augmented by winter visitants, many migrating from outside the state (Garrett and Dunn 1981). The CNDDB indicate there are 2 historical, and 17 recent records in Riverside Co. (CNDDB 2016).	High	Regularly detected in the Project vicinity during avian and wildlife surveys. The Project supports suitable foraging and nesting habitat for this species.
Prairie falcon (Nesting) *Falco mexicanus*	WL	BCC	-	Occurs in annual grasslands to alpine meadows, but associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. Typically nests cliffs and bluffs. The CNDDB indicates 30 historical occurrences in Riverside Co. (CNDDB 2016).	Nesting - Low Foraging - High	Regularly detected in the Project vicinity during avian surveys. The Project supports suitable foraging but lacks nesting habitat for this species. The DRECP species distribution model indicates low to moderate probability of suitable habitat within the Project site.
American peregrine falcon (Nesting) *Falco peregrinus anatum*	CFP	BCC	-	Rare in the arid southeast, but they occur and are suspected to breed in the lower Colorado River Valley. Peregrine falcons require open habitat for foraging, and prefer breeding sites near water. Nesting habitat includes cliffs, steep banks, dunes, mounds, and some human-made structures. There are no CNDDB records for Riverside County (CNDDB 2016).	Nesting - Low Foraging - Moderate	Detected in the Project vicinity during avian surveys (3 observations in fall 2013 and 2 in spring 2015). The Project supports suitable foraging but lacks nesting habitat for peregrine falcon.
Sandhill crane (Wintering) *Grus canadensis*	SSC	-	-	Breeds in open wetland habitats surrounded by shrubs or trees. They nest in marshes, bogs, wet meadows, prairies, burned-over aspen stands, and other moist habitats, preferring those with standing water. Outside of known wintering grounds, extremely rare except during migration over much of interior California.	Nesting - Low Migration - Moderate	Detected in the Project vicinity during avian surveys (6 groups of 57 observations in fall 2013); however, the Project site does not support typical foraging or nesting habitat. Occurrences are expected to be of migrants only.
Yellow-breasted chat (Nesting) *Icteria virens*	SSC	-	-	This species occupies shrubby riparian habitat with an open canopy, and will nest in non-native species, including tamarisk. The CNDDB indicate 7 historic, and 5 recent occurrences in Riverside Co., associated with the Salton Sea or the Colorado River (CNDDB 2016). The closest CNDDB records for this species are two 1986 records east of the project site at the Colorado River.	Low	Detected in the Project vicinity during avian surveys (1 observation in fall 2013). The Project site does not support typical foraging or nesting habitat. Occurrences are expected to be of migrants only.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Loggerhead shrike (Nesting) *Lanius ludovicianus*	SSC	BCC	-	Open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. Highest density occurs in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. The CNDDB indicate 2 historic, and 32 recent occurrences in Riverside Co. (CNDDB 2016).	High	Regularly detected on site during wildlife and avian surveys. The Project site supports suitable foraging and nesting habitat.
Gila woodpecker *Melanerpes uropygialis*	SE	BCC, BLMS	-	In California, this species is found primarily along the Colorado River and in small numbers in Imperial County. In southeastern California, Gila woodpeckers formerly were associated with desert washes extending up to 1 mile from the Colorado River; however, their range may be expanding. The CNDDB indicate 12 historic and 1 recent occurrence (2008) in Riverside County (CNDDB 2016). The closest CNDDB record for this species is a 1986 record approximately 30 miles east of the project site at the Colorado River (CNDDB 2016). Another individual was documented by the USFWS at the Rio Mesa project site near the Colorado River in 2012.	Low	Not detected on site during focused suitability surveys for Gila woodpecker or within numerous small bird count stations within microphyll woodland. One observation was recorded greater than 1 mile from the Project site during avian surveys (fall 2013). The Project site does not support typical foraging or nesting habitat.
Elf owl *Micrathene whitneyi*	SE	BCC, BLMS	-	A very rarely seen spring and summer resident of the Colorado River Valley. West of the Colorado River, there are records at the oases of Cottonwood Springs and Corn Springs over 6 miles from the Project site. Nests in desert riparian habitat with cottonwood, sycamore, willow or mesquite; absent from desert riparian habitat dominated by saltcedar. The CNDDB indicates 5 historic and 2 recent occurrence in Riverside County (CNDDB 2016).	Low	Not detected on site, or in the Project vicinity, during focused suitability surveys for elf owl or within numerous small bird count stations within microphyll woodland. The Project site does not support typical foraging or nesting habitat.
Long-billed curlew (Nesting) *Numenius americanus*	WL	BCC	-	Preferred breeding and winter habitats include large coastal estuaries, upland herbaceous areas, and croplands. On estuaries, feeding occurs mostly on intertidal mudflats.	Nesting - Low Migration - Moderate	Detected in the Project vicinity during avian surveys (15 observations from 2013 to 2015); however, the Project site does not support typical foraging or nesting habitat. Occurrences are expected to be of migrants only.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Lucy's warbler (Nesting) *Oreothlypis luciae*	SSC	BCC, BLMS	-	An uncommon to common, summer resident and breeder along the Colorado River, fairly common locally in a few other desert areas, and rare near Salton Sea. It occurs in desert wash and desert riparian habitats, especially those dominated by mesquite; also ranges into saltcedar and other thickets. May use abandoned verdin nests.	Moderate	Detected in the Project vicinity during avian surveys (2 observations in fall 2013). The Project site does not support typical nesting habitat (mesquite thickets), but the microphyll woodland may have a moderate potential to serve as nesting habitat.
American white pelican (Nesting colony) *Pelecanus erythrorhynchos*	SSC	-	-	Common spring and fall migrant at Salton Sea and Colorado River. Migrant flocks pass overhead almost any month, but mainly in spring and fall throughout the state, especially in southern California (Cogswell 1977, McCaskie et al. 1979, Garrett and Dunn 1981).	Nesting/Wintering – Low Migration - Moderate	Detected in the Project vicinity during avian surveys (42 observations from 2013 to 2015); however, the Project site does not support typical foraging, wintering, or nesting habitat. Occurrences are expected to be of migrants only.
Black-tailed gnatcatcher *Polioptila melanura*	WL	-	-	A year-round resident in southwestern United States and central and northern Mexico, in California the black-tailed gnatcatcher is found in the southeast desert wash habitat from Palm Springs and Joshua Tree National Park south, and along the Colorado River. It is now rare in eastern Mojave Desert north to the Amargosa River, Inyo County. This species nests primarily in wooded desert wash habitat, but also occurs in creosote scrub habitat during the non-breeding season. The CNDDB indicate 14 historic and 4 recent occurrences in Riverside County (CNDDB 20176).	High	Detected in the Project vicinity during avian surveys (174 observations from 2013 to 2015). The Project site supports suitable foraging and nesting habitat. Black-tailed gnatcatchers have beedn recorded nesting within the site, primarily associated with larger trees within microphyll woodlands.
Vesper sparrow *Pooecetes gramineus*	SSC	-	-	Fairly common locally in southern deserts in winter and during migration. Occupies grasslands, croplands, and open brushlands in winter.	Low	One observation was incidentally recorded in spring 2013 approximately 1,200 feet north of the Project site. The Project site does not support typical wintering or nesting habitat.
Purple martin *Progne subis*	SSC	-	-	The historical breeding range of the purple martin includes southern California, though populations have shrunk dramatically. Neither the historical or current breeding range, however, includes the Colorado Desert. Purple martins habitat requirements include adequate nest sites and availability of large aerial insects, and therefore are most abundant near wetlands and other water sources. The CNDDB indicate 6 historic and 0 recent occurrence in Riverside County (CNDDB 2016). .	Low	One observation was recorded in fall 2013. The Project site does not support typical wintering or nesting habitat. Occurrences are expected to be of migrants only.

Species	Status			Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
	State	Federal	WBWG			
Vermilion flycatcher (Nesting) *Pyrocephalus rubinus*	SSC	-	-	They are usually found near water in arid scrub, farmlands, parks, golf courses, desert, savanna, cultivated lands, and riparian woodlands; nesting substrate includes cottonwood, willow, and mesquite. The CNDDB indicate 7 historic and 0 recent occurrence in Riverside County (CNDDB 2016). The closest record includes a 1983 record from the Blythe golf course.	Low	Not detected on site during wildlife or avian surveys. The Project site does not support typical habitat for this species. Occurrences are expected to be of migrants only.
Ridgway's clapper rail *Rallus obsoletus yumanensis*	ST, CFP	FE	-	Formerly Yuma clapper rail, it occurs in inland areas in the southwestern United States. This subspecies is partially migratory, with many birds wintering in brackish marshes along the Gulf of California. Some remain on their breeding grounds throughout the year; for example, the Salton Sea (south) Christmas Bird Count frequently records this species in the fresh-water marshes in and around the Imperial Wildlife Area (Wister Unit). Nesting and foraging habitat occurs only along the Lower Colorado River (from Topock Marsh southward) and around the Salton Sea.	Low	Not detected on site during wildlife or avian surveys. There is no suitable foraging habitat, and no nesting habitat on site. Nearest records are associated with the Salton Sea and Colorado River, both approximately 35 miles from the Project site. A clapper rail was detected at the Desert Sunlight Solar Farm, approximately 10 miles northwest of the Project site.
Bank swallow (Nesting) *Riparia riparia*	ST	BLMS	.	A neotropical migrant found primarily in riparian and other lowland habitats in California west of the deserts during the spring-fall period. Uses holes dug in cliffs and river banks for cover. Will also roost on logs, shoreline vegetation, and telephone wires.	Nesting/Wintering – Low Migration - Moderate	Detected in the Project vicinity during avian surveys (52 observations from 2013 to 2015). The Project site is outside the geographical range for nesting. Bank swallow is likely a relatively common migrant within the Project vicinity during the non-breeding season.
Sonora Yellow warbler (Nesting) *Setophaga petechia sonorana*	SSC	BCC	.	In southeastern California, this species is known only from the lower Colorado River Valley from the middle of San Bernardino County through Riverside and Imperial Counties. This species commonly uses wet, deciduous thickets for breeding, and seeks a variety of wooded, scrubby habitats in winter. The CNDDB indicate 2 historic and 0 recent occurrence in Riverside County (CNDDB 2016). The closest extant CNDDB records for this species are two 1986 records 35 miles east of the project site at the Colorado River.	Nesting - Low Migration - Moderate	Detected in the Project vicinity during avian surveys (7 observations from 2013 to 2015). The Project site is outside the typical geographical range for nesting, which is primarily associated with the Colorado River. Occurrences are expected to be of migrants only.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Lawrence's goldfinch (Nesting) *Spinus lawrencei*	-	BCC	-	Highly erratic and localized in occurrence. Rather common along western edge of southern deserts. Breeds in open oak or other arid woodland and chaparral, near water. Typical habitats in southern California include desert riparian, palm oasis, pinyon-juniper, and lower montane habitats. The CNDDB indicate 0 historic and 2 recent occurrences in Riverside County, both greater than 10 miles from the Project site.	Low	One observation was recorded in fall 2013. The Project site does not support typical wintering or nesting habitat. Occurrences are expected to be of migrants only.
Bendire's thrasher *Toxostoma bendirei*	SSC	BCC, BLMS	-	Favors open grassland, shrubland, or woodland with scattered shrubs, primarily in areas that contain large cholla, Joshua tree, Spanish bayonet, Mojave yucca, palo verde, mesquite, catclaw, desert-thorn, or agave. The CNDDB indicate 14 historical, and 3 recent record in Riverside County, two records are located within 7 miles of the site near Desert Center (CNDDB 2016).	Low	Not detected on site during wildlife or avian surveys. The Project site does not support typical habitat for this species. Occurrences are expected to be of migrants only.
Crissal thrasher *Toxostoma crissale*	SSC	-	-	This species prefers habitats characterized by dense, low scrubby vegetation, which, at lower elevations, includes desert and foothill scrub and riparian brush. The CNDDB indicate 14 historic and 22 recent occurrences in Riverside County (CNDDB 2016). The closest occurrence based on the CNDDB is from 1977 and is approximately 14.2 miles south of the project site.	Low	One observation was recorded in fall 2013. The Project site does not support typical wintering or nesting habitat. Occurrences are expected to be of migrants only.
Le Conte's thrasher *Toxostoma lecontei*	SSC	-	-	Occurs primarily in open desert wash, desert scrub, alkali desert scrub, and desert succulent shrub habitats; also occurs in Joshua tree habitat with scattered shrubs. The CNDDB indicate 16 historic and 34 recent occurrences in Riverside County (CNDDB 2016).	High	Detected in the Project vicinity during avian surveys (57 observations from 2013 to 2015). The Project site supports suitable foraging and nesting habitat. Le Conte's thrashers have been recorded nesting within the site, primarily associated with larger trees within microphyll woodlands.

Species	Status State	Federal	WBWG	Habitat Requirements, Geographic Range, Regional Occurrence Records	Potential to Occur on Project Site	Comments
Bell's vireo *Vireo bellii* Arizona bell's vireo *V. b. arizonae* least Bell's vireo *V. b. pusillus*	 SE SE	 BCC, BLMS FE	 - -	Subspecies *V. b. pusillus* (endemic to California and northern Baja California and state-listed and federal-listed) and subspecies *V. b. arizonae* are State-listed. Bell's vireo is now a rare, local, summer resident below about 600 m (2000 ft) in willows and other low, dense valley foothill riparian habitat and lower portions of canyons mostly in San Benito and Monterey cos.; in coastal southern California from Santa Barbara Co. south; and along the western edge of the deserts in desert riparian habitat. The CNDDB indicate 14 historic and 92 recent occurrences in Riverside County, all greater than 30 miles from the Project site (CNDDB 2016).	Low	One observation was recorded in fall 2013 during avian surveys. The Project site does not support typical wintering or nesting habitat. Occurrences are expected to be of migrants only.
Yellow-headed blackbird (Nesting) *Xanthocephalus xanthocephalus*	SSC	-	-	Nests in fresh emergent wetland with dense vegetation and deep water, often along borders of lakes or ponds. Forages in emergent wetland and moist, open areas, especially cropland and muddy shores of lacustrine habitat. Occurs as a migrant and local breeder in deserts. The CNDDB indicate 1 historic and 2 recent occurrences in Riverside County, over 30 miles from the Project site (CNDDB 2016).	Low	Detected in the Project vicinity during avian surveys (6 observations from 2013 to 2015). The Project site does not support typical wintering or nesting habitat. Occurrences are expected to be of migrants only.

APPENDIX B

Cumulative Wildlife Compendium

2009 to 2016

Common Name	*Scientific Name*
Avian	
American avocet	*Recurvirostra americana*
American coot	*Fulica americana*
American goldfinch	*Spinus tristis*
American kestrel	*Falco sparverius*
American pipit	*Anthus rubescens*
American white pelican	*Pelecanus erythrorhynchos*
American wigeon	*Anas americana*
Anna's hummingbird	*Calypte anna*
Ash-throated flycatcher	*Myiarchus cinerascens*
Audobon’s cottontail	*Sylvilagus audubonii*
Bank swallow	*Riparia riparia*
Barn swallow	*Hirundo rustica*
Bell's sparrow	*Artemisiospiza belli*
Bell's vireo	*Vireo bellii*
Belted kingfisher	*Ceryle alcyon*
Bewick's wren	*Thryomanes bewickii*
Black phoebe	*Sayornis nigricans*
Black tern	*Chlidonias niger*
Black-bellied plover	*Pluvialis squatarola*
Black-capped gnatcatcher	*Polioptila nigriceps*
Black-chinned hummingbird	*Archilochus alexandri*
Black-headed grosbeak	*Pheucticus melanocephalus*
Black-necked stilt	*Himantopus mexicanus*
Black-tailed gnatcatcher	*Polioptila melanura*
Black-throated gray warbler	*Setophaga nigrescens*
Black-throated sparrow	*Amphispiza bilineata*
Blue grosbeak	*Guiraca caerulea*
Blue-gray gnatcatcher	*Polioptila caerulea*
Blue-winged teal	*Anas discors*
Bonaparte's gull	*Chroicocephalus philadelphia*
Brewer’s sparrow	*Spizella breweri*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown-headed cowbird	*Molothrus ater*
Bufflehead	*Bucephala albeola*
Bullock’s oriole	*Icterus bullockii*
Burrowing owl	*Athene cunicularia*
Cactus wren	*Campylorhynchus brunneicapillus*
California gull	*Larus californicus*

Common Name	*Scientific Name*
California horned lark	*Eremophila alpestris*
California quail	*Callipepla californica*
Canvasback	*Aythya valisineria*
Cassin's Finch	*Haemorhous cassinii*
Cassin's kingbird	*Tyrannus vociferans*
Cassin's vireo	*Vireo cassinii*
Cattle egret	*Bubulcus ibis*
Chipping sparrow	*Spizella passerina*
Cinnamon teal	*Anas cyanoptera*
Clark's grebe	*Aechmophorus clarkii*
Cliff swallow	*Petrocheliodon pyrrhonota*
Common goldeneye	*Bucephala clangula*
Common Raven	*Corvus corax*
Common yellowthroat	*Geothlypis trichas*
Cooper's hawk	*Accipiter cooperii*
Costa's Hummingbird	*Calypte costae*
Crissal thrasher	*Toxostoma crissale*
Dark-eyed junco	*Junco hyemalis*
Double-crested cormorant	*Phalacrocorax auritus*
Dunlin	*Calidris alpina*
Eared grebe	*Podiceps nigricollis*
Eurasian collared-dove	*Streptopelia decaocto*
European starling	*Sturnus vulgaris*
Ferruginous hawk	*Buteo regalis*
Forster's tern	*Sterna forsteri*
Gadwall	*Anas strepera*
Gambel’s quail	*Callipepla gambelii*
Gila woodpecker	*Melanerpes uropygialis*
Golden eagle	*Aquila chrysaetos*
Gray flycatcher	*Empidonax wrightii*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Greater roadrunner	*Geococcyx californianus*
Greater scaup	*Aythya marila*
Greater yellowlegs	*Tringa melanoleuca*
Great-tailed grackle	*Quiscalus mexicanus*
Green heron	*Butorides virescens*
Green-winged teal	*Anas crecca*
Hammond's flycatcher	*Empidonax hammondii*
Hermit thrush	*Catharus guttatus*

Common Name	*Scientific Name*
Hermit warbler	*Dendroica occidentalis*
Herring gull	*Larus argentatus*
Hooded merganser	*Lophodytes cucullatus*
Hooded oriole	*Icterus cucullatus*
Horned lark	*Eremophila alpestris*
House finch	*Haemorhous mexicanus*
House sparrow	*Passer domesticus*
House wren	*Troglodytes aedon*
Killdeer	*Charadrius vociferus*
Ladder-backed woodpecker	*Picoides scalaris*
Lark sparrow	*Chondestes grammacus*
Laughing gull	*Leucophaeus atricilla*
Lawrence's goldfinch	*Spinus lawrencei*
Lazuli bunting	*Passerina amoena*
Le Conte's thrasher	*Toxostoma lecontei*
Least sandpiper	*Calidris minutilla*
Lesser goldfinch	*Spinus psaltria*
Lesser nighthawk	*Chordeiles acutipennis*
Lesser scaup	*Aythya affinis*
Lesser yellowlegs	*Tringa flavipes*
Lincoln's sparrow	*Melospiza lincolnii*
Little gull	*Hydrocoloeus minutus*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed curlew	*Numenius americanus*
Long-billed dowitcher	*Limnodromus scholopaceus*
Long-eared owl	*Asio otus*
Long-tailed duck	*Clangula hyemalis*
Lucy's warbler	*Oreothlypis luciae*
MacGillivray's warbler	*Geothlypis tolmiei*
Mallard	*Anas platyrhynchos*
Marbled godwit	*Limosa fedoa*
Merlin	*Falco columbarius*
Mew gull	*Larus canus*
Mexican duck	*Anas diuzi*
Mountain plover	*Charadrius montanus*
Mourning dove	*Zenaida macroura*
Mule deer	*Odocoileus hemionus*
Nashville warbler	*Oreothlypis ruficapilla*
Northern flicker	*Colaptes auratus*
Northern harrier	*Circus cyaneus*

Common Name	*Scientific Name*
Northern mockingbird	*Mimus polyglottos*
Northern pintail	*Anas acuta*
Northern roughwinged swallow	*Stelgidopteryx serripennis*
Northern shoveler	*Anas clypeata*
Northern waterthrush	*Parkesia noveboracensis*
Olive-sided flycatcher	*Contopus cooperi*
Orange-crowned warbler	*Oreothlypis celata*
Osprey	*Pandion haliaetus*
Pacific-slope flycatcher	*Empidonax difficilis*
Painted bunting	*Passerina ciris*
Pectoral sandpiper	*Calidris melanotos*
Peregrine falcon	*Falco peregrinus*
Phainopepla	*Phainopepla nitens*
Pied-billed grebe	*Podilymbus podiceps*
Pine siskin	*Spinus pinus*
Prairie falcon	*Falco mexicanus*
Purple martin	*Progne subis*
Raven	*Corvus corax*
Red tailed hawk	*Buteo jamaicensis*
Red-breasted merganser	*Mergus serrator*
Redhead	*Aythya americana*
Red-shouldered hawk	*Buteo lineatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged Blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Ring-necked duck	*Aythya collaris*
Rock wren	*Salpinctes obsoletus*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Ross' goose	*Chen rossii*
Ruby-crowned kinglet	*Regulus calendula*
Ruddy duck	*Oxyura jamaicensis*
Rufous hummingbird	*Selasphorus rufus*
Sage thrasher	*Oreoscoptes montanus*
Savannah sparrow	*Passerculus sandwichensis*
Say's phoebe	*Sayornis saya*
Semipalmated plover	*Charadrius semipalmatus*
Semipalmated sandpiper	*Calidris pusilla*
Sharp-shinned hawk	*Accipiter striatus*
Short-billed dowitcher	*Limnodromus griseus*
Short-eared owl	*Asio flammeus*

Common Name	***Scientific Name***
Snow goose	*Chen caerulescens*
Snowy egret	*Egretta thula*
Snowy plover	*Charadrius nivosus*
Solitary sandpiper	*Tringa solitaria*
Song sparrow	*Melospiza melodia*
Spotted sandpiper	*Actitis macularius*
Swainson’s hawk	*Buteo swainsoni*[2]
Swainson's thrush	*Catharus ustulatus*
Swamp sparrow	*Melospiza georgiana*
Townsend's warbler	*Setophaga townsendi*
Tree swallow	*Tachycineta bicolor*
Turkey vulture	*Cathartes aura*
Vaux's swift	*Chaetura vauxi*
Verdin	*Auriparus flaviceps*
Violet green swallow	*Tachycineta thalassina*
Warbling vireo	*Vireo gilvus*
Western grebe	*Aechmophorus occidentalis*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
Western sandpiper	*Calidris mauri*
Western tanager	*Piranga ludoviciana*
Western wood-pewee	*Contopus sordidulus*
Whimbrel	*Numenius phaeopus*
White-crowned sparrow	*Zonotrichia leucophrys*
White-faced Ibis	*Plegadis chihi*
White-tailed kite	*Elanus leucurus*
White-throated swift	*Aeronautes saxatalis*
White-winged dove	*Zenaida asiatica*
Willet	*Tringa semipalmata*
Willow flycatcher	*Empidonax traillii*
Wilson’s warbler	*Wilsonia pusilla*
Wilson's phalarope	*Phalaropus tricolor*
Wilson's snipe	*Gallinago delicata*
Wilson's warbler	*Cardellina pusilla*
Yellow rumped warbler	*Setophaga coronata*
Yellow warbler	*Dendroica petechia*
Yellow-breasted chat	*Icteria virens*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Yellow-rumped warbler	*Dendroica coronata*
Zone-tailed hawk	*Buteo albonotatus*

Common Name	*Scientific Name*
Invertebrate	
Ant lion	*Myrmeleontidae sp.*
Black harvester ant	*Messor pergandei*
California harvester ant	*Pogonomyrmex californicus*
Checkered white	*Pontia protodice*
Dainty sulphur	*Nathalis iole*
Darkling beetle	*Eleodes sp.*
Desert ironclad beetle	*Asbolus verrucosus*
Desert leafcutter ant	*Acromyrmex versicolor*
Forelius ant	*Forelius sp.*
Formica ant	*Formica sp.*
Giant sand treader cricket	*Macrobaenetes sp.*
Green lacewing	*Chrysopa sp.*
Honey bee	*Apis mellifera*
Marine blue butterfly	*Leptotes marina*
Painted lady	*Vanessa cardui*
Palo verde beetle	*Derobrachus geminatus*
Pigmy blue	*Brephidium exilis*
Red harvester ant	*Pogonomyrmex sp.*
Tarantula hawk	*Pepsis chrysothemis*
Thread-waisted wasp	*Ammophila sp.*
Velvet ant	*Dasymutilla sp.*
Virginia lady	*Vanessa virginiensis*
White-lined sphinx moth	*Hyles lineata*
Wind scorpion	*Solifugae sp.*
Mammal	
American badger	*Taxidea taxus*
Antelope ground squirrel	*Ammospermophilus leucurcus*
Big free-tailed bat	*Nyctinomops macrotis*
Black-tailed jackrabbit	*Lepus californica*
Bobcat	*Lynx rufus*
Burro deer	*Odocoileus hemionus*
California myotis	*Myotis californicus*
Canyon bat	*Parastrellus hesperus*
Coyote	*Canis latrans*
Desert kangaroo rat	*Dipodomys deserti*
Desert kit fox	*Vulpes macrotis*
Domestic dog	*Canis familiaris*
Merriam's kangaroo rat	*Dipodomys merriami*
Mexican free-tailed bat	*Tadarida brasiliensis*

Common Name	*Scientific Name*
Pallid bat	*Antrozous pallidus*
Pocket mouse species	*Perognathus longimembris*
Pocket mouse species	*Chaetodipus sp.*
Round tailed ground squirrel	*Xerospermophilus tereticaudus*
Western mastiff bat	*Eumops perotis*
Western yellow bat	*Lasiurus xanthinus*
Western yellow bat	*Lasiurus xanthinus*
Reptile	
Desert horned lizard	*Phrynosoma platyrhinos*
Desert iguana	*Dipsosaurus dorsalis*
Desert spiny lizard	*Sceloporus magister*
Desert tortoise	*Gopherus agassizii*
Glossy snake	*Arizona elegans*
Long-nosed leopard lizard	*Gambelia wislizenii*
Long-tailed brush lizard	*Urosaurus graciosus*
Mojave fringe toed lizard	*Uma scoparia*
Ornate tree lizard	*Urosaurus ornatus*
Patch-nosed snake	*Salvadora hexalepis*
Side blotched lizard	*Uta stansburyana*
Sidewinder	*Crotalus cerastes*
Western banded gecko	*Coleonyx variegates*
Western shovel-nosed snake	*Chionactis occipitalis*
Western whiptail lizard	*Aspidoscelis tigris*
Zebra tail lizard	*Callisaurus draconoides*

APPENDIX C

Special Status Plant Species

Species	Latin Name	Habitat Requirements, Geographic Range, Occurrence Records	Potential to Occur on Project Site
Angel trumpets	*Acleisanthes longiflora*	This species occurs in Sonoran desert scrub on carbonate soils from approximately 200 to 300 feet above MSL. There is only 1 CNDDB element occurrence from the Palo Verde area, approximately 35 miles east of the project (CNPS 2016). There are 5 records from the Consortium of California Herbaria from the Colorado Desert, the closest two are likewise from the Palo Verde area (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. The elevation range of the project site is appropriate for this species, but the BRSA does not support carbonate/limestone derived soils.
Argus (=Darlington's) blazing star	*Mentzelia puberula*	This species occurs in desert scrub and desert woodlands with limestone and granitic slopes above 2,000 feet in elevation, with 11 CNDDB occurrences (CNPS 2016). Based on 49 Consortium of California Herbaria database records, this species has been collected from Riverside, San Bernardino, and Imperial Counties, the nearest record from the Coxcomb Mountains northwest of the project site (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. This species is not expected to occur in the BRSA due to lack of limestone and granitic slopes, which are soil types and terrain preferred by this species. The project site is located at approximately 130 to 200 feet above MSL, which is well below the typical elevation where this species typically occurs.
Arizona spurge	*Euphorbia (Chamaesyce) arizonica*	This species occupies sandy areas in Sonoran desert scrub and has been reported from Imperial, Riverside, and San Diego Counties and portions of Arizona and Baja California (CNPS 2016) from approximately 150 feet to 1,200 feet above MSL. There are 12 database records from the Consortium of California Herbaria primarily from San Diego County but also from Riverside County often from sandy areas and transition areas between chaparral and desert habitats. The closest record is from the Salton sea, approximately 34 miles southwest of the project (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. This species has a low potential to occur within Sonoran creosote bush scrub habitats and sandy area within the project area.
Flat-seeded spurge	*Euphorbia (Chamaesyce) platysperma*	This species occurs in desert dunes and Sonoran desert scrub habitat types, in sandy places or shifting dunes, at elevations from approximately 200 to 300 feet. This ephemeral summer annual blooms February through September (CNPS 2016). There are 4 records in the Consortium of California Herbaria from San Bernardino County to Imperial and eastern San Diego counties to Arizona, Nevada, Mexico, and Baja California (CCH 2016), all of them "historical" (i.e., pre-1964). There are five CNDDB and Consortium of California Herbaria records of this species for the entire state of California, only one of which is from Riverside County; the closest occurrences are approximately 50 miles away. Of the total five occurrences in California, one of these are protected under State Park ownership and three are historical records and none of these occurrences have documented threats (CEC 2010).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Although there are no documented nearby occurrences, the Project site occurs within its range, suitable habitat is present, and as an ephemeral summer annual it may be under-surveyed (LaDoux pers. comm.). Potential of occurrence on the project site and gen-tie remains low, but recommendation is to resurvey in fall 2016 after sufficient summer monsoonal rainfall, emphasizing sandy habitats.

Species	Latin Name	Habitat Requirements, Geographic Range, Occurrence Records	Potential to Occur on Project Site
Bitter hymenoxys	*Hymenoxys odorata*	Bitter hymenoxys grows in riparian scrub and Sonoran desert scrub from 150 feet to 500 feet above MSL. This species blooms from February through November (CNPS 2016). Based on 37 records from the Consortium of California Herbaria, this species has been collected from Riverside, San Bernardino, and Imperial Counties. Riverside records are from the Palo Verde Valley, and from locales surrounding Blythe (CCH 2016). There are six CNDDB records for this species for the entire State of California, two of which occur in Riverside County; the nearest CNDDB occurrence is a historical record approximately 28.7 miles southeast of the Project Area from sandy slope, low bottom lands and overflow flats (CNPS 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. This species prefers mesic situations near seasonal watercourses, but has a low potential to occur within desert dry wash woodland, unvegetated washes, and Sonoran creosote bush scrub habitats within the project area.
California ayenia	*Ayenia compacta*	This species occurs in Mojavean and Sonoran desert scrub from approximately 500 to 3,300 feet above MSL. This species blooms from March through April. There are 123 records from the Consortium of California Herbaria database, the closest being about 7 miles distant (CCH 2016). The nearest CNDDB occurrence is a historical record from 1976 approximately 7.4 miles southwest of the project area in the Chuckwalla Mountains (CNPS 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. This species has a low potential to occur within Sonoran creosote bush scrub and desert wash habitats within the project area, but prefers higher elevations and rockier terrain.
California satintail	*Imperata brevifolia*	This species occurs in grassy areas found near chaparral, desert scrub, riparian scrubs, coastal scrub, wet springs, meadows, stream sides and floodplains from sea level to approximately 1,500 feet above MSL. The nearest CNDDB occurrence is from agriculture fields near Blythe (CNPS 2016). There are 107 records from the Consortium of California Herbaria database scattered across California in many different habitats. Records from Riverside County are from the Palm Springs, San Jacinto Mountains, and San Bernardino Mountains area along irrigation ditches or streams (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. California satintail has a low potential to occur within the PSEGS BRSA due to the lack of suitable habitat (mesic situations).

Species	Latin Name	Habitat Requirements, Geographic Range, Occurrence Records	Potential to Occur on Project Site
Chaparral sand verbena	*Abronia villosa var. aurita*	This species occupies sandy soil areas of chaparral, coastal sage scrub, and sandy desert dunes (CNPS 2016) from approximately 240 feet to approximately 4,800 feet above MSL. The nearest CNDDB occurrence is located approximately 5.4 miles north of the project, where approximately 100 plants were observed in 2012 in stabilized sand dune habitat (CNPS 2016). There are 226 records in the Consortium of California Herbaria database, many of which are from Riverside County in the San Jacinto Mountains area. Most of these specimens were collected from the north Palm Springs Mecca Hills and Temescal Canyon Road areas, with one collection from the Palen sand dunes (CCH 2016). The 2012 Palen sand dunes specimen collection is likely the 2012 CNDDB occurrence record.	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Although this species was documented nearby, and suitable habitat exists onsite, only the more common *Abronia villosa* var. *villosa* was seen.
Coachella Valley milkvetch	*Astragalus lentiginosus var. coachellae*	The Coachella Valley Multiple Species Habitat Conservation Plan states that this species occurs on "dunes and sandy flats, along the disturbed margins of sandy washes, and in sandy soils along roadsides and in areas formerly occupied by undisturbed sand dunes. Within the sand dunes and sand fields, this milkvetch tends to occur in the coarser sands at the margins of dunes, not in the most active blows and areas. As this species is strongly affiliated with sandy substrates, it may occur in localized pockets where sand has been deposited by wind or by active washes. It may also occur in sandy substrates in creosote bush scrub, not directly associated with sand dune habitat (BLM 2011, p. 3.18-24). This plant species blooms from February to May, producing pink to deep magenta-colored flowers. This species occurs on aeolian deposits with fewer than 25 occurrences in the Coachella Valley. Coachella Valley milkvetch depends on natural disturbances from fluvial and aeolian processes for seedling establishment (BLM 2002).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. The distribution of Coachella Valley milkvetch is restricted to the Coachella Valley in Riverside County, between Cabazon and Indio. CVAG identifies six outlying occurrences within a 5-mile area along Rice Road in the Chuckwalla Valley north of Desert Center, California (BLM 2011, p. 3.18-24); however, USFWS staff has indicated that these occurrences are not of the listed taxon (BLM, 2011).
Cove's cassia	*Senna covesii*	This species occurs on dry, sandy desert washes and slopes of the Sonoran Desert between 1,600 to 2,000 feet above MSL (CNPS 2016). The CNDDB has several records in Riverside County southwest of the project area, with the nearest occurrence recorded in 2011 approximately 5.0 miles south of the project in the Chuckwalla Mountains. California herbaria document 87 occurrences, the nearest from Corn Springs, about 5 miles southwest of the project (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Cove's cassia has a low potential to occur within the PSEGS BRSA due to the lack of suitable habitat and the project site being located below the typical elevation range where this species is known from.

Species	Latin Name	Habitat Requirements, Geographic Range, Occurrence Records	Potential to Occur on Project Site
Crucifixion thorn	*Castela emoryi*	This species occurs in Sonoran Desert and Mojavean Desert in scrub and playas with dry, gravelly washes, slopes, and plains from approximately 300 to 2,100 feet above MSL. There are 125 records in the Consortium of California Herbaria database, with the nearest occurrence 4.5 mile west of the project site (CCH 2016). The CNDDB contains 50 records for the species, many in Riverside County west of the project area and some scattered northeast and southeast of the project (CNPS 2016); the nearest CNDDB occurrence was recorded in 2011 and is located 0.8 mile north of the project's gen-tie corridor.	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Although there is appropriate habitat in the study area, and potential for a waif or two, *Castela* is a well-marked perennial plant, and would be difficult to miss during surveys.
Desert portulaca	*Portulaca halimoides*	This species occurs in Joshua tree woodlands and has been reported from Riverside, San Bernardino, and portions of Arizona and Baja, California from 3,000 feet to 3,600 feet above MSL). There are 13 CNDDB records for this species, all far to the north (CNPS 2016). There are 71 records in the Consortium of California Herbaria database (CCH 2016), the nearest being about 54 miles northwest of the site in Joshua Tree National Park.	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. It is not expected to occur within the project site due to lack of typical habitat associations and the project site being located well below the elevation range.
Desert sand parsley	*Ammoselinum giganteum*	This species occupies Sonoran creosote bush scrub and has been reported from Riverside County, California and portions of Arizona (CNPS 2016) at approximately 1,200 feet elevation. There is only one CNDDB record for the species in California (CNPS, 2016), and 2 very old historic records from the Consortium of California Herbaria database from the Hayfields area of western Chuckwalla Valley at 500 feet above MSL (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Desert sand parsley has not been collected in California since 1928, and has a low potential to occur within the PSEGS BRSA due to the lack of suitable habitat on the project site.

Species	Latin Name	Habitat Requirements, Geographic Range, Occurrence Records	Potential to Occur on Project Site
Desert spike moss	*Selaginella eremophila*	This is a dense, mat forming, non-flowering plant. This species occurs in Sonoran creosote bush scrub in gravelly or rocky soils from approximately 600 to 2,700 feet above MSL. There are 40 records in the CNDDB, with 2 from Riverside County south and southwest of the project area from 1922 and 1964; the nearest occurrence is the 1922 record located approximately 4.2 miles south of the project (CNPS 2016), There are 115 records in the Consortium of California Herbaria database from mostly Riverside and San Diego Counties with several records from Anza-Borrego Desert State Park, Palm Springs, Palm Canyon, and San Jacinto Mountain Range. One collection from Riverside County is from the vicinity of the Chocolate-Chuckwalla Mountain region near the north side of the Orocopia Mountains from sloped rocky, shady surfaces in gravelly soils (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. This species has a low potential to occur within the PSEGS BRSA due to the lack of shaded rocky habitat, and the low elevation of the project site.
Dwarf germander	*Teucrium cubense ssp. depressum*	This species occurs in desert dune, playa margins, and Sonoran desert scrub from approximately 100 feet to 1,200 feet above MSL. This species typically blooms from March to May but may also bloom from September through November. This species typically occurs in sandy soils and wash habitats and is known from fewer than 10 occurrences in California (CNPS 2016). There are 16 records from Consortium of California Herbaria database from Riverside and Imperial Counties (CCH 2016); there are records from the Chuckwalla Valley in the Hayfield area and Palo Verde Valley. There is a 1979 CNDDB record from Wiley's Well Road (400 feet elevation) (CNDDB 2016) approximately 16.5 miles southeast of the project; the nearest CNDDB occurrence is a CDFW, 2001 record from subsaline flat habitat along the Colorado River aqueduct, located approximately 15.6 miles southwest of the project (CNDDB 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. The BRSA site offers marginally appropriate habitat for this species, but dry sandy site conditions reduce the probability of occurrence.

Species	Latin Name	Habitat Requirements, Geographic Range, Occurrence Records	Potential to Occur on Project Site
Foxtail cactus	*Coryphantha alversonii*	This species occurs on rocky, granitic soils in Sonoran and Mojavean desert scrub from 200 feet to 4,600 feet above MSL. Prior to conducting spring 2009 field surveys, a reference population was observed on April 9, 2009 at a gravel pit northwest of Blythe along State Route 95 and several individuals were observed in relatively undisturbed Sonoran creosote bush scrub on granitic rock, a preferred habitat type of this species (CNPS 2016). There are 47 records of this species from the Consortium of California Herbaria database mostly from Riverside and San Bernardino Counties, including from the Chuckwalla Valley west of Desert Center (CCH 2016). The CNDDB contains 55 records for the species, most of them from Riverside County (CNDDB 2016). The nearest occurrence was documented in 1982, located 1.3 miles west of the project's gen-tie corridor along Interstate 10 (CNDDB 2016).	**LOW**. Although well-marked in its habit and vestiture, this species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Foxtail cactus has a low potential to occur within the PSEGS BRSA due to the lack of rocky desert scrub habitat.
Las Animas colubrina	*Colubrina californica*	Las Animas colubrina is an evergreen to semi-evergreen shrub that occurs in rocky Mojavean and Sonoran desert scrub (creosote bush series) and occurs at elevations from approximately 30 to 3,000 feet (CNPS 2106). It primarily occurs in dry canyons or headwater reaches of desert washes with gravelly, sandy soils. The distribution of this species includes San Diego, Imperial, and Riverside counties; portions of Arizona; Baja California; and Sonora, Mexico. This species has been reported from isolated desert locales in Joshua Tree National Monument, the Eagle Mountains, and Chuckwalla Mountains (BLM 2011). Las Animas colubrina has been identified in the Project region during surveys performed for other solar projects (BLM 2011). There are 75 records of this species in the Consortium of California Herbaria database including eleven historical records from between 1930 and 1966, four recent records found in the Colorado Desert (including several occurrences in the mountains and foothills surrounding Chuckwalla Valley (CCH 2016).	**LOW**. Colubrina was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys, and has a low potential to occur due to the absence of appropriate rocky wash margin and hillside habitat on the Project site.
Mesquite nest straw	*Stylocline sonorensis*	This species is presumed extirpated in California (CNPS 2016). It previously occupied Sonoran desert scrub around 1,300 feet elevation and has been reported from Riverside County and portions of Arizona and Sonora, Mexico. There are 2 CNDDB records from Hayfields in western Chuckwalla valley, but these are presumed extirpated (CNPS 2016). These correspond to the 2 records from the Consortium of California Herbaria database from 1930 (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Mesquite nest straw has not been seen in California since 1930, and has a low potential to occur within the PSEGS BRSA .

Species	Latin Name	Habitat Requirements, Geographic Range, Occurrence Records	Potential to Occur on Project Site
Orocopia sage	*Salvia greatae*	This species occurs in the southeastern Sonoran Desert and is associated with the Orocopia and Chocolate Mountains on alluvial slopes between 100 and 800 feet above MSL. There are 79 records from the Consortium of California Herbaria database, mostly from the Chocolate, Chuckwalla, and Orocopia mountain areas (CCH 2016). There are 25 records in the CNDDB, many from southwestern Riverside County (CNDDB 2016); the nearest documented occurrence is located approximately 21.8 miles southwest of the project.	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Although the project site has marginally appropriate habitat and elevation range, this well-marked species has a low potential of occurrence, because its distribution is restricted to areas south of the Chuckwalla mountains.
Pink fairyduster	*Calliandra eriophylla*	This species occurs in the Sonoran Desert in sandy washes, slopes and mesas from 350 to 5,000 feet above MSL. There are 116 records from the Consortium of California Herbaria database, several from the Chocolate-Chuckwalla Mountains area in Imperial and San Diego Counties (CCH 2016). There are 50 records in the CNDDB, mostly from other counties; however, the nearest documented Riverside County occurrence is a 1964 record along Interstate 10 approximately 6.3 miles east of the project (CNPS 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Marginally appropriate habitat and elevation range exists on the site for this well-marked species, but the aridity of the site and paucity of collections in the Chuckwalla valley render its potential of occurrence at low.
Pink velvet mallow	*Horsfordia alata*	This species occurs in the Sonoran Desert in California, Arizona, and Mexico. It occurs in rocky Sonoran desert scrub from approximately 300 to 1,500 feet above MSL. There are no CNDDB records for this species for the entire state of California (CNDDB, 2016). The Consortium of California Herbaria database contains 29 records from Riverside, Imperial, and San Diego Counties (CCH 2016). The nearest collection is from Palm Desert, 60 miles west of the project.	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Rocky scrub habitat does not exist on site, and there have been no historical collections in the Chuckwalla valley.
Sand evening-primrose	*Camissonia arenaria*	This species occupies sandy and gravelly areas of Sonoran desert scrub and has been reported from Imperial and Riverside Counties and areas of Arizona and Mexico from 200 feet to 2,700 feet above MSL (CNPS 2016). There are 31 records of this species in the Consortium of California Herbaria database, several from the Chocolate-Chuckwalla Mountains, Palo Verde Valley, and Ogilby Pass area (CCH 2016). There are 16 CNDDB records for this species (CNPS 2016), the closest in the Chuckwalla bench area 15 miles south from the project.	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Although marginal habitat and elevation exist on the site, this species has a low potential to occur because it is out of range, and has never been recorded in the Chuckwalla valley

Species	Latin Name	Habitat Requirements, Geographic Range, Occurrence Records	Potential to Occur on Project Site
Slender woolly-heads	*Nemacaulis denudata var. gracilis*	This species occupies desert sand dunes, coastal dunes, and Sonoran desert scrub (CNPS 2016) from 150 to 1,200 feet above MSL. There are 99 records in the Consortium of California Herbaria database, the closest approximately 30 miles northeast of the project in the Arica mountains (CCH 2016). There are 24 records in the CNDDB, with a few in western Riverside County (CNPS 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. Slender woolly-heads has never been documented in the Chuckwalla valley, and has a low potential to occur within the PSEGS BRSA, although marginally suitable habitat and appropriate elevation range exists.
Small-flowered androstephium	*Androstephium breviflorum*	This species occurs in desert dune and Mojavean desert scrub from approximately 700 feet to 2,000 feet above MSL. This species blooms from March through April and often occurs on desert bajadas. The nearest CNDDB record for this species is from Cadiz Valley approximately 24.2 miles north of the project (CNPS 2016). There are 32 records in the Consortium of California Herbaria database, the closest from the Arica mountains approximately 30 miles northeast of the project site.	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. This species has a low potential to occur within the site. Appropriate habitat exists, but *Androstephium* has never been documented this far south.
Spearleaf	*Matelea parvifolia*	This species occurs in rocky Mojavean and Sonoran desert scrub from 1,320 feet to approximately 3,300 feet above MSL. This species blooms from March through May (CNPS 2016). The nearest extant CNDDB record for this species is from the Chuckwalla Bench area during 1986 from desert dry wash woodland and creosote bush scrub habitats (CNDDB 2016). There are 28 records in the Consortium of California Herbaria database, the closest from Corn Springs, about 6 miles southwest of the project site (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys. This species has a low potential to occur within the Project Disturbance Area because the site is located below the typical elevation range of this species, and contains no rocky habitat.
Wiggins' cholla	*Cylindropuntia (=Opuntia) wigginsii*	Wiggins' cholla is not recognized as a species, but is considered a hybrid of silver cholla (*C. echinocarpa*) and pencil cholla (*C. ramosissima*). Wiggins' cholla is not found as a separate species in The Jepson Manual (1993; 2012) nor in Munz et al A California Flora and Supplement (1973); however, the BLM's Proposed Northern and Eastern Colorado Desert Coordinated Management Plan identifies Wiggins' cholla as a special-status species (BLM 2002). CNDDB and CNPS recognizes Wiggins' cholla as a CRPR 3.3 species meaning more information is needed about this species and it is not considered very endangered in California. CNPS also considers this species a sporadic hybrid of the two *Cylindropuntia* species mentioned above, and identifies occurrences in Riverside, Imperial, San Bernardino, and San Diego Counties (CNPS 2016). There are no records in the Consortium of California Herbaria database (CCH 2016).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys, and probably does not deserve recognition as a distinct taxon.

Species	Latin Name	Habitat Requirements, Geographic Range, Occurrence Records	Potential to Occur on Project Site
Winged cryptantha	*Cryptantha holoptera*	Winged cryptantha has a limited distribution in California. This is a spring-blooming annual that occurs in Mojavean and Sonoran desert scrub habitats from 300 feet to approximately 5,000 feet above mean sea level within California, Arizona, and Nevada (CNPS 2016). There are 173 records of this species in the Consortium of California Herbaria database from Riverside, Imperial, San Bernardino, and San Diego counties (CCH 2016). Winged cryptantha was observed near the Colorado Substation at the southeastern end of Chuckwalla Valley, approximately 22 miles east (Solar Millennium 2010d).	**LOW**. This species was not observed during the 2009, 2010 (spring and fall), 2013, or 2016 surveys.

APPENDIX D

Cumulative Floristic Compendium

2009 to 2017

SCIENTIFIC NAME	**COMMON NAME**
Abronia villosa var. *villosa*	desert sand verbena
Achyronchia cooperi	onyx flower
Acmispon strigosus	strigose lotus
Allionia incarnata	windmills
Ambrosia dumosa	white bursage
Ambrosia salsola	cheesebush
Amsinckia mensiesii var. *menziesii*	rancher's fireweed
Amsinckia tessellata	devil's lettuce
Aristida adscencionis	sixweeks three-awn
Aristida purpurea	purple three-awn
Asclepias albicans	whitestem milkweed
Asclepias erosa	desert milkweed
Asclepias subulata	skeleton milkweed
Astragalus aridus	annual desert milkvetch
Astragalus didymocarpus	dwarf white milkvetch
Astragalus insularis* var. *harwoodii	**Harwood's milkvetch**
Atrichoseris platyphylla	parachute plant
Atriplex canescens	four-wing saltbush
Atriplex canescens var. *macilenta*	salton saltbush
Atriplex polycarpa	allscale saltbush
Baileya pauciradiata	desert marigold
Baileya pleniradiata	woolly desert marigold
Bebbia juncea var. *aspera*	rush sweetbush
Boerhavia triquetra var. *intermedia*	slender spiderling
Bouteloua aristidoides	needle gramma
Bouteloua barbata var. *barbata*	six-weeks gramma
Brandegia bigelovii	desert starvine
**Brassica tournefortii*	Sahara mustard
Calycoseris wrightii	white tackstem
Caulanthus lasiophyllus	California mustard
Chaenactis carphoclinia	pebble pincushion
Chaenactis fremontii	Fremont's pincushion
Chaenactis stevioides	desert pincushion
Chorizanthe brevicornu	brittle spineflower
Chorizanthe corrugata	wrinkled spineflower
Chorizanthe rigida	spiny herb
Chylismia brevipes ssp. *brevipes*	golden suncup
Chylismia claviformis	browneyes
Cisthanthe ambigua	desert calandrinia
Condalia globosa* var. *pubescens	**spiny abajo**

SCIENTIFIC NAME	COMMON NAME
Croton californicus	California croton
Cryptantha angustifolia	narrow leaved cryptantha
Cryptantha barbigera	bearded cryptantha
Cryptantha costata	**ribbed cryptantha**
Cryptantha maritima	Guadalupe cryptantha
Cryptantha micrantha	redroot cryptantha
Cryptantha nevadensis	Nevada cryptantha
Cryptantha pterocarya var. *cycloptera*	wingnut cryptantha
Cryptantha pterocarya var. *pterocarya*	wingnut cryptantha
Cucurbita palmata	coyote melon
Cuscuta sp.	dodder
Cylindropuntia bigelovii	teddybear cholla
Cylindropuntia echinocarpa	silver cholla
Cylindropuntia ramosissima	pencil cholla
Dalea mollis	hairy prairie clover
Dalea mollissima	silky dalea
Datura discolor	jimson weed
Dicoria canescens	dicoria
Ditaxis lanceolata	narrowleaf ditaxis
Ditaxis neomexicana	New Mexico ditaxis
Ditaxis serrata* var. *californica	**California ditaxis**
Dithyrea californica	spectacle pod
Echinocactus polycephalus var. polycephalus	cottontop cactus
Echinocereus engelmannii	hedgehog cactus
Emmenanthe pendulifera	whispering bells
Encelia farinosa	brittlebush
Encelia fructescens	button brittlebush
Eremalche exilis	white mallow
Eremalche rotundifolia	desert fivespot
Eremothera boothii ssp. desertorum	desert suncup
Eriastrum harwoodii	**Harwood's woolystar**
Eriastrum sparsiflorum	Great Basin woolystar
**Erodium cicutarium*	red stem filaree
Erodium texanum	desert heron's bill
Eriogonum inflatum	desert trumpet
Eriogonum thomasii	Thomas' buckwheat
Eschscholzia glyptosperma	desert golden poppy
Eschscholzia minutiflora	pygmy poppy
Eschscholzia parishii	Parish's poppy
Eucrypta micrantha	desert hideseed

SCIENTIFIC NAME	COMMON NAME
Euphorbia micromeria	Sonoran sandmat
Euphorbia polycarpa	smallseed sandmat
Euphorbia setiloba	Yuma sandmat
Fagonia laevis	California fagonia
Ferocactus cylindraceus var. *cylindraceus*	barrel cactus
Festuca octoflora	sixweeks fescue
**Festuca sp.*	fescue
Fouquieria splendens	ocotillo
Funastrum hirtellum	hairy milkweed
Funastrum utahense	**Utah vine milkweed**
Geraea canescens	desert sunflower
Gilia scopulorum	rock gilia
Gilia stellata	star gilia
Heliotropium convolvulaceum var. *californicum*	bindweed heliotrope
Hesperocallis undulata	desert lily
Hibiscus denudatus	paleface
Hilaria rigida	big galleta grass
Hyptis emoryi	desert lavendar
Isocoma acradenia	alkali goldenbush
Justicia californica	chuparosa
Kallstroemia californica	California caltrop
Krameria bicolor	white rhatany
Langloisia setosissima ssp. *setosissima*	bristly langloisia
Larrea tridentata	creosote bush
Lepidium lasiocarpum	pepperweed
Linanthus jonesii	Jones' lananthus
Loeseliastrum matthewsii	Desert calico
Loeseliastrum schottii	Schott's calico
Lupinus arizonicus	Arizona lupine
Lupinus concinnus	bajada lupine
Lycium andersonii	Anderson's desert thorn
Malacothrix glabrata	desert dandelion
Mammillaria tetrancistra	fishook cactus
Marina parryi	Parry's false prairie clover
Mentzelia affinis	yellowcomet
Mentzelia albicaulis	white stemmed stickleaf
Mentzelia involucrata	whitebract blazingstar
Mentzelia multiflora var. *longiloba*	yerba amarilla
Mirabilis laevis var. *retrorsa*	wishbone bush
Monolepis nuttalliana	poverty weed

SCIENTIFIC NAME	COMMON NAME
Monoptilon bellioides	Mojave desertstar
Nama demissum var. *demissum*	purplemat
Nama pusillum	small leaved nama
Nemacladus glanduliferus	glandular threadplant
Nicotiana obtusifolia	desert tobacco
Oenothera deltoides ssp. *deltoides*	birdcage desert primrose
Oenothera primiveris ssp. *bufonius*	desert evening primrose
Oligomeris linifolia	lineleaf whitepuff
Olneya tesota	desert ironwood
Opuntia basilaris	prickly pear cactus
Orobanche cooperi	desert broomrape
Palafoxia arida var. arida	spanish needles
Parkinsonia florida	blue palo verde
Pectis papposa var. papposa	chinch weed
Pectocarya heterocarpa	combseed
Pectocarya platycarpa	broadfruit combseed
Perityle emoryi	Emory's rockdaisy
Petalonyx thurberi	sandpaper plant
Petunia parviflora	wild petunia
Phacelia crenulata var. *ambigua*	purplestem phacelia
Phacelia crenulata var. *minutiflora*	cleftleaf phacelia
Phacelia distans	common phacelia
Phacelia neglecta	alkali phacelia
**Phalaris minor*	little-seed canary grass
Phoradendron californicum	desert mistletoe
Physalis crassifolia	ground cherry
Plantago ovata	wooly plantain
Prosopis glandulosa	honey mesquite
Psathyrotes ramosissima	turtleback
Psorothamnus emoryi	indigo bush
Psorothamnus schottii	Schott's indigo bush
Psorothamnus spinosus	smoke tree
Rafinesquia neomexicana	desert chicory
**Salsola tragus*	russian thistle
Salvia columbariae	chia
**Schismus arabicus*	Mediterranean grass
Senegalia greggii	catclaw acacia
Sesuvium verrucosum	western sea-purslane
**Sisymbrium irio*	London rocket
Sphaeralcea ambigua	desert globemallow

SCIENTIFIC NAME	**COMMON NAME**
Stephanomeria pauciflora var. *pauciflora*	wire lettuce
Stillingia spinulosa	broad leaved stillingia
Stipa hymenoides	indian rice grass
Streptanthella longirostris	longbeak fiddle mustard
Stylocline gnaphaloides	nest straw
Suaeda nigra	bush seepweed
**Tamarix sp.*	tamarisk
Tidestromia suffruticosa var. *oblongifolia*	Arizona honeysweet
Tiquilia plicata	fanleaf crinklemat
Trianthema portulacastrum	horse purslane
Trichoptilium incisum	yellowhead
Ziziphus obtusifolia var. *canescens*	graythorn

* Nonnative species

Bold face indicates special status species

APPENDIX E

Memorandum: Potential Impacts to Federal ESA-Listed Bird Species

Ironwood Consulting
370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

www.
www.

April 17, 2017

Javier De La Garza
Director, Solar Business Development
EDF Renewable Energy
505 14th Street Suite 1150
Oakland, CA 94612

SUBJECT: Potential Impacts to Federal ESA-Listed Bird Species - Palen Solar Photovoltaic Project

Mr. De La Garza:

This memorandum provides an assessment of impacts to bird species listed as threatened or endangered under the Federal Endangered Species Act (ESA) that may result from the Palen Solar PV Project (Project). While no suitable breeding or wintering habitat for ESA-listed bird species occurs within or near the Project, incidental records of ESA-listed bird species at other utility-scale solar projects in California suggest that analyzing the potential effects to such species may be warranted. This memorandum addresses the following four ESA-listed species:

- Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) – Threatened;
- Southwestern willow flycatcher (*Empidonax traillii extimus*) – Endangered;
- Least Bell's vireo (*Vireo bellii pusillus*) – Endangered; and
- Ridgeway's [Yuma Ridgway's] rail (*Rallus obsoletus yumanensis* [*R. longirostris y*]) – Endangered.

Baseline avian data and analysis of potential effects to these listed species have been partly described in the *Bird and Bat Conservation Strategy for the Palen Photovoltaic Solar Project* (BBCS, Western EcoSystems Technology [WEST] 2017a), *Biological Resources Technical Report for the Palen Solar PV Project* (Ironwood Consulting 2017), and *Biological Opinion on the Proposed Land Use Plan Amendment* (LUPA) *under the Desert Renewable Energy Plan* (DRECP) (U.S. Fish and Wildlife Service [USFWS] 2016). The Project's BLM right-of-way application predates the DRECP and is therefore not subject to the provisions of the LUPA Biological Opinion; however, the effects analysis regarding ESA-listed bird species in the LUPA Biological Opinion is relevant because the Project is located within a development focus area (DFA) per the LUPA. This memorandum summarizes key elements of these documents to support the preparation of the Project's Supplemental Environmental Impact Statement / Report (SEIS/EIR).

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

Status of ESA-Listed Species

Western yellow-billed cuckoos, southwestern willow flycatchers, and least Bell's vireos are alike in that they breed in riparian habitats in California, winter south of the United States-Mexico border, and migrate though the Colorado Desert between breeding and wintering habitats. It should be noted that the riparian habitat associated with these listed species is different than the xeric, microphyll riparian scrub woodland found on and near the Project site. Yuma Ridgway's rail nests in freshwater marshes and is distinct from the other listed bird species in that they are not known to regularly migrate between areas of breeding habitat. The descriptions below include information on the species' listing status, habitat preferences, distribution, population status, migration potential, and records associated with existing solar facilities is described separately below.

Western Yellow-Billed Cuckoo

The western yellow-billed cuckoo was listed as threatened on 3 November 2014 (79 Federal Register [FR] 59991) because the number of western yellow-billed cuckoos in the western United States had declined substantially over the past 100 years. This species is known to currently breed in portions of California, Nevada, Arizona, and New Mexico that support extensive riparian areas. The USFWS estimated the current breeding population at 680 to 1,025 pairs, with 350 to 495 pairs north of the Mexican border and the remainder in Mexico (USFWS 2016). The winter range of the western yellow-billed cuckoo is relatively unknown (USFWS 2016).

The closest known breeding habitat to the Project site is located approximately 35 miles away along the Colorado River (USFWS 2016). There have been no documented sightings of western yellow-billed cuckoos within the LUPA DFAs (USFWS 2016). Western yellow-billed cuckoos migrate across the desert and use scrub habitat during migration (USFWS 2016). Dead western yellow-billed cuckoos have been found in or adjacent to desert scrub habitat in the Ivanpah Valley and eastern Riverside County (Davis 2015; Beeler 2015 - as cited in USFWS 2016).

Two records of dead western yellow-billed cuckoos have been noted to date at concentrating solar power (CSP) facilities in California (USFWS 2016). These records occurred at Ivanpah Solar Electric Generating System, during construction in 2012, and Genesis Solar Project (Davis 2015; Beeler 2015; WEST 2016a - as cited in USFWS 2016). The causes of death were unknown. There is limited information regarding mortalities of western yellow-billed cuckoos at renewable energy facilities outside California (USFWS 2016). No mortalities of western yellow-billed cuckoos have been reported from renewable energy facilities in Nevada (Nicolai 2015 as cited in USFWS 2016). No mortalities of western yellow-billed cuckoos have been reported from solar photovoltaic (PV) facilities (Althouse and Meade 2014 [Topaz]; H. T. Harvey and Associates 2014 [CVSR]; and WEST 2016b).

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

Southwestern Willow Flycatcher

The southwestern willow flycatcher was listed endangered on 27 February 1995 (60 FR 10694) because of threats related to large-scale loss of habitat and nest parasitism by the brown-headed cowbird (*Molothrus ator*). This species breeds in dense riparian habitats in the southwestern United States, and winters in southern Mexico, Central America, and northern South America (USFWS 2002). Over the past decade, survey data from various breeding sites in California suggest that the number of territories has declined (USFWS 2016).

The closest known breeding habitat to the Project site is approximately 35 miles away along the Colorado River and adjacent to the Salton Sea (USFWS 2016). Southwestern willow flycatchers migrate through the Colorado Desert (USFWS 2016). Migrating willow flycatchers may use a wider range of habitats during migration than during breeding (Craig and Williams 1998 - as cited in USFWS 2016).

Willow flycatchers have been found dead at solar facilities and overhead powerlines in the California desert; however, none of the dead birds were identified as the ESA-listed southwestern willow flycatcher (Guigliano 2015; Dietsch 2015a; Dietsch 2015b; EDM International 2016 - as cited in USFWS 2016). There is limited information regarding mortalities of southwestern willow flycatchers at renewable energy facilities outside California (USFWS 2016). No mortalities of southwestern willow flycatchers have been reported from renewable energy facilities in Nevada (Nicolai 2015 as cited in USFWS 2016).

Least Bell's Vireo

The least Bell's vireo was listed as endangered on 2 May 1986 (51 FR 16474) because of similar threats to that of the southwestern willow flycatcher as mentioned above. This species breeds in structurally diverse riparian habitats in Southern California and portions of northern Baja California, Mexico and winters in southern Baja California, Mexico (USFWS 1998). The distribution of this species has likely increased since its listing, although it remains absent from large parts of its former range (USFWS 2016). The closest known breeding habitat to the Project site is over 70 miles to the northwest in the Big Morongo Canyon (USFWS 2016). Least Bell's vireos are also uncommon breeders at the Anza Borrego Desert State Park, located approximately 70 miles southwest of the Project site (USFWS 2016). The subspecies Arizona Bell's vireo (*V. b. arizonae*) is not ESA-listed, but is State-listed as endangered, and is known to occur along the lower Colorado River, approximately 35 miles east of the Project site.

Least Bell's vireos likely migrate through the Colorado Desert; however, there is little information on this species' migration behavior (USFWS 2016). It is presumed that this species may utilize patches of riparian habitat varying in size and possibly upland scrub habitat during migration (USFWS 2016).

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

There have been no reports of least Bell's vireos found dead or injured at renewable energy facilities (USFWS 2016).

Yuma Ridgway's Rail

The Yuma Ridgway's rail was listed as endangered on 11 March 1967 (32 FR 4001). Until recently, Ridgway's rail (*Rallus obsoletus yumanensis*) was considered three different sub-species (BirdLife International 2014; Chesser et al. 2014), including Yuma clapper rail (*Rallus obsoletus yumanensis*, formerly *R. longirostris yumanensis*), light-footed clapper rail (*R.o. levipes*), and California rail (*R.o. obsoletus*). The revision of the name of the species did not affect the taxon with regard to its listing as endangered. Because of this separation, population data were divided between the different subspecies. For the purposes of this analysis and based on the USFWS's identification of the Yuma clapper rail as the likely sub-species present in the Project vicinity (USFWS 2009), population trends, life histories, and migration and dispersal behaviors for only Yuma clapper rail as identified in the literature, in agency profiles and abstracts and other specified sources area discussed herein.

The current known range of Yuma Ridgway's rail includes portions of Arizona, California, Nevada, and Colorado River delta regions in Mexico (Arizona Game and Fish Department [AZGFD] 2001; USFWS 2009; BirdLife International 2014). This species is found along the lower Colorado River southward to its terminus at the Sea of Cortez, along the Gila River drainage in Arizona, at Lake Mead (and the Overton Arm) and its local tributaries, along the Virgin River in Nevada and Utah, and at the Salton Sea/Imperial Valley areas of California (California Energy Commission [CEC] et. al 2014; USFWS 2014). In these areas, the species nests and feeds primarily on invertebrates in freshwater marsh habitats from which most individuals do not migrate (USFWS 2014). Many of the areas that support important habitat for Yuma Ridgway's rail are Federal or State-owned lands with existing management plans including the Cibola and Sonny Bono Salton Sea National Wildlife Refuges located approximately 35 miles from the Project site (USFWS 2016).

Estimates of population size have been difficult to ascertain for Yuma Ridgway's rail. Studies performed in the U.S. from 2006 to 2014 indicate that the number individuals declined steadily (USFWS 2016). Recent population estimates include 7,714 to 9,686 individuals along the Colorado River Delta in Mexico in 2010 and 2011 (Hinojosa-Huerta et al. 2013 - as cited in USFWS 2016). Yuma Ridgway's rails in Mexico have the potential to disperse into the United States (USFWS 2016).

The extent of dispersal or migration between the populations is not well known (USFWS 2009); however, outlier records across the desert suggest some level of movement may occur (USFWS 2016). Outlier observations of Yuma Ridgway's rails have been documented at Harper Dry Lake, East Cronese Dry Lake, and Desert Center at a great distance from known breeding areas (USFWS 2016). The triggers for movements appear to be the need to find suitable habitat, the need to find mates, and/or the need to locate food (Eddleman 1989 as cited in CEC et. al 2014). Eddleman (1989 as cited

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

in USFWS 2009) suggested that availability of suitable habitat and food sources, specifically crayfish on the Lower Colorado River may influence the rail's need to migrate. Similar conditions and circumstances may be applicable to the population on the Salton Sea, where a large portion of a recent decline in the population from 2007 to 2014 appears to have been due largely to lack of sufficient water and routine maintenance to support suitable breeding conditions at the Imperial Wildlife Area (USFWS 2009; Riesz 2015). It is currently presumed that a majority of the Yuma Ridgway's rail on the Lower Colorado River and Salton Sea do not migrate but rather remain in the general area year-round (AZGFD 2001, USFWS 2009, CEC et. al 2014).

Two records of dead Yuma Ridgway's rails have been noted to date at solar facilities in California, one at the fixed PV Desert Sunlight Solar Project in Riverside County during construction in 2013 and one at the single axis tracker PV Solar Gen 2 Project in Imperial County in 2014 (USFWS 2016). The causes of death were unknown. A live Yuma Ridgway's rail, observed to be uninjured, was recorded at the Blythe Solar PV Project during construction in 2015 (USFWS 2016). There is limited information regarding mortalities of Yuma Ridgway's rails at renewable energy facilities outside California (USFWS 2016). No mortalities of Yuma Ridgway's rails have been reported from known renewable energy facilities in Arizona or Nevada (Fitzpatrick 2015b; Nicolai 2015 - as cited in USFWS 2016). No Ridgeway rails have been found during the two subsequent years of standardized monitoring at Desert Sunlight, or the first years of monitoring at the Blythe and McCoy projects.

Potential Effects to Listed Species

Loss of Habitat

Development of the Project would result in the removal of approximately 3,500 acres of desert habitat, which does not represent typical stopover habitat for ESA-listed bird species, but may be used during dispersal or migration. On a larger scale assessing all DFWs (over 38,000 acres) within the entire LUPA, the USFWS concluded that the loss of habitat would not likely adversely affect migration of these riparian-nesting species (USFWS 2016). This conclusion was reached based on several factors, including:

- The loss of habitat within all DFAs would comprise less than 1% of the total land within the LUPA;
- BLM-managed lands are intermixed with millions of acres of lands owned by other agencies and private parties, which provide habitat to for migrating birds;
- The BLM would avoid the majority of riparian areas within the LUPA and these areas will likely provide the highest quality resting and foraging habitat riparian-nesting species; and

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

- The location and distribution of solar facilities within the DFAs would not impose a substantial barrier to individuals of the listed riparian-nesting species during migration or preclude their movement across the desert.

Collision and Electrocution

The potential for individuals of the four ESA-listed species to collide with Project infrastructure is expected to be similar to that of other resident and migratory bird species if they are in the vicinity of the Project. Above-ground infrastructure that may add to collision risk includes solar panels, meteorological towers, power lines, fences, buildings, and large equipment. The Project would consist of PV technology and would not involve collision risks associated with turbines, heliostats, or power towers. Electrocution may occur if birds encounter aboveground, electrified powerlines including the gen-tie line; however, with regard to these ESA-listed species, electrocution potential is relatively low due to their narrow wing span.

Lighting

Southwestern willow flycatcher, least Bell's Vireo, and yellow-billed cuckoo are known to migrate at night. Yuma Ridgway's rail dispersal behavior is less understood, but this species is also thought to migrate at night. Artificial lighting may serve as an attractant when deployed on artificial structures (e.g., communication towers, offshore oil platforms), which can result in night-migrating birds colliding with these structures (Poot et al. 2008, Gehring et al. 2009, Kerlinger et al. 2010 – as cited in WEST 2017a). During construction, artificial lighting typically includes lights from construction vehicles when and if construction occurs during the overnight hours, lights on structures (e.g., office trailers), parking areas, site security facilities, and possible lighting associated with project roads. During operations, artificial lighting typically includes lights on buildings and site security facilities.

Indirect Effects

The presence of construction activities, personnel, equipment, and solar infrastructure may result in indirect effects to wildlife in general, including ESA-listed birds. Potential indirect effects that may that may occur over time include increase risk of fire, degradation of habitat due to spread of invasive weed species, and attraction of potential predators (e.g., common raven [*Corvus corax*]). Additionally, the hypothesis that bird species might interpret solar facilities as water has been proposed by Kagan et al. (2014), Walston et al. (2015), and Huso et al. (2016). Currently, the data are inconclusive with respect to supporting or refuting the lake effect hypothesis (WEST 2017b). Data from three publicly available studies at PV solar facilities suggest that avian fatalities were generally distributed across numerous species, typically passerines, doves, and pigeons (WEST 2017b). No water-associated bird fatalities were discovered at two of the three sites, California Valley Solar Ranch (CVSR) and Topaz (H. T. Harvey and Associates 2014; Althouse and Meade 2014). Water-associated bird fatalities were discovered at the fixed PV Desert Sunlight Solar Project; however, overall estimates of water-associated bird mortality did not differ significantly from estimates of non-water associated bird mortality among arrays (WEST 2016b). Further studies are needed, and have been recently proposed, to explore of the lake effect hypothesis in terms of the causal mechanisms and how birds perceive solar energy facilities (WEST 2017b). Additional discussion on the lake effect hypothesis is included in the technical memorandum prepared for the Project (WEST 2017b).

Effects Not Applicable to the Project

Other effects generally associated with solar facilities include evaporation ponds, entanglement with netting, and solar flux. Due to the proposed PV technology, the Project would not involve the use of evaporation ponds and thus entanglement with pond netting would not occur. The Project would also not create solar flux.

Minimization Measures

Measures for avoiding, minimizing, and mitigating potential adverse effects to resident and migratory bird species are included in the Project's adopted PSPP Mitigation Measures (MMs), Applicant Proposed Measures (APMs), and BBCS. A summary is provided below.

Project design would include several measures to avoid or minimize risk to birds during construction and operations. Utility lines would be designed to prevent bird injury and fatalities resulting from to electrocution. Utility lines would be built following Avian Power Line Interaction Committee (APLIC) Guidelines (APLIC 2012) to minimize electrocution risks. To further minimize effects to birds, structures would consist of monopole or dual-pole design versus lattice tower design to minimize perching and nesting opportunities, as well as reduce the likelihood of bird collisions. The Project would minimize and control the use of external lighting per PSPP MM BIO-8 and VIS-3, which would reduce the potential for lighting to have a measurable effect on ESA-listed species.

The Project would implement additional measures to avoid or minimize potential effects to wildlife in general, including birds. PSPP MM BIO-8 would require implementation of APLIC guidelines to reduce the risk of electrocution of large birds, as well as the preparation of a Nesting Bird Management and Monitoring Plan. To minimize the likelihood of vehicle strikes to wildlife during construction vehicle speeds would be limited to under 25 miles per hour on all dirt Project access roads. Any instances of road-killed animals or other carcasses detected by personnel on roads associated with the Project would be reported and removed promptly. All trash and food-related waste would be contained in secure, closed lid containers to reduce the attractiveness of the site to opportunistic predators, such as common ravens and coyotes, and to prevent trash from being exposed or blown around the Project. Equipment and vehicle travel would be limited to existing roads or specific construction pathways during construction. A site-specific Worker Environmental

Awareness Program (WEAP) per PSPP MM BIO-6 would be developed that would include information regarding sensitive biological resources, including listed bird species, and emphasize reporting all dead or alive bird observations to the Designated Biologist or Biological Monitor. The Project would use the minimal amount of water needed for dust abatement to prevent the formation of puddles, which could attract birds and other wildlife. To minimize the potential effects of habitat loss due to fire, fire prevention measures would be implemented per PSPP MM BIO-6 and PSPP MM WS-1 and 2. Indirect effects to adjacent lands from the potential spread of weeds would be controlled through the implementation of the Weed Management Plan per PSPP MM BIO-14. All unused material and equipment will be removed upon completion of construction and maintenance activities outside the permanently fenced site. The risk of attracting common ravens to the Project, which could result in increased predation on native species including migrating or dispersing listed birds, will be controlled through implementation of the Common Raven Monitoring, Management, and Control Plan per PSPP MM BIO-13.

A comprehensive list of minimization measures that directly or indirectly relate to the protection of birds are listed in APM-52 as Tier 1 Impact Avoidance Measures, as follows:

1) *The Project owner shall initiate consultation with USFWS and CDFW if there is a Project-attributed injury or mortality to any species regulated by BGEPA, ESA or CESA.*
2) *PSPP MM BIO-1: Designated Biologist Selection and Qualifications*
3) *PSPP MM BIO-2: Designated Biologist Duties*
4) *PSPP MM BIO-3: Biological Monitor Selection and Qualifications*
5) *PSPP MM BIO-4: Biological Monitor Duties*
6) *PSPP MM BIO-6: Worker Environmental Awareness Program (WEAP)*
7) *PSPP MM BIO-8: Impact Avoidance and Minimization Measures (e.g., 1. Limit disturbance areas; 2. Minimize road impacts; 3. Minimize traffic impacts; 4. Monitor during construction; 5. Minimize impacts of transmission/pipeline alignments, roads, and staging areas; 6. Avoid use of toxic substances; 7. Minimize lighting impacts; 8. Minimize noise impacts; 12. Minimize standing water; 13. Dispose of road-killed animals; 14. Minimize spills of hazardous materials; 15. Worker guidelines; 17. Monitor ground disturbing activities prior to pre-construction site mobilization; 18. Control unauthorized use of the project access roads; 20. Avoid spreading weeds)*
8) *PSPP MM BIO-12: Desert Tortoise Compensatory Mitigation*
9) *PSPP MM BIO-13: Raven Management Plan and Fee*
10) *PSPP MM BIO-14: Weed Management Plan*
11) *PSPP MM BIO-15: Pre-Construction Nest Surveys and Avoidance Measures*
12) *PSPP MM BIO-16: Avian Protection Plan*
13) *PSPP MM BIO-18: Burrowing Owl Impact Avoidance, Minimization, and Compensation Measures*

Ironwood Consulting

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

14) *PSPP MM BIO-19: Special-Status Plant Impact Avoidance, Minimization and Compensation*
15) *PSPP MM BIO-21: Mitigation for Impacts to State Waters (e.g., 1. Acquire off-site state waters)*
16) *PSPP MM BIO-25: Golden Eagle Inventory and Monitoring*
17) *PSPP MM BIO-26: Evaporation Pond Netting and Monitoring*
18) *PSPP MM VIS-03: Temporary and Permanent Exterior Lighting (e.g., minimize visibility, minimize glare, minimize illumination)*
19) *PSPP MM VIS-04: Project Design (e.g., minimize the number of structures, reduce the amount of disturbed area)*
20) *APM-1: Designated Biologist*
21) *APM-2: Worker Education Program*
22) *APM-4: Integrated Weed Management Actions*
23) *APM-6: Noise Controls for Special-Status Species*
24) *APM-7: Standard Practices to Protect Special Status Species (e.g., prohibition of domestic pets)*
25) *APM-16: Bendire's Thrasher Monitoring*
26) *APM-17: Passive Burrow Exclusion*
27) *APM-18: Golden Eagle Nest Avoidance*
28) *APM-19: Golden Eagle Compensation*
29) *APM-20: Contribution to Golden Eagle Monitoring Program*
30) *APM-42: Manage Visual Resources as VRM Class IV*
31) *APM-45: Visual Design Standards*
32) *APM-46: Required Visual Resource BMPs*

Avian Monitoring and Reporting

Specifications for avian fatality monitoring and reporting during construction and post-construction (operations) are also included in the Project's adopted PSPP MMs, APMs, and BBCS. Relevant measures are summarized below.

Site personnel would be required to report any injured or dead birds found within the Project limits and the applicant would report such sightings to the BLM. PSPP MM BIO-2 requires the Designated Biologist to notify the BLM, USFWS, and CDFW of any dead or injured listed species found on the Project. PSPP MM BIO-5 provides authorization to the Designated Biologist to immediately stop any Project activity to avoid take of an individual of a listed species.

The BBCS (Section 5.0) includes a post-construction monitoring program that provides a standardized approach to document known bird and bat fatalities and injuries, and to estimate seasonal and annual post-construction fatality rates associated with Project features. The monitoring program is founded on a statistically sound spatial and temporal sampling design, including protocols for independently estimating and correcting for quarterly searcher-efficiency and seasonal (i.e., at least quarterly) scavenger (avian and mammalian) removal rates. It describes specific data to be collected during scheduled carcass searches, protocols for handling any dead or injured birds and bats that are found, and procedures for reporting incidents to applicable government agencies. The monitoring program includes sampling of solar arrays and regular inspections of the perimeter fence and gen-tie line. The BBCS includes instructions and contact information for rehabilitation facilities that work with injured birds. The BBCS (Section 6.0) includes reporting requirements and conditions the applicant to report all documented bird and bat injuries and fatalities to the BLM, CDFW and USFWS using the USFWS Avian Injury and Mortality Reporting Form.

Adaptive Management

Adaptive management actions, which may be implemented during and/or following the post-construction monitoring program, are described in the BBCS (Section 7.0) and APM-52. Adaptive management would follow a data-driven approach whereby problems would be assessed in the context of other sources of anthropogenic impact (e.g., other solar facilities) to bird species. The guiding principles associated with adaptive management are:

- Recommendations will be made based on best available science and existing approvals and permits to address specific issues resulting from the Project;
- Recommendations will be assessed by all agencies involved, as well as representatives for the Project;
- Provide sufficient flexibility to adapt as more is learned about the Project as well as strategies to reduce avian impacts, if warranted;
- Review results of fatality monitoring;
- Review annual report on status of compliance with mitigation measures and permit conditions and provide recommendations to the BLM and the Riverside County equivalent, as necessary.
- Evaluate effectiveness of implemented adaptive management strategies and provide the BLM and the Riverside County equivalent with recommendations based on findings.

After at least two monitoring seasons have passed, data will be reviewed to determine if adjustments to the monitoring frequency are warranted based on carcass persistence trial results. The applicant and the agencies will also meet at the end of the second year of monitoring to determine if continued/focused monitoring is warranted. Continued, focused monitoring may be warranted if data indicate that bird mortality caused by solar facilities is substantial and is having potential adverse impacts on special-status bird populations or there are other special circumstances. Such monitoring will be designed to address specific concerns that are identified after review of the data.

Ironwood Consulting

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

Furthermore, the BBCS directly references the stepwise adaptive management program described in APM-52 to reduce or offset fatalities caused by the Project. APM-52 provides the framework for adaptive management, including a definition of mitigation performance standards and two additional tiers of impact reduction measures, described as follows:

> *The Project owner shall implement a bird and bat adaptive management program that includes potential measures the Project owner can implement to adaptively respond to detected mortality and injuries attributable to the Project. Adaptive actions undertaken will be discussed and evaluated in survey reports prepared under the Project's BBCS. Any impact reduction measures must be commensurate (in terms of factors that include geographic scope, costs, and scale of effort) with the level of avian or bat mortality or injury that is specifically and clearly attributable to the Project facilities, consistent with the nexus and proportionality requirements of California statutory and constitutional law and of U.S. constitutional law.*
>
> a. *Performance Standards. Appropriate performance standards for mitigation of impacts to any species regulated by BGEPA [Bald and Golden Eagle Protection Act], ESA [Federal Endangered Species Act], and CESA [California Endangered Species Act] exist through required consultation with USFWS and CDFW under their respective regulatory and permitting frameworks, as specified in Tier 1 Measures, below. For impacts to all other special status avian and bat species, adaptive management measures must reduce or offset mortalities caused by the Project to a level that avoids a substantial, long-term reduction in the demographic viability of the population of the species in question, as estimated through implementation of the Project BBCS, which employs the structured approach set forth in the USFWS Land-Based Wind Energy Guidelines (USFWS 2012).*
>
> b. *Impact Reduction Measures.*
>   - i. *<u>Tier 1 Measures</u>. [noted in "Minimization Measures" above]*
>   - ii. *<u>Tier 2 Measures</u>. If Tier 1 measures do not achieve the performance standards described above, the monitoring results of the Project, as well as those of other PV projects and the results of their respective impact reduction efforts, will be analyzed to formulate additional impact reduction measures to achieve the performance standards. Such measures may include, but not be limited to:*
>   1) *Use of a secure cover or floating, high-density plastic balls to cover construction ponds, as recommended by the Federal Avian Administration's "Wildlife Hazard Management at Airports" manual.*
>   2) *Passive avian diverter installations along the perimeter or at other locations within the Project to reduce or minimize bird use of the site.*
>   3) *The use of sound, light or other means to discourage site use consistent with applicable legal requirements.*
>   4) *Onsite habitat management or prey control measures consistent with applicable legal requirements.*

5) *Modifications to support structures or other facilities to exclude nesting birds (e.g., netting or shielding around framework; capping open pipes or tubing).*

iii. *Tier 3 Measures. In the event Tier 1 and Tier 2 avoidance and minimization measures do not meet the above performance standards, or upon election of the Project owner, the Project owner shall implement compensatory mitigation on terms and at ratios deemed appropriate by USFWS and/or CDFW to meet the performance standard applicable to the species in question. Such measures shall be approved by USFWS and/or CDFW and may include, but not be limited to:*

1) *Restoration of degraded off-site habitat with native vegetation.*
2) *Restoration of off-site agricultural fields to bird habitat.*
3) *Management of off-site agricultural fields to enhance bird populations.*
4) *Retrofitting of structures to minimize collisions.*
5) *Support for avian and bat research and/or management efforts conducted by entities approved by the USFWS and CDFW within the Project's mitigation lands or other approved locations.*
6) *Funding efforts to address avian diseases or depredation due to the expansion of predators in response to anthropomorphic subsidies that may adversely affect birds that use the mitigation lands or other approved locations.*
7) *Contributions to the Migratory Bird Conservation Fund managed by the Migratory Bird Conservation Commission.*

Summary and Conclusion

The western yellow-billed cuckoo, southwestern willow flycatcher, and least Bell's vireo are riparian-nesting species that breed and winter mostly outside of the Colorado Desert. No suitable breeding or wintering habitat for these ESA-listed bird species occurs on or adjacent to the Project site. The nearest suitable habitat for the western yellow-billed cuckoo and southwestern willow flycatcher is located approximately 35 miles west of the Project site along the Colorado River. The nearest suitable habitat for the least Bell's vireo is located approximately 70 miles northwest of the Project site in Big Morongo Canyon. Individuals of these species migrate through the Colorado Desert between breeding or wintering habitat. During migration, these species may fly over the Project vicinity. There remains a potential for these species to occasionally stopover within the Project vicinity.

The Yuma Ridgway's rail nests in freshwater marshes and generally disperse or migrate to a lesser degree than the riparian-nesting ESA-listed species. The nearest suitable habitat for the Yuma Ridgway's rail is located approximately 35 miles from the Project site along the Colorado River and Salton Sea. Records of Yuma Ridgway's rail have been documented at outlying locations from known breeding habitat. This species may fly over or temporarily stopover within the Project vicinity.

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

Overall, the potential for these ESA-listed bird species to occur within the Project vicinity is low. The existence of outlying records and documented dispersal or migration suggest that there is a remote possibility that transient individuals may occasionally occur in the Project vicinity during the 30-year lease period. If they were to occur, the potential effects may include loss of habitat, collision, electrocution, artificial lighting, increased fire risk, degradation of habitat due to invasive weed species, and increased predation threat. These potential effects would be avoided, minimized, or mitigated for through the Project's adopted PSPP MMs, APMs, and BBCS. The Project would involve PV technology and consequently would not include the use of evaporation ponds or netting and would not create solar flux; therefore, the effects associated with these features would not occur.

In conclusion, the Project is not expected to adversely affect populations of ESA-listed bird species with regard to breeding habitat, reproductive capacity, ability to disperse, or migration because occurrences of these species on the Project site are expected to be infrequent, at most, during the 30-year lease period and potential effects to these species would be reduced substantially through the implementation of a comprehensive set of avoidance, minimization, and mitigation measures.

References

Althouse and Meade, Inc. 2014. Topaz Solar Farms 2013 Fourth Quarter/Second Annual Report for Avian and Bat Protection Plan and Bird Monitoring and Avoidance Plan. Prepared for Topaz Solar Farms LLC, Santa Margarita, California. Prepared by Althouse and Meade, Inc., Paso Robles, California. March 2014.

Arizona Game and Fish Department (AZGFD). 2001. Unpublished abstract compiled and edited by the Heritage Data Management System, AZGFD, Phoenix, Arizona. 10 pp. Available online at: http://www.azgfd.gov/pdfs/w_c/hdms/Birds/Rallloyu.fi.pdf

Avian Power Line Interaction Committee. 2012. Reducing avian collisions with power lines: The state of the art in 2012. Edison Electric Institute, Avian Power Line Interaction Committee, and California Energy Commission. Washington, D.C., and Sacramento, California.

Beeler, H. 2015. Personal communication. Electronic mail transmitting the Genesis 2015 avian mortality report. Dated October 14. Eagle Permit Coordinator, Pacific Southwest region, U.S. Fish and Wildlife Service. Sacramento, California.

BirdLife International. 2014. Rallus crepitans. Species Factsheet. BirdLife International, Birdlife Global Office, Cambridge, United Kingdom. Accessed January 22, 2017. Information available online at: http://datazone.birdlife.org/species/factsheet/clapper-rail-rallus-crepitans

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

Bureau of Land Management (BLM). 2015. Desert Renewable Energy Conservation Plan. Proposed land use plan amendment and final environmental impact statement. Dated October. Sacramento, California.

Craig, D., and P.L. Williams. 1998. Willow flycatcher (*Empidonax traillii*). In The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. http://www.prbo.org/calpif/htmldocs/riparian_v-2.html.

California Energy Commission (CEC), California Energy Commission, California Department of Fish and Wildlife, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service. 2014. Draft Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement.

Davis, D. 2015. Personal communication. Dead western yellow-billed cuckoo near the Ivanpah Solar Electric Generating System. Dated April 30. Manager, Environmental, West Region, NRG Energy. Nipton, California.; USFWS 2009b

Dietsch, T. 2015a. Personal communication. Electronic mail regarding identity of the willow flycatcher found along the Beacon transmission line. Dated August 28. Migratory Bird Biologist, US Fish and Wildlife Service. Carlsbad, California.

Dietsch, T. 2015b. Personal communication. Electronic mail regarding willow flycatcher mortality along transmission line. Migratory Bird Biologist, US Fish and Wildlife Service. Carlsbad, California.

eBird. 2016. eBird: An online database of bird distribution and abundance. Ithaca, New York. Available: http://www.eBird.org. Accessed on July 28.

Eddleman, W. R. 1989. Biology of the Yuma Clapper Rail in the Southwestern United States and Northwestern Mexico. Report prepared for the US Bureau of Reclamation. Yuma, Arizona.

EDM International, Inc. 2016. Implementation of the avian monitoring and mitigation plan for the Sunrise Powerlink. Final report. Submitted to San Diego Gas and Electric Company. Fort Collins, Colorado.

Fitzpatrick, L. 2015a. Personal communication. Survey results for the Yuma Ridgway's rail 2006 to 2014. Dated March 15. Arizona Ecological Services, Southwest Region, U.S. Fish and Wildlife Service. Phoenix, Arizona.

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

Fitzpatrick, L. 2015b. Personal communication. Renewable energy facilities in Arizona in relation to the Yuma Ridgway's rail. Dated December 14. Arizona Ecological Services, Southwest Region, U.S. Fish and Wildlife Service. Phoenix, Arizona.

Gehring, J., P. Kerlinger, and A.M. Manville, II. 2009. Communication Towers, Lights, and Birds: Successful Methods of Reducing the Frequency of Avian Collisions. Ecological Applications 19(2): 505-514.

Guigliano, J. 2015. Personal communication. Electronic mail regarding willow flycatcher mortality in vicinity of Beacon transmission line. Dated June 5. AECOM. San Diego, California.

H. T. Harvey and Associates. 2014. California Valley Solar Ranch (CVSR) Project Avian and Bat Protection Plan Annual Postconstruction Fatality Report: 16 August 2012 – 15 August 2013. Project #3326-03. Prepared for HPR II, LLC, California Valley Solar Ranch, Santa Margarita, California. Prepared by H. T. Harvey and Associates, San Luis Obispo, California. March 28, 2014.

Hinojosa-Huerta, O., R. Guzmán-Olachea, J. Butrón-Méndeza, J.J. Butrón-Rodrígueza, and A. Calvo-Fonsecaa. 2013. Status of marsh birds in the wetlands of the Colorado River delta, México. Ecological Engineering 59:7–17.

Huso, M., Dietsch, T., and Nicolai, C. 2016. Mortality monitoring design for utility-scale solar power facilities: U.S. Geological Survey Open-File Report 2016-1087. http://dx.doi.org/10.3133/ofr20161087.

Ironwood Consulting. 2017. Biological Resources Technical Report for the Palen Solar PV Project. Prepared February 7, 2017.

Johnson, T. 2015. Personal communication. Electronic mail regarding mortality monitoring at the Desert Sunlight Solar Project, Riverside County, California. Dated October 7. West, Inc. Laramie, Wyoming.

Kagan, R. A., T. C. Viner, P. W. Trail, and E. O. Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory. Ashland, Oregon. 28 pp.

Kerlinger, P., J. L. Gehring, W. P. Erickson, R. Curry, A. Jain, and J. Guarnaccia. 2010. Night Migrant Fatalities and Obstruction Lighting at Wind Turbines in North America. Wilson Journal of Ornithology 122(4): 744-754.

370 Alabama Street, Suite A
Redlands, CA 92373
(909) 798-0330
www.ironwoodbio.com

Kus, B., S. Howell, R. Pottinger, K. Allen, and M. Madden. 2014. Recent population trends in least Bell's vireos and southwestern willow flycatchers: 2014 Update. San Diego Field Station, Western Ecological Research Center, U.S. Geological Survey. San Diego, California.

Nicolai, C. 2015. Personal communication. Electronic mail regarding mortality of listed migratory birds at renewable energy facilities in Nevada. Dated December 16. Migratory Bird Biologist, U.S. Fish and Wildlife Service. Reno, Nevada.

Poot, H., B. J. Ens, H. de Vries, M. A. H. Donners, M. R. Wernand, and J. M. Marquenie. 2008. Green Light for Nocturnally Migrating Birds. Ecology and Society 13(2): 47.

U.S. Fish and Wildlife Service (USFWS). 1998. Draft recovery plan for the least Bell's vireo (*Vireo bellii pusillus*).

U.S. Fish and Wildlife Service (USFWS). 2002. Final recovery plan, southwestern willow flycatcher (*Empidonax traillii extimus*). Albuquerque, New Mexico.

U.S. Fish and Wildlife Service (USFWS). 2009. Yuma clapper rail (*Rallus longirostris yumanensis*) recovery plan. Draft first revision. Southwest Region. Albuquerque, New Mexico.

U.S. Fish and Wildlife Service (USFWS). 2014a. Southwestern willow flycatcher (*Empidonax traillii extimus*) 5-year review: Summary and evaluation. Dated August 15. Arizona Ecological Services. Phoenix, Arizona.

U.S. Fish and Wildlife Service (USFWS). 2014b. Yuma Clapper Rail (*Rallus longirostris yumanensis*). Species Profile. USFWS Environmental Conservation Online System (ECOS). Updated December 2014. ECOS available at: http://ecos.fws.gov/ecos/indexPublic.do; Yuma clapper rail species profile available online at: http://ecos.fws.gov/ecp0/profile/speciesProfile?sId=3505

U.S. Fish and Wildlife Service (USFWS). 2016. Biological Opinion on the Proposed Land Use Plan Amendment (LUPA) under the Desert Renewable Energy Plan (DRECP).

Walston, L., Jr., K. E. Rollins, K. P. Smith, K. E. LaGory, K. Sinclair, C. Turchi, T. Wendelin, and H. Souder. 2015. A Review of Avian Monitoring and Mitigation Information at Existing Utility-Scale Solar Facilities. Argonne National Laboratory and National Renewable Energy Laboratory, ANL/EVS-15/2, http://www.evs.anl.gov/downloads/ANL-EVS_15-2.pdf

Western EcoSystems Technology, Inc (WEST). 2016a. Post-construction monitoring at the Genesis Solar Energy Project, Riverside County, California. First annual report 2015 – 2016.

Draft. Dated July 1. Prepared for Genesis Solar LLC, Juno Beach, Florida. Cheyenne, Wyoming

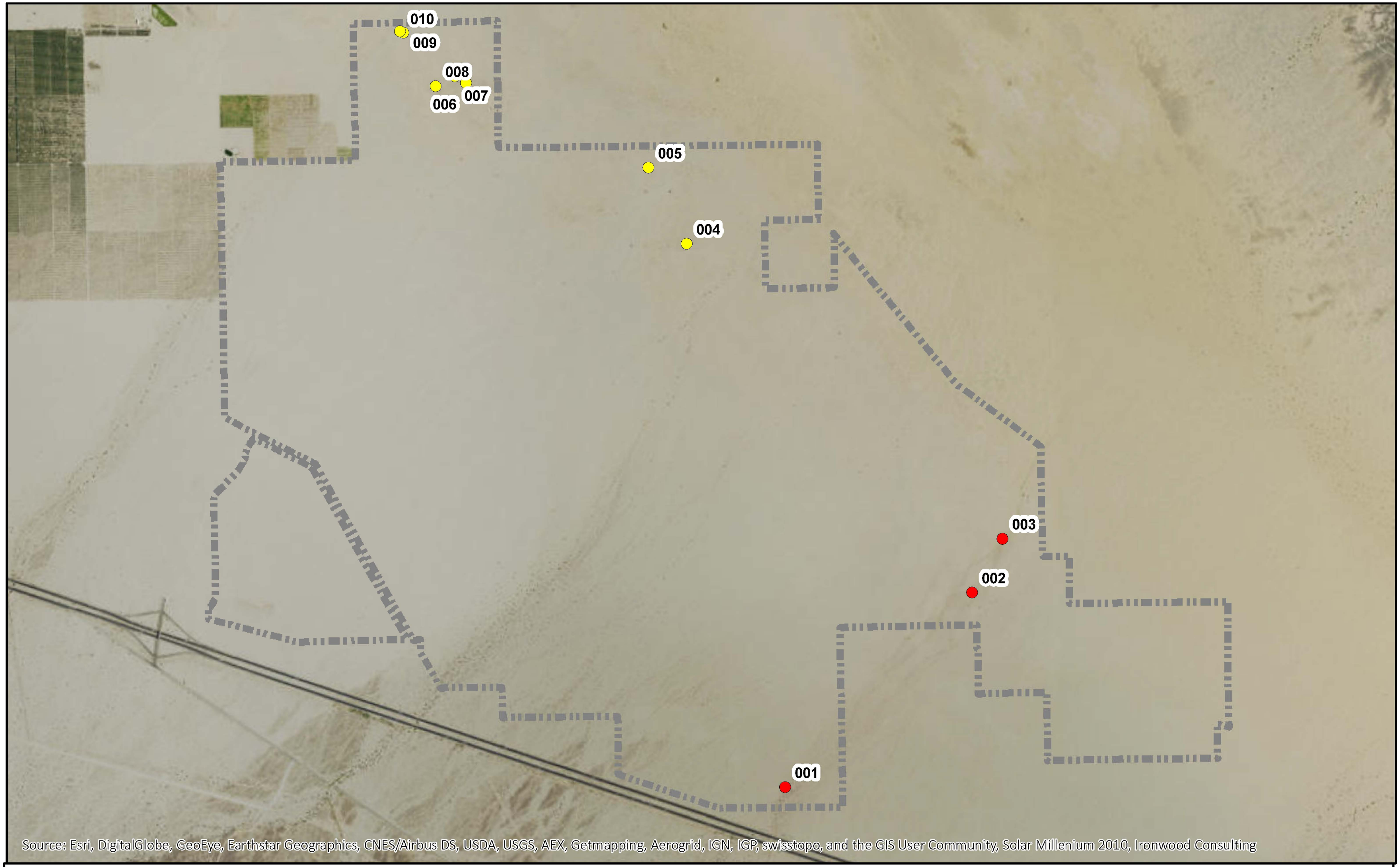
Western EcoSystems Technology, Inc (WEST). 2016b. Post-construction monitoring at the Desert Sunlight Solar Project, Riverside County, California. 2015 - 2016 first annual report. Draft. Dated July 1. Prepared for Desert Sunlight 250, LLC and Desert Sunlight 300, LLC, Juno Beach, Florida. Cheyenne, Wyoming.

Western EcoSystems Technology, Inc (WEST). 2017a. Draft Bird and Bat Conservation Strategy for the Palen Photovoltaic Solar Project (BBCS). January 25, 2017.

Western EcoSystems Technology, Inc (WEST). 2017b. Technical Memorandum: Understanding potential risk, and patterns of avian fatalities from utility-scale photovoltaic solar facilities. Prepared for EDF Renewable Energy. January 23, 2017.

Appendix B-2

Creosote Ring Assessment



Ironwood Consulting

0 500 1,000

Meters

Study Area

Gen-Tie Line

SCE Red Bluff Substation

Potential Creosote Ring

Confirmed Negative

Possible

Palen Solar PV Project

Creosote Ring Assessment

C:\Users\chris\Desktop\WORK\EDF PALEN Maverick\GIS\MXDs\Creosote Rings\Creosote Rings.mxd | 2/3/2017

Appendix B-3

Bird and Bat Conservation Strategy

DRAFT

Bird and Bat Conservation Strategy for the Palen Solar Photovoltaic Project

Prepared for

Palen Solar III, LLC

Prepared by:

Western EcoSystems Technology, Inc.

415 West 17th Street, Suite 200
Cheyenne, Wyoming 82001

August 21, 2017

ACRONYMS AND ABBREVIATIONS

ABPP	Avian and Bat Protection Plan
AGS	Almasol Generating Station
AICc	corrected Akaike Information Criteria
APLIC	Avian Power Line Interaction Committee
APM	Applicant Proposed Measure
BBCS	Bird and Bat Conservation Strategy
BBI	Bloom Biological Inc.
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BUC	Bird Use Count
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
DFA	Development Focus Area
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FG	Fish and Game
GPS	Global Positioning System
km	Kilometer
M	Meter
MBTA	Migratory Bird Treaty Act
MN	Mist Net
MW	megawatts
NEPA	National Environmental Policy Act
PA/FEIS	Plan Amendment/Final EIS
POD	Plan of Development
PSEGS	Palen Solar Electric Generating System
PSH	Palen Solar Holdings
PSPP	Palen Solar Power Project
PV	Photovoltaic
ROD	Record of Decision
ROW	Right of Way
SBC	Small Bird Count
SEIS	Supplemental Environmental Impact Statement
SPUT	Special Purpose Utility Permit
TAG	Technical Advisory Group
USFWS	US Fish and Wildlife Service

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

Palen Solar III, LLC, a wholly owned subsidiary of EDF Renewable Energy (EDF RE), is developing the Palen Solar Photovoltaic Project (Project), which consists of single axis photovoltaic (PV) panel arrays with a net capacity of 500 megawatts (MW). The proposed Project will occupy approximately 4,200 acres (17.0 square kilometers [km^2]) of Bureau of Land Management (BLM) administered land in Riverside County, California (Figure 1). Previously-evaluated projects at the same site include a solar trough thermal energy generating project and a power tower solar thermal energy generating project subject to regulation by the California Energy Commission (CEC).

To monitor and manage Project-related avian and bat injuries and mortalities, the BLM, in consultation with the California Department of Fish and Wildlife (CDFW) and US Fish and Wildlife Service (USFWS), established Conditions of Certification and Mitigation Measure BIO-16 (or SEIS measure WIL-7) that requires the Project to develop a Bird and Bat Conservation Strategy (BBCS), formerly known as an Avian and Bat Protection Plan (ABPP). This BBCS is based on the results of biological resource surveys at the Project and other publicly available information for the area. This BBCS provides a written record of efforts by Palen Solar III to understand potential Project impacts to birds and bats and to document conservation measures that have or will be taken to avoid, minimize, and/or mitigate for those potential impacts.

1.1 Project Background and Description

The location of this Project is the location of the Palen Solar Power Project (PSPP), a solar trough facility, which was licensed by the CEC in 2010, but a Record of Decision (ROD) was never issued by the BLM, and the PSPP was never constructed (CEC 2010; Figure 2).

EDF RE, through its subsidiary Palen Solar III, has applied to amend the ROW Grant application (Case File Number CACA-48810) from the BLM to construct, operate, and decommission a solar PV energy generating facility. The solar facility and generation interconnection line (gen-tie line) are included in the Project, which is proposed to be sited within the previously analyzed PSPP and Palen Solar Electric Generating System (PSEGS) footprints.

The proposed Project will use a single-axis tracking system with PV technologies including, but not limited to, crystalline silicon panels or copper indium gallium selenide panels. The nominal energy output of the Project is proposed to be 500 MW (alternating current). The permanent footprint of the Project will be approximately 4,200 acres, entirely within the footprint of the previously analyzed PSPP. The solar facility site includes the solar arrays, power generating equipment, and support facilities. The linear features include a gen-tie line, distribution line, and a main access road.

The Project will contain all facilities that create a footprint in and around the field of solar panels (solar PV modules), including facilities such as:

- One primary solar field, with two smaller, adjacent solar fields for a total of three solar fields made up of 200 power blocks of electrical generating capacity, including inverters, overhead lines, and access corridors;
- One switchyard;
- One 11 km (7 mile) 220 kilovolt (kV) gen-tie line
- Operations and management facility, potentially off site;
- Other site improvements, such as a temporary laydown area, perimeter and access roads, fencing, water treatment, up to 10 groundwater wells, and lighting;
- Two telecommunications lines (primary and redundant); and
- A main access road from Interstate-10 (I-10)/Corn Springs Road interchange.

.

Figure 1. Location of the Palen Photovoltaic (PV) Solar Project.

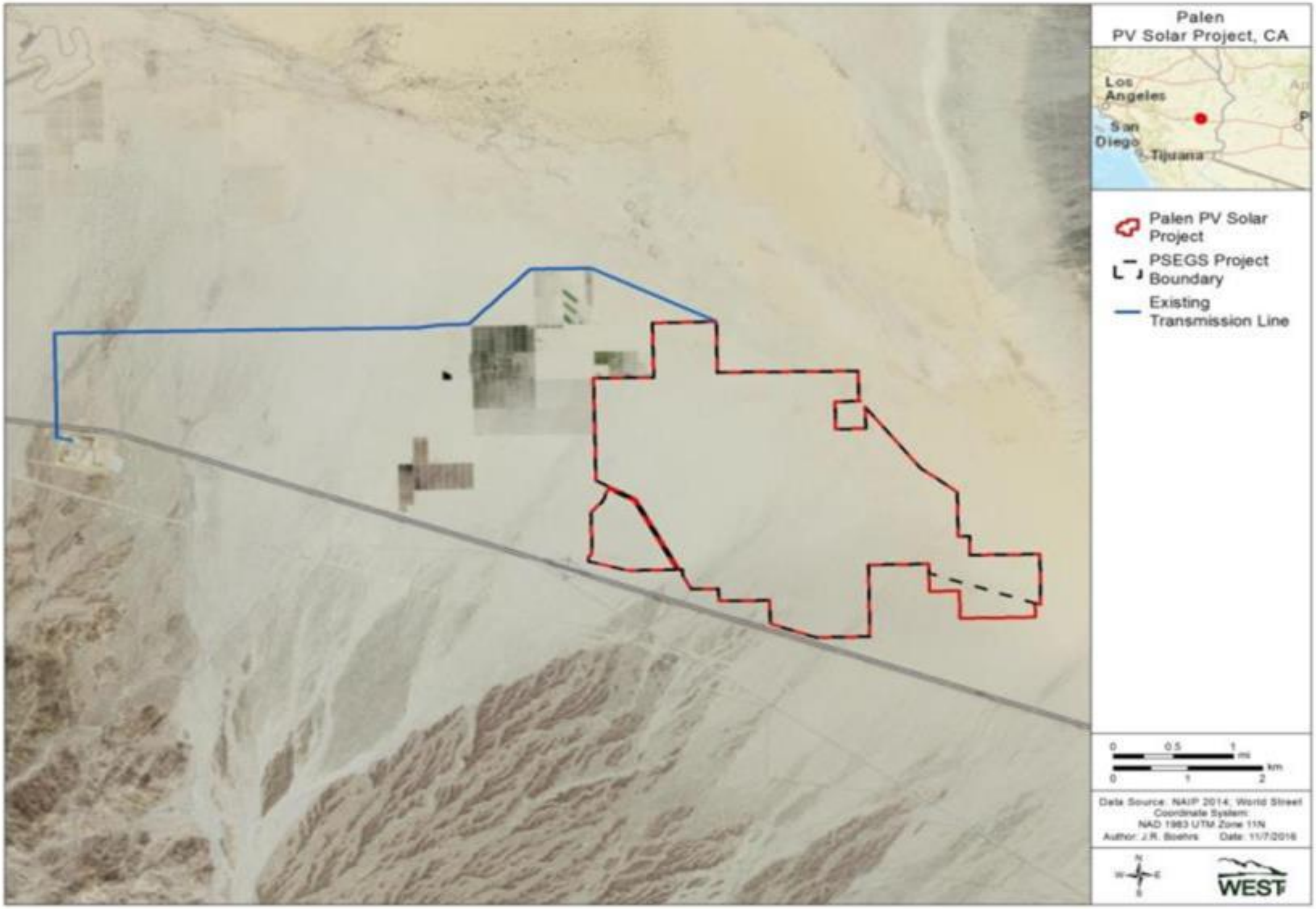


Figure 2. Footprints of the Palen Photovoltaic (PV) Solar Project and the Palen Solar Electric Generating System (PSEGS) Project.

1.2 BBCS Purpose

The USFWS and the CDFW (formerly the California Department of Fish and Game [CDFG]) currently recommend the development of a project-specific BBCS, formerly called an Avian and Bat Protection Plan (ABPP), for certain renewable energy projects that may impact bird and bat resources. This BBCS applies to the Project as currently designed, but will be updated, as needed, in the event that future phases of the project warrant revisions.

The purpose of this BBCS is to:

- Describe baseline conditions for bird and bat species present within the Project site, including results of site-specific surveys;
- Assess potential risk to birds and bats based on the proposed activities
- Specify conservation measures that will be employed to avoid, minimize, and/or mitigate any potential adverse effects to these species;
- Describe the incidental monitoring and reporting that will take place during construction; and
- Provide details for post-construction monitoring; and
- Specify the adaptive management process that will be used to address potential adverse effects on avian and bat species.

1.3 Regulatory Setting

The Project is subject to all relevant federal, state, and local statutes, regulations, and plans as described in the EIS and Commission Decision. The key federal, state, and local agency approvals, reviews, and permitting requirements for avian and bat species are presented in Table 1.

Table 1. Key avian and bat laws, regulations, and authorizations.

Authorization	Agency Authority	Statutory Reference
Federal		
National Environmental Policy Act (NEPA) Compliance to Grant Right-of-Way	Bureau of Land Management (BLM)	NEPA (Public Law [PL] 91-190, 42 United States Code [USC] Sections [§§] 4321−4347, January 1, 1970, as amended by PL 94-52, July 3, 1975, PL 94-83, August 9, 1975, and PL 97-258, §4[b], September 13, 1982)
Endangered Species Act (ESA) Compliance	US Fish and Wildlife Service (USFWS)	Endangered Species Act (PL 93-205, as amended by PL 100-478 [16 USC §§ 1531, et seq.]); 50 Code of Federal Regulations (CFR) 402
Migratory Bird Treaty Act (MBTA)	USFWS	16 USC §§ 703-711; 50 CFR 21 Subchapter B
Bald and Golden Eagle Protection Act (BGEPA)	USFWS	16 USC §§ 668-668(d)

State		
California Endangered Species Act (CESA) of 1984	California Department of Fish and Wildlife (CDFW)	Fish and Game Code (FG Code) §§ 2050-2098
California Fish and Game Code	CDFW	FG Code §§ 3503, 3503.5, 3511,3513, 4150, 4700, 5050, 5515
California Environmental Quality Act (CEQA)	Riverside County	Pub. Resources Code, § 21000 et seq.

Several federal and state laws and regulations, including National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), BLM Sensitive Species (BLM 2010), and California's Fish and Game Code (FG Code), provide the foundation for the development of this BBCS. This document represents a comprehensive plan to meet the requirements of these regulatory mechanisms as they apply to birds and bats in the Project area.

National Environmental Policy Act

Under NEPA (42 United States Code [USC] Sections [§§] 4321-4370h), federal agencies are required to prepare an EIS for any major federal action significantly affecting the quality of the human environment. The environmental impacts of the Project have been addressed by the Plan Amendment/Final EIS (; BLM 2014). This BBCS corresponds to design features for ecological resources specified in previous licensing documents, which are associated with reducing potential impacts to bird and bat species.

Endangered Species Act

Certain species at risk of extinction, including many birds and bats, are protected under the federal ESA of 1973, as amended. The ESA defines and lists species as "endangered" and "threatened" and provides regulatory protection for the listed species. The federal ESA provides a program for conservation and recovery of threatened and endangered species. Section 7(a)(2) directs all federal agencies to insure that any action they authorize, fund, or carry-out does not jeopardize the continued existence of an endangered or threatened species or designated or proposed critical habitat (collectively, referred to as protected resources).

Migratory Bird Treaty Act

The MBTA (16 USC §§ 703, et seq.), passed by the US Congress and signed into law in 1918, makes it unlawful to "pursue, hunt, take, capture or kill; attempt to take capture or kill; possess; offer to or sell, barter, purchase, or deliver; or cause to be shipped, exported, imported, transported, or received any native migratory bird, part, nest, egg, or product." The MBTA, enforced by the USFWS, protects all MBTA-listed migratory birds within the US. In the continental US, native non-covered species generally belong to the Order Galliformes (i.e., game birds). Common non-native species not protected by the MBTA include rock pigeon (*Columba livia*), Eurasian collared-dove (*Streptopelia decaocto*), European starling (*Sturnus vulgaris*), and house sparrow (*Passer domesticus*; USFWS 2005). Although permits may be obtained to collect MBTA-listed birds for scientific purposes or to destroy depredating migratory birds, the MBTA does not provide any permit mechanism authorizing the incidental take of migratory birds in connection with otherwise lawful activities. Nevertheless, federal agencies such as the BLM have been directed to evaluate the effects of its actions on migratory birds, with an emphasis on species of concern (per Executive Order 13186).

Bald and Golden Eagle Protection Act

The BGEPA (16 USC §§ 668-668d) prohibits the take, defined as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb," of any bald eagle (*Haliaeetus leucocephalus*) or golden eagle (*Aquila chrysaetos*). Through recent regulation (50 Code of Federal Regulations [CFR] § 22.26; USFWS 2009a), the USFWS can authorize take of bald and golden eagles when the take is associated with, but not the purpose of, an otherwise lawful activity and cannot practicably be avoided. The USFWS has issued *Eagle Conservation Plan Guidance* (USFWS 2013) for land-based wind energy projects to help project proponents avoid unanticipated take of bald and golden eagles and comply with the BGEPA. Although the guidelines were developed for land- based wind energy projects, certain components of eagle surveys and monitoring are applicable to other renewable energy projects, including PV solar plants, and have been incorporated into this BBCS.

BLM Sensitive Species

The BLM Sensitive Species are species designated by the State Director and includes only those species that are not already federal or state listed, proposed, or candidate species due to potential endangerment. BLM's policy is to "ensure that actions authorized, funded, or carried out do not contribute to the need to list any of these species as threatened or endangered."

California Endangered Species Act

The California Endangered Species Act (CESA; FG Code §§ 2050-2098 protects and preserves species designated by the Fish and Game Commission as either threatened or endangered in the state of California. These protected resources include those native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, that are threatened with extinction, as well as those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation. The CESA also allows for take that is incidental to otherwise lawful development projects.

California Fish and Game Code

FG Code Sections 3503 and 3503.5 (protection of birds and raptors) – These sections state that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird (§

3503) and birds of prey (§ 3503.5), except as otherwise provided by the code or any regulation made pursuant thereto.

FG Code Sections 3511, 4700, 5050, and 5515 (fully protected species) – These state laws classify and prohibit the take of “fully protected” bird, mammal, amphibian/reptile, and fish species in California.

FG Code Section 3513 (migratory birds) – This section prohibits any take or possession of birds that are designated by the MBTA as migratory non-game birds except as allowed by federal rules and regulations promulgated pursuant to the MBTA.

FG Code Sections 4150 (mammals) – This section defines all mammals that naturally occur in California as non-game mammals, with exceptions for those defined as game mammals, fully protected mammals, or fur-bearing mammals. Non-game mammals or parts thereof may not be taken or possessed except as otherwise provided by the code or any regulation made pursuant thereto.

California Environmental Quality Act

Under the California Environmental Quality Act (CEQA) as amended (Public Resources Code [PRC] Section 21000, et seq.), state and local agencies must identify the significant environmental impacts of their actions and avoid or mitigate those impacts, if feasible. The County (Riverside) is the non-federal public agency with the principal responsibility for approving the Project, and as such is the Lead Agency for this project under CEQA.

1.4 Personnel Roles and Responsibilities

Four key roles will be responsible for the implementation of the BBCS, including post construction mortality monitoring: Lead Avian Biologist, Lead Bat Biologist, Avian Biologists, and Biological Monitors. Contingent upon acceptable qualifications, the BLM-approved Designated Biologist(s) may perform these roles and responsibilities.

Lead Avian Biologist

Palen will assign a Lead Avian Biologist to the Project. The Lead Avian Biologist will be responsible for overseeing the implementation of the BBCS and ensuring all monitoring and reporting requirements are met and will be onsite as needed to handle events as they occur. Palen will ensure the Lead Avian Biologist meets the minimum qualifications below and will submit the resume of the proposed Lead Avian Biologist to the BLM and the County for review to confirm that the Lead Avian Biologist meets the minimum qualifications. Palen will also designate an alternate Lead Avian Biologist with the same minimum qualifications as the Lead Avian Biologist, to be reviewed by the BLM. The Lead Avian Biologist and alternate Lead Avian Biologist will have the following minimum qualifications:

- A bachelor's degree in biological sciences, zoology, botany, ecology, or a related field and three years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society;
- At least one year of field experience with avian resources and/or monitoring in the southwest region.

In lieu of the above requirements, the resume shall demonstrate to the satisfaction of the BLM and County that the proposed Lead Avian Biologist and alternate Lead Avian Biologist have the appropriate training and background to implement the BBCS effectively. The Designated Biologist (PSPP MM BIO-1), may also serve as the Lead Avian Biologist or alternate Lead Avian Biologist based on qualifications meeting or exceeding those outlined above. The Applicant will ensure that the Lead Avian Biologist performs the activities specified in the BBCS. The Lead Avian Biologist may be the same as the overall site lead given the individual meets the approval of the BLM and the County.

Avian Biologist

The Applicant may designate qualified Avian Biologists to the Project. Avian Biologists will be responsible for conducting fieldwork pursuant to the conservation measures included in the BBCS that require implementation by a trained avian biologist. Field tasks may include species identification for the post - construction avian fatality surveys. Resumes of all proposed Avian Biologists will be submitted to the BLM and the County for review in consultation with the CDFW and USFWS to confirm that they meet the minimum qualifications. Avian Biologists will have the following minimum qualifications:

- A bachelor's degree in biological sciences, zoology, botany, ecology, or a related field;
- At least one year of field experience with avian research and/or monitoring in the southwest region.

In lieu of the above requirements, the resume shall demonstrate to the satisfaction of the BLM and County that the proposed Avian Biologists have the appropriate training and background to implement the BBCS effectively. The Lead Avian Biologist will ensure that the Avian Biologists perform the activities specified in the BBCS and may assist in the field as needed.

Lead Bat Biologist

The Applicant will assign a Lead Bat Biologist to the Project. The Lead Bat Biologist will be responsible for overseeing the implementation of the portions of the BBCS addressing bat conservation and ensuring all bat-related monitoring and reporting requirements are met. The Applicant will submit the resume of the proposed Lead Bat Biologist to the BLM and the County for review in consultation with the CDFW and USFWS to confirm that the Lead Bat Biologist meets the minimum qualifications. The Lead Avian and Bat Biologist(s) may be the same individual if they possess the proper qualifications. The proposed Bat Lead will have the minimum qualifications:

- A minimum of one year of field experience with bat resources in the southwest region;
- Demonstrate proficiency at current bat survey and monitoring techniques; and
- Possess at least a bachelor's degree in biological sciences, zoology, botany, ecology, or a related field and three years of experience in field biology or current certification of a nationally recognized biological society.

In lieu of the above requirements, the resume shall demonstrate to the satisfaction of the BLM and County that the proposed Lead Bat Biologist has the appropriate training and background to implement the BBCS effectively. The Applicant will ensure that the Lead Bat Biologist performs the activities specified in the BBCS. The Lead Bat Biologist may be the same as the overall site lead given the individual meets the approval of the BLM and the County.

Biological Monitors

The Lead Avian and Bat Biologists may designate general Biological Monitors for the Project, as needed. Biological Monitors will have either proven bird or bat identification experience or an appropriate level of oversight by the Lead Avian and Bat Biologists and/or Avian Biologists. Biological Monitors may include solar facility staff if qualified. As appropriate, the Biological Monitors may also be assigned to record observations of special status avian and bat species on the Project site and vicinity, as well as instances of avian or bat mortality. The Biological Monitors may assist with certain avian-related field tasks, such as responding to incidental mortality observations found during construction and post-construction mortality monitoring.

Biological Monitors will be trained in distance-sampling search methodology, identification and documentation of carcasses, implementation of carcass removal trials, and notification of a rehabilitation center in the event of injured birds or bats. Carcasses will be handled in accordance with stipulations in Special Purpose Utility Permit (SPUT). An avian biologist will evaluate all carcass detections to ensure proper species identification. Accurate identification of rare, special status species will be emphasized during training. All surveyors will take photographs of all avian or bat carcass finds. All data collection will be standardized and the approved Avian Biologist will decide which carcasses to report as survey observations; however, all observations that were not conclusive will be reported.

Training

The trainer, curriculum, and training materials for training of non-biologist personnel in monitoring methods will be approved by the BLM and County and will be conducted by the approved Lead Avian and/or Biologist(s), or Avian Biologist(s) under the supervision of the Lead Avian and/or Biologist(s), prior to initiation of the study. Components of the training program will include:

- A classroom-based portion with lecture and handout materials, and photographic or specimen-based (if available) species identification;
- A field-based portion that allows trainees the opportunity to practice and receive feedback on conducting carcass searches and trials, identification of species, completing data forms, and following protocols for assessing and assisting injured birds and bats;
- Assessment of learning outcomes for each participant; and
- A training log to be updated with each trainee's name and contact information upon successful completion of the course. All reference material will be maintained and provided to the agencies in the event that there are questions about species identification.

2.0 PRE-CONSTRUCTION CONSERVATION MEASURES

2.1 Environmental Setting

The Project site is located within the Chuckwalla Valley and is bordered by the Chuckwalla Mountains to the south, the Coxcomb Mountains to the north, and by the Palen Mountains to the northeast (Figure 1). The Palen Dry Lake lies immediately to the north of the site. The topography of the Project is generally flat with no significant terrain features. Elevations within the site range from approximately 134 meters (m; 440 feet [ft]) above mean sea level in the northeast of the site to approximately 207 m (680 ft) in the southwest. According to vegetation mapping conducted for the site by EDAW AECOM (EDAW AECOM 2009a), the dominant vegetative cover type within the Project footprint is Sonoran Creosote Scrub (Figure 3). Several dry desert washes with sparse to moderately dense areas of Desert Dry Wash Woodland are present within and adjacent to the Project (Figure 3). Immediately adjacent to the northwest boundary of the Project is a privately-owned date palm plantation, approximately 530 acres (215 hectares [ha]) in size. Within the privately-owned lands to the northwest of the site are three agricultural ponds, each less than 2.5 acres (1.0 ha) in size.

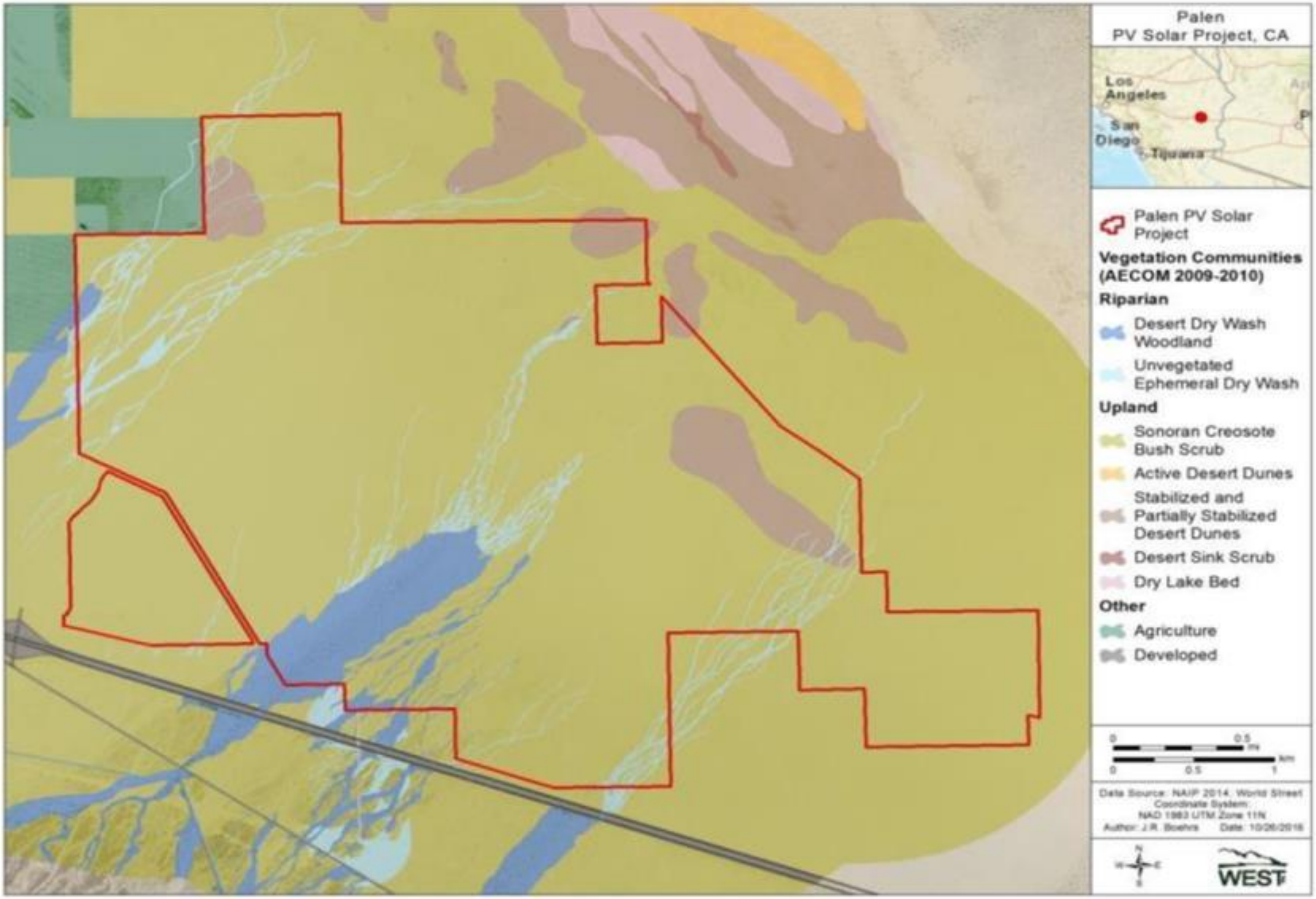


Figure 3. Vegetative cover types of the Palen Photovoltaic (PV) Solar Project

2.2 Special Status Species

A total of 16 special status bat species and 40 special status bird species were evaluated for the potential to occur at the Project or in the vicinity (Ironwood 2016). Species are listed in Table 2 with state, federal, and Western Bat Working Group (WBWG; bats only) special status designations, and the assessment of potential to occur on the project site.

Table 2. Special status bird and bat species with potential to occur at or in the vicinity of the Project

Species	Status[1]			Potential to Occur on Project Site[2]
	State	Federal	WBWG	
BATS				
Pallid bat *Antrozous pallidus*	SSC	BLMS	H	Foraging - Moderate Roosting - Low
Townsend's big-eared bat *Corynorhinus townsendii*	SSC	BLMS	H	Foraging - Moderate Roosting - Low
Big brown bat *Eptesicus fuscus*	-	-	L	Low
Spotted bat *Euderma maculatum*	SSC	BLMS	H	Low
Western mastiff bat *Eumops perotis*	SSC	BLMS	H	Low
Hoary bat *Lasiurus cinereus*	-	-	M	Foraging - Moderate Roosting - Low
Western yellow bat *Lasiurus xanthinus*	SSC	-	H	Moderate
California leaf-nosed bat *Macrotus californicus*	SSC	BLMS	H	Low
California myotis *Myotis californicus*	-	-	L	Foraging - Moderate Roosting - Low
Arizona myotis *Myotis occultus*	SSC	-	-	Low
Cave myotis *Myotis velifer*	SSC	BLMS	M	Low
Yuma myotis *Myotis yumanensis*	-	BLMS	LM	Low
Pocketed free-tailed bat *Nyctinomops femorosaccus*	SSC	-	M	Low
Big free-tailed bat *Nyctinomops macrotis*	SSC	-	MH	Foraging - Moderate Roosting - Low
Canyon bat *Parastrellus hesperus*	-	-	L	Foraging - Moderate Roosting - Low
Mexican free-tailed bat *Tadarida brasiliensis*	-	-	L	Foraging - Moderate Roosting - Low
Birds				
Golden eagle *Aquila chrysaetos*	CFP, WL	BCC, BLMS	-	Nesting/Wintering - Absent Foraging - Low

Table 2. Special status bird and bat species with potential to occur at or in the vicinity of the Project

Species	Status[1]			Potential to Occur on Project Site[2]
Short-eared owl *Asio flammeus*	SSC	-	-	Low
Western burrowing owl *Athene cunicularia hypugaea*	SSC	BCC, BLMS	-	High
Redhead *Aythya americana*	SSC	-	-	Low
Ferruginous hawk *Buteo regalis*	WL	BCC	-	Moderate
Swainson's hawk *Buteo swainsoni*	ST	BCC	-	Nesting - Low Migration - High
Costa's hummingbird *Calypte costae*	-	BCC	-	Moderate
Vaux's swift *Chaetura vauxi*	SSC	-	-	Nesting - Low Migration - High
Mountain plover *Charadrius montanus*	SSC	BCC, BLMS	-	Nesting - Low Migration - Moderate
Black tern *Chlidonias niger*	SSC	-	-	Low
Northern harrier *Circus cyaneus*	SSC	-	-	Nesting - Low Wintering/Migration - High
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	SE	FT, BCC, BLMS	-	Low
Gilded flicker *Colaptes chrysoides*	SE	BCC, BLMS	-	Low
Black swift *Cypseloides niger*	SSC	BCC	-	Low
Willow flycatcher *Empidonax traillii*	SE	-	-	Low
Southwestern willow flycatcher *E. t. extimus*	SE	FE	-	Low
California horned lark *Eremophila alpestris actia*	WL	-	-	High
Prairie falcon *Falco mexicanus*	WL	BCC	-	Nesting - Low Foraging - High
American peregrine falcon *Falco peregrinus anatum*	CFP	BCC	-	Nesting - Low Foraging - Moderate
Sandhill crane *Grus canadensis*	SSC	-	-	Nesting - Low Migration - Moderate
Yellow-breasted chat *Icteria virens*	SSC	-	-	Low
Loggerhead shrike *Lanius ludovicianus*	SSC	BCC	-	High
Gila woodpecker *Melanerpes uropygialis*	SE	BCC, BLMS	-	Low
Elf owl *Micrathene whitneyi*	SE	BCC, BLMS	-	Low
Long-billed curlew *Numenius americanus*	WL	BCC	-	Nesting - Low Migration - Moderate

Table 2. Special status bird and bat species with potential to occur at or in the vicinity of the Project

Species	Status[1]			Potential to Occur on Project Site[2]
Lucy's warbler *Oreothlypis luciae*	SSC	BCC, BLMS	-	Moderate
American white pelican *Pelecanus erythrorhynchos*	SSC	-	-	Nesting/Wintering - Low Migration - Moderate
Black-tailed gnatcatcher *Polioptila melanura*	WL	-	-	High
Vesper sparrow *Pooecetes gramineus*	SSC	-	-	Low
Purple martin *Progne subis*	SSC	-	-	Low
Vermilion flycatcher *Pyrocephalus rubinus*	SSC	-	-	Low
Ridgway's clapper rail *Rallus obsoletus yumanensis*	ST, CFP	FE	-	Low
Bank swallow *Riparia riparia*	ST	BLMS	-	Nesting/Wintering - Low Migration - Moderate
Sonora Yellow warbler *Setophaga petechia sonorana*	SSC	BCC	-	Nesting - Low Migration - Moderate
Lawrence's goldfinch *Spinus lawrencei*	-	BCC	-	Low
Bendire's thrasher *Toxostoma bendirei*	SSC	BCC, BLMS	-	Low
Crissal thrasher *Toxostoma crissale*	SSC	-	-	Low
Le Conte's thrasher *Toxostoma lecontei*	SSC	-	-	High
Arizona Bell's vireo *Vireo bellii arizonae*	SE	BCC, BLMS	-	Low
Least Bell's vireo *V. b. pusillus*	SE	FE		
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	SSC	-	-	Low

Table 2. Special status bird and bat species with potential to occur at or in the vicinity of the Project

Species	Status[1]	Potential to Occur on Project Site[2]

[1] Status

Federal FE = Federally listed endangered: species in danger of extinction throughout a significant portion of its range

FT = Federally listed, threatened: species likely to become endangered within the foreseeable future

FCT = Proposed for federal listing as a threatened species

BCC = Fish and Wildlife Service: Birds of Conservation Concern

State SSC = State Species of Special Concern

CFP = California Fully Protected

SE = State listed as endangered

ST = State listed as threatened

WL = State watch list

CPF = California Protected Furbearing Mammal

CPGS = California Protected Game Species

Bureau of Land Management

BLMS = BLM Sensitive

Western Bat Working Group (WBWG)

H = are imperiled or are at high risk of imperilment

M = warrant closer evaluation, more research, and conservation actions

L = most of the existing data support stable populations

[2] Species not detected during previous surveys may have the potential to occur on the Project site in the future.

2.3 Pre-project Surveying Data

In response to concerns about impacts to wildlife resulting from the development of the Project, a variety of field studies and literature reviews were conducted. In 2009-2010, EDAW AECOM conducted baseline avian and bat studies in support of the original PSPP (EDAW AECOM , 2009a, 2009b; EDAW AECOM and Bloom Biological Inc. [BBI] 2009), which was licensed by the CEC in 2010. In the spring of 2013, baseline studies were initiated for the PSEGS project and its subsequent modifications. These studies were multiple types of avian use surveys, including bird use surveys focused on raptors and vultures, shorebirds/waterfowl surveys at agricultural ponds in the Project vicinity, small bird count surveys, radar surveys to document passage of nocturnal migrants, and mist nest surveys. Surveys for bats included both acoustic surveys and surveys for roosting habitat. Surveys completed at the Project are listed in Table 3 and a brief summary of results are included in the sections below. For a description of the study methods, see Appendix A: Summary of Study Methods for Pre-project Surveys.

Table 3. Pre-construction field survey efforts.

Study	Taxa	Survey Dates	Survey Effort
Bird Use Count Surveys			
BBI 2013a BBI 2013b Western EcoSystems Technology Inc. (WEST). (Levenstein et al. 2014a,b) (Levenstein et al. 2015)	Large birds including Raptors, Vultures	April 8– May 4, 2013 May 5 – June 1, 2013 August 20 – December 13, 2013 March 24 – June 05, 2014 March 09 – June 05, 2015	8 hrs/survey 6 stations; 762 hrs 6 stations; 192 hrs 6 stations; 3,220 hrs 2 stations; 666 hrs 2 stations; 785 hrs
Small Bird Count Surveys			
EDAW and BBI 2009 BBI 2013a BBI 2013b WEST (Levenstein et al. 2014a,b) (Levenstein et al. 2015)	Small birds	April 12 – May 8, 2009 April 8 – May 4, 2013 May 5 – June 29, 2013 August 19 – November 14, 2013 March 24 – June 05, 2014 March 16 – June 05, 2015	10 min/survey 48 stations; 1,920 min 120 stations; 4,790 min 186 stations; 12,960 min 150 stations; 19,390 min 72 stations; 7,870 min 64 stations; 7,000 min
Mist Net Surveys			
BBI 2013a BBI 2013b WEST (Levenstein et al. 2014a)	Small birds	April 11 – May 4, 2013 May 9 – June 14, 2013 September 18 – October 30, 2013	12, 12x2.6m nets/survey 502.7 mist net hours 1,322.4 mist net hours 1,080 mist net hours
Gila Woodpecker Surveys			
BBI 2013b	Gila woodpecker	April 8 – May 4, 2013 May 5 – June 29, 2013	Concurrent with SBCs 120 stations; 4,790 min 186 stations; 12,960 min
Elf Owl Surveys			
BBI 2013b	Elf owl	May 18 – June 15, 2013	143 callback stations 63 listening stations 10 – 14 min/station
Habitat Evaluation for Elf Owl and Gila Woodpecker			
BBI 2013b	Gila woodpecker and elf owl	July 2 – July 19, 2013	29, 50-meter radius Habitat Suitability stations
Golden Eagle Nest Surveys			

Table 3. Pre-construction field survey efforts.

Study	Taxa	Survey Dates	Survey Effort
BBI 2013c		March 20 – April 15, 2013; May 24 – August 3,2013	Surveys by air and ground as per USFWS Guidelines
WEST (Hallingstad 2014)	Golden eagles	April 08 – 12, July 01—03, 2014	Surveys by air and ground as per USFWS Guidelines;
WEST (Levenstein et al. 2015)		March 10 – 19, 2015	Surveys by ground as per USFWS guidelines
Golden Eagle Prey Abundance Surveys			
BBI 2013d	Lagomorphs	April 8 – May 4, 2013 May 5 – June 29, 2013	Concurrent with SBCs 579.69 km of transects 120 stations 186 stations
Golden Eagle Camera Trap and Visual Surveys			
BBI 2013d	Golden eagles	January 23 – February 27, 2013	Camera trap surveys at bait stations and surveys by ground
Burrowing Owl Surveys			
EDAW AECOM 2009b	Burrowing owls	March 10 – June 14, 2009	Per CBOC 1993 Protocol Guidelines and concurrent with desert tortoise survey
Karl 2013		April 7 – June 26, 2013	Per CDFG 2012 Protocol Guidelines
Agricultural Pond Surveys			
WEST (Levenstein et al. 2014a,b)	Shorebirds/ waterbirds/ waterfowl	August 19 – December 10, 2013 March 27 – June 02, 2014	3 stations; 139 hrs 3 stations; 88 hrs
(Levenstein et al. 2015)		March 13 – June 03, 2015	1 station; 96 hrs
Nocturnal Radar Surveys			
WEST (Levenstein and Nations 2014)	Nocturnal migrants	August 19 – October 31, 2013 March – June 2014	1, 3 km radius station 600 hours
Acoustic Bat Surveys			
Brown and Rainey 2013, 2014	Bats	May 11 – 14, 2013	12 survey locations in spring 2013; 989 bat call minutes
		October 7 – December 14, 2013	4 stations in fall/winter 2013; 11,638 bat call minutes

Table 3. Pre-construction field survey efforts.

Study	Taxa	Survey Dates	Survey Effort
Bat Roost Surveys			
EDAW AECOM 2009a Karl 2013	Bats	March 2009 May 11 – 14, 2013 October 7 – December 14, 2013	Targeted visual surveys Analysis of acoustic information to determine potential presence of species with various roosting habits

2.3.1 Bird Use Count Surveys

2.3.1.1 Results

Spring 2013

During the spring of 2013 (April 8 – May 4), a total of 96 BUC surveys were conducted. During this time, 4,399 bird observations were recorded, and 58 unique bird species were identified. Turkey vulture (*Cathartes aura*; 1,701 observations) was the most abundant species observed, accounting for 38.7% of overall observations. A total of 2,734 focal bird (all raptors and other birds larger than an American crow [*Corvus brachyrhynchos*]) observations, representing 14 unique species, were recorded, accounting for 62.2% of overall bird observations. Among the bird types that associate with water, waterbirds (27 observations) and shorebirds (four observations) accounted for less than 0.01% of the observations.

Summer 2013

During the summer of 2013 (May 5 – June 1), a total of 24 BUC surveys were conducted. During this time, 2,492 bird observations were recorded, and 52 unique bird species were identified. Horned lark (*Eremophila alpestris*; 424 observations) was the most abundant species observed, accounting for 17.0% of overall observations. A total of 837 focal bird (all raptors and other birds larger than an American crow) observations, representing eight unique species, were recorded, accounting for 33.6% of overall bird observations. The most commonly observed focal species was turkey vulture (382 observations). Among the bird types that associate with water, waterbirds (two observations) accounted for less than 0.01% of the observations.

Fall 2013

During the fall (August 20 – December 13, 2013) a total of 414 BUC surveys were conducted. During this time, 114,572 bird observations in 4,808 separate groups were recorded, and 75 unique bird species were identified. Turkey vulture (106,379 observations in 1,959 separate groups) was the most abundant species observed, accounting for 92.8% of overall observations. A total of 1,587 individual diurnal raptor observations, representing 14 unique species, were recorded, accounting for 1.4% of overall bird observations. Among the bird types that associate with water, waterbirds accounted for

1.0%, waterfowl accounted for 0.8% shorebirds accounted for 0.4%, and gulls/terns accounted for 0.4% of total observations. See Appendix B for additional details.

Spring 2014

During the spring (March 24 – June 05, 2014) a total of 86 surveys were conducted. During this time, 1,268 bird observations in 545 groups were recorded, and 19 unique bird species were identified. Turkey vulture (694 observations in 271 separate groups) was the most abundant species observed, accounting for 54.7% of overall observations. A total of 157 individual diurnal raptor observations, representing four unique species, were recorded, accounting for 12.3% of overall bird observations. Among the bird types that associate with water, waterbirds accounted for 1.0%, shorebirds accounted for 0.2%, and gulls/terns accounted for 0.2% of total observations; there were no waterfowl observed. See Appendix B for additional details.

Spring 2015

During the spring (March 09 – June 05, 2015) a total of 98 surveys were conducted. During this time, 2,073 bird observations in 545 groups were recorded, and 12 unique bird species were identified. Turkey vulture (1,924 observations in 413 separate groups) was the most abundant species observed, accounting for 92.8% of overall observations. A total of 128 individual diurnal raptor observations, representing seven unique species, were recorded, accounting for 6.2% of overall bird observations during BUC surveys. There were no water- associated bird observations during the spring 2015 BUC surveys. See Appendix E for additional details.

2.3.1.2 Conclusions

The majority of the Project site supports desert scrub vegetation and does not contain the appropriate topography (e.g., ridgelines) known to be used, and in some cases funnel, certain species of medium to large migrating birds (e.g., raptors) through the Project area. The site also lacks other features such as water bodies and large stands of mature trees known to attract certain migrating species (e.g., waterbirds, shorebirds, forest birds, etc.). There are small agricultural ponds (1 mile; 1.6 km) and a small lake (Lake Tamarisk) associated with a golf course nearby (10 miles; 16 km), but the closest major water body is the Salton Sea, which is 34 miles (55 km) southwest of the site, and the irrigated agriculture fields near Blythe, which are approximately 30 miles (48 km) to the southeast. The results of BUC/migration counts by BBI and WEST did not indicate that concentrations of migratory movements of diurnally migrating raptor and water-associated bird species occurred during the study periods; however, there was a relatively substantial movement of turkey vultures through the area during the fall of 2013 and, to a lesser extent, during the spring of 2015. Inferences about the abundance or frequency of nocturnal migrants passing over the Project area cannot be made via the BUC/migration surveys.

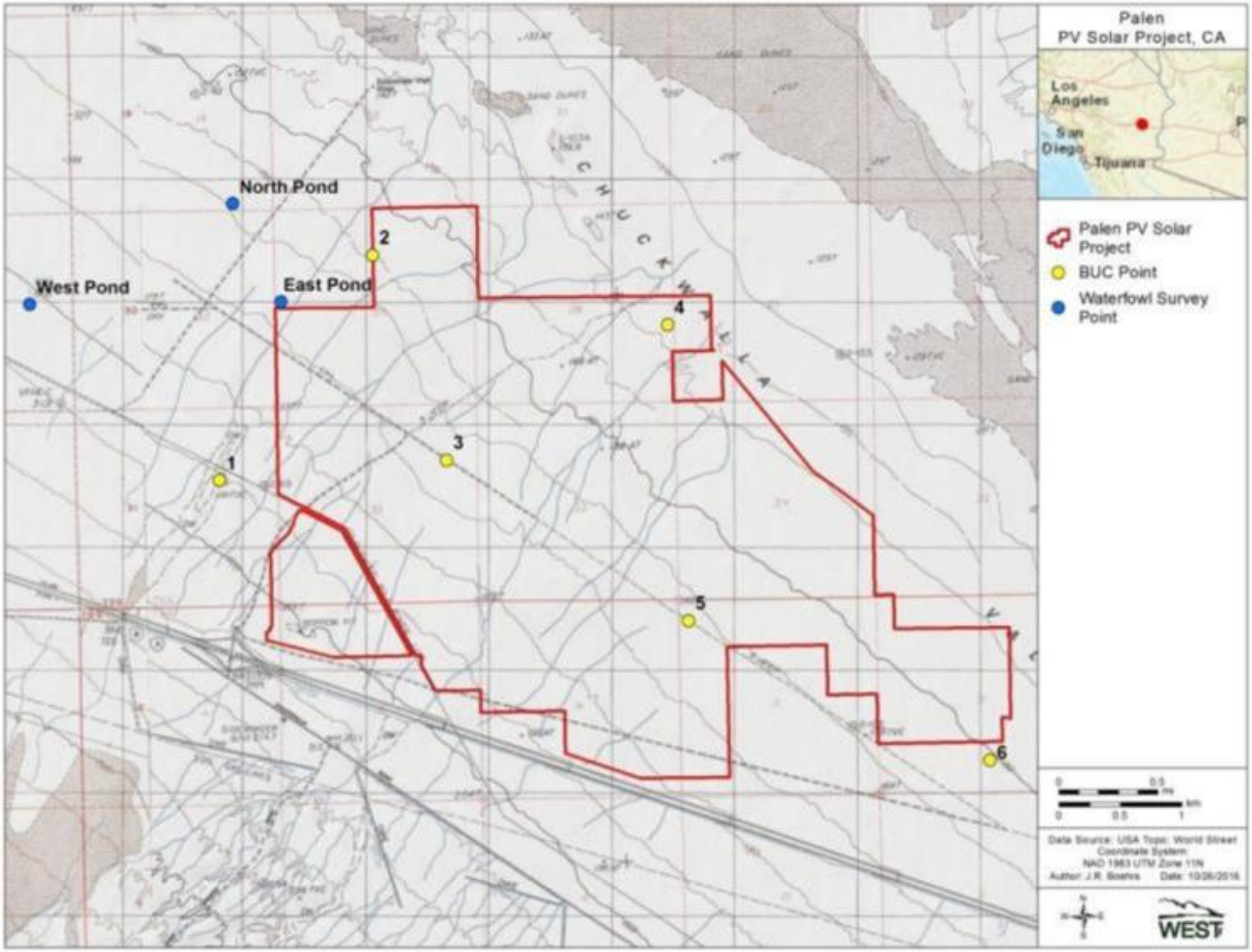


Figure 4. Location of bird use count (BUC) survey points and shorebird/waterfowl survey points at the Palen Photovoltaic (PV) Solar Project.

2.3.2 Small Bird Count Surveys

2.3.1.2 Results

Spring 2009

Thirteen species of resident breeding birds were recorded at the Project site during weekly SBC surveys conducted between April 12 and May 8. The most abundant resident species observed was horned lark, which composed 77% of all individuals recorded during SBCs. All other species recorded composed less than 6% of total observations individually. Vegetation communities with a desert dry wash woodland component had the highest resident species richness with nine species, followed by creosote bush (*Larrea tridentata*), scrub with six species. As expected, desert dry wash woodland communities had the highest number of resident species detected per station (2.63 species/station) when compared to the other vegetation communities (i.e., creosote bush scrub, dunes, dry lake bed, and disturbed communities), which averaged 1.33 species/station.

Thirteen species of migratory nonresident birds were identified within or flying over the survey plots during SBCs. Of these, swallows were the most numerous, with 12 observations of three species recorded: tree swallow (Tachycineta bicolor), barn swallow (Hirundo rustica), and cliff swallow (Petrochelidon pyrrhonota). The latter two species are likely breeding in the vicinity of the proposed Project vicinity; however, no suitable nesting habitat for either is found within the site. These were followed by warblers with 11 observations of four species: orange-crowned warbler (Vermivora celata), Wilson’s warbler (Wilsonia pusilla), hermit warbler (Dendroica occidentalis), and yellow-rumped warbler (D. coronata). As expected, desert dry wash woodland communities had the highest number of nonresident species detected per station (2.25 species/station) when compared to the other habitat types (creosote bush scrub and dune), which averaged 0.91 species/station.

Spring 2013

During the spring 2013, 479 10-min SBC surveys were conducted. A total of 1,982 bird observations were recorded and 73 unique species were observed. Cumulatively, five species (6.8% of all species) comprised 50.3% of the individual observations: turkey vulture (308 observations; most seen outside of the 100-m viewshed), horned lark (40 observations), cliff swallow (205 observations), verdin (*Auriparus flaviceps*; 137 observations), and loggerhead shrike (*Lanius ludovicianus*; 106 observations). All other species composed less than 5% of the observations individually. Avian use at stations in dry wash woodland was generally higher than at stations in other habitat types within the project boundary; overall use was highest outside of the project boundary (see exhibit 4 in BBI 2013a).

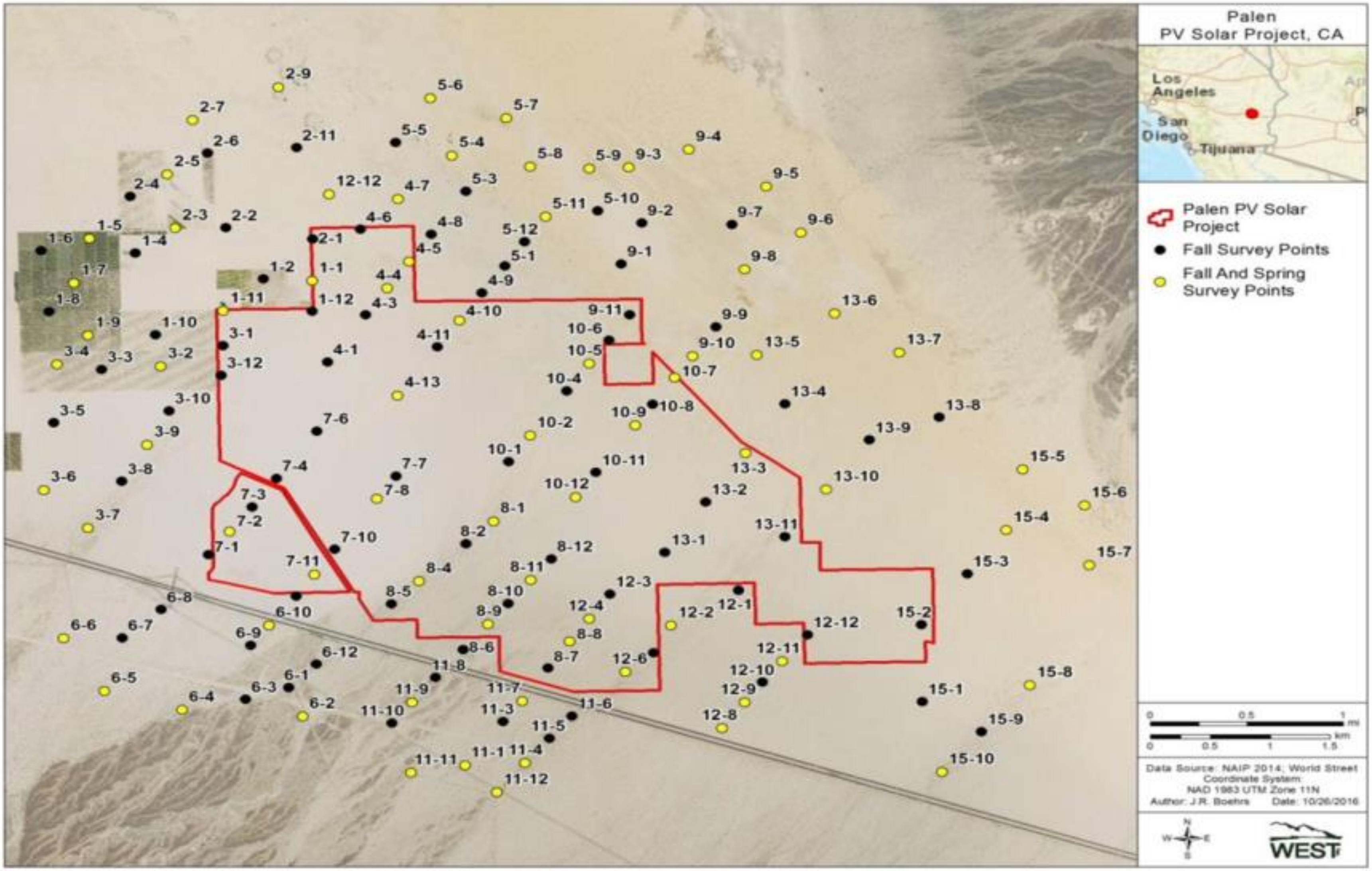


Figure 5. Locations of fall 2013 and spring 2014 small bird count (SBC) survey points at the Palen Photovoltaic (PV) Solar Project. Note: all 150 points pictured above were surveyed during fall 2013, while only 120 of the points were surveyed in early spring 2013, 186 points (36 additional points not depicted above) were surveyed during summer 2013, and only 72 points (yellow, above) were surveyed in spring 2014.

Summer 2013

During the summer 2013, 1,296 10-min SBC surveys were conducted. A total of 6,837 bird observations were recorded and 78 unique species were observed. Cumulatively, six species (7.7% of all species) composed 64.9% of the individual observations: horned lark (1,463 observations), turkey vulture (1,242 observations; most seen outside of the 100-m viewshed), common raven (*Corvus corax*; 584 observations), verdin (424 observations), house finch (*Haemorhous mexicanus*; 365 observations), and loggerhead shrike (358 observations). All other species composed less than 5% of the observations individually. Avian use at stations in dry wash woodland was generally higher than at stations in other habitat types within the project boundary; overall use was highest outside of the project boundary (see exhibit 5 in BBI 2013b).

Fall 2013

During the fall 2013, 1,939 10-min SBC surveys were conducted. A total of 10,072 bird observations within 3,100 separate groups were recorded and 122 unique species were observed. Cumulatively, five species (4.1% of all species) composed 69.6% of the individual observations: horned lark (2,541 observations), turkey vulture (1,877 observations; most seen outside of the 100-m viewshed), house finch (1,098 observations), common raven (1,002 observations), and yellow-rumped warbler (496 observations). All other species composed less than 4% of the observations individually. The highest use by birds overall occurred at points north/northwest of the Project boundary (which coincides with an agricultural area with water features) and the area northeast of the Project boundary in the dry lake bed and stabilized desert dunes. Overall use per station was low (1.5-3.1 birds/station-survey) at points in dry wash woodland habitat, and comparable to stations in other types of habitat within the Project. Overall use was highest outside of the Project (Figure 6a). See Appendix D for additional details.

Spring 2014

During the spring of 2014, 787 10-min SBC surveys were conducted. A total of 2,147 bird observations within 991 separate groups were recorded and 66 unique species were observed. Cumulatively, the top five identifiable species (7.6% of all species) composed 35.4% of the individual observations: horned lark (204 observations), common raven (150 observations), turkey vulture (148 observations), cliff swallow (138 observations), and tree swallow (120 observations). All other species composed less than 5% of the observations individually. Spring 2014 was generally consistent with fall 2013 in that the highest use by birds, overall, was at points north/northwest of the Project boundary (which coincides with an agricultural area with water features) and the area northeast of the Project boundary in the dry lake bed and stabilized desert dunes (see Figure 6a). Overall use per station was low (0.0-3.0 birds/station-survey) at points in dry wash woodland habitat, and comparable to stations in other types of habitat within the Project. Overall use was highest outside of the Project (Figure 6b). See Appendix D for additional details.

Spring 2015

During the spring of 2015, 700 10-min SBC surveys were conducted. A total of 797 bird observations within 492 separate groups were recorded and 45 unique species were observed. Cumulatively, the top five identifiable species (11.1% of all species) composed 49.2% of the individual observations: verdin (121 observations), house finch (79 observations), horned lark (71 observations), barn swallow (66 observations), and tree swallow (54 observations). All other species composed less than 6% of the observations individually. Spring 2015 was generally consistent with fall 2013 and spring 2014 surveys, where the highest use by birds, overall, was at points north/northwest of the Project boundary (which coincides with an agricultural area with water features); and mean avian use at stations in dry wash woodland habitat was generally higher (0.73-3.18 birds/station-survey) than use at stations in other habitat types within the Project boundary (see Figure 6c). See Appendix G for additional details.

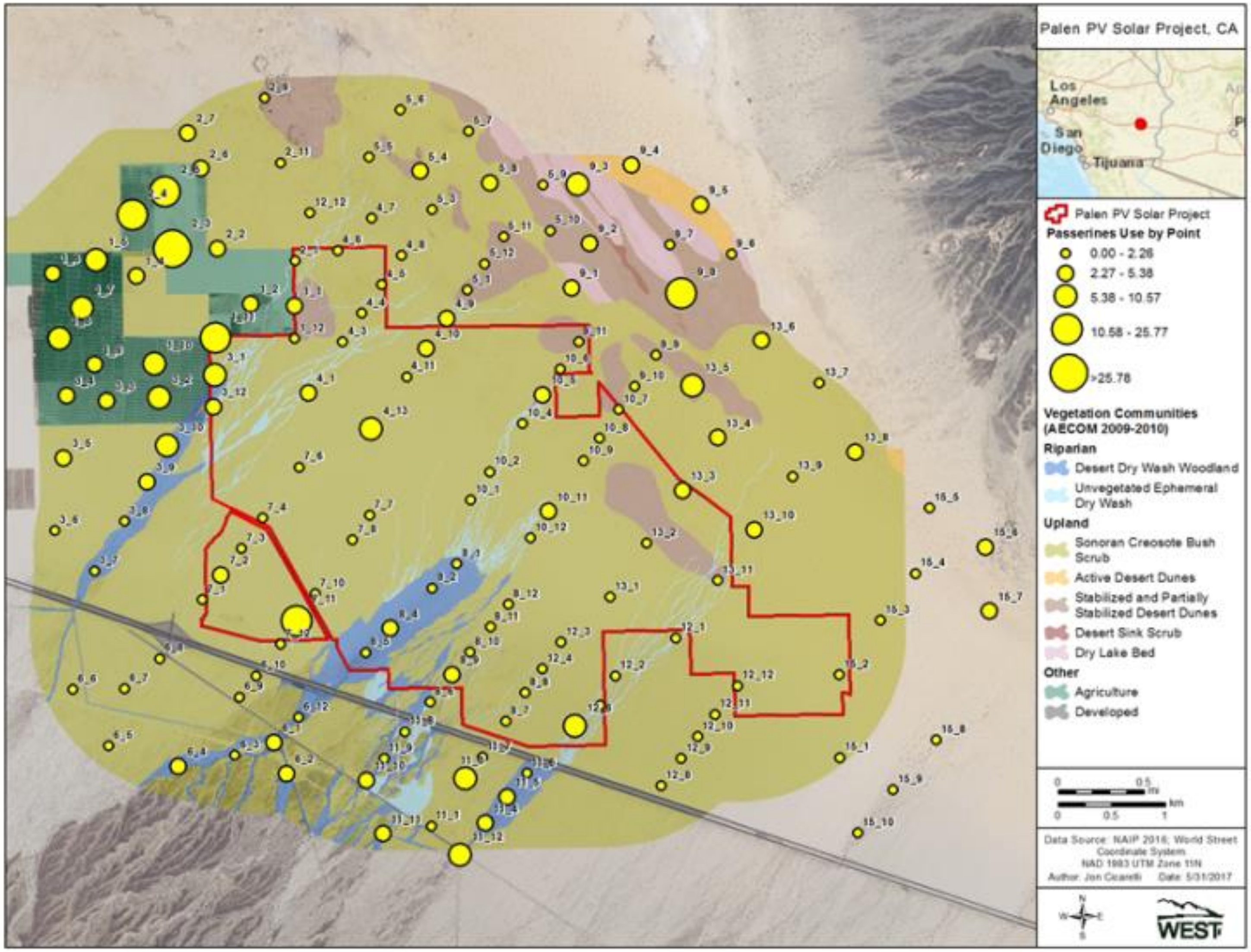


Figure 6a. Bubble plots of overall passerine use (number of birds/observer-hour/survey) by point during small bird count (SBC) surveys at the Palen Photovoltaic (PV) Solar Project, fall 2013.

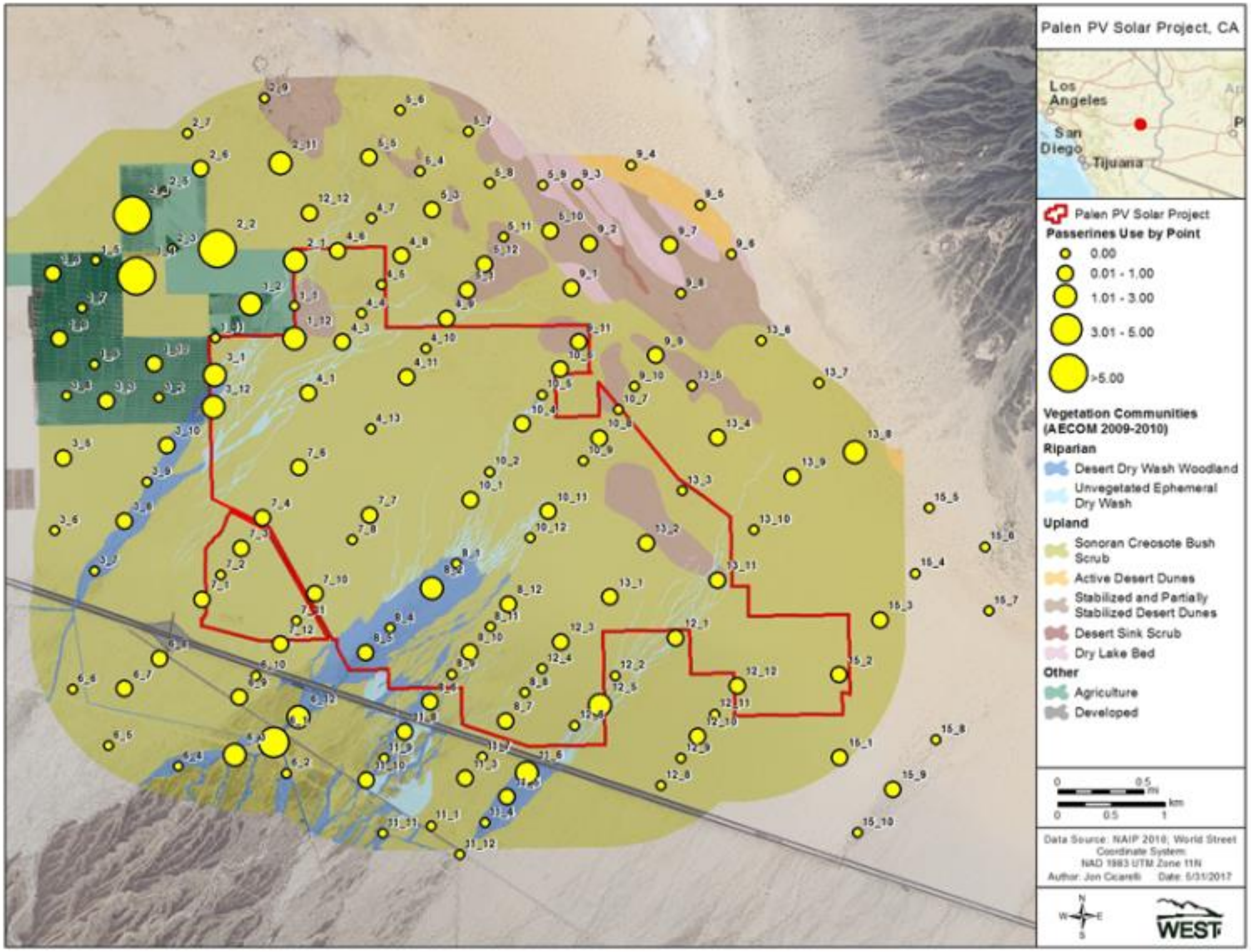


Figure 6b. Bubble plots of overall passerine use (number of birds/observed hour/survey) by point during small bird count (SBC) surveys at the Palen Photovoltaic (PV) Solar Project spring 2014

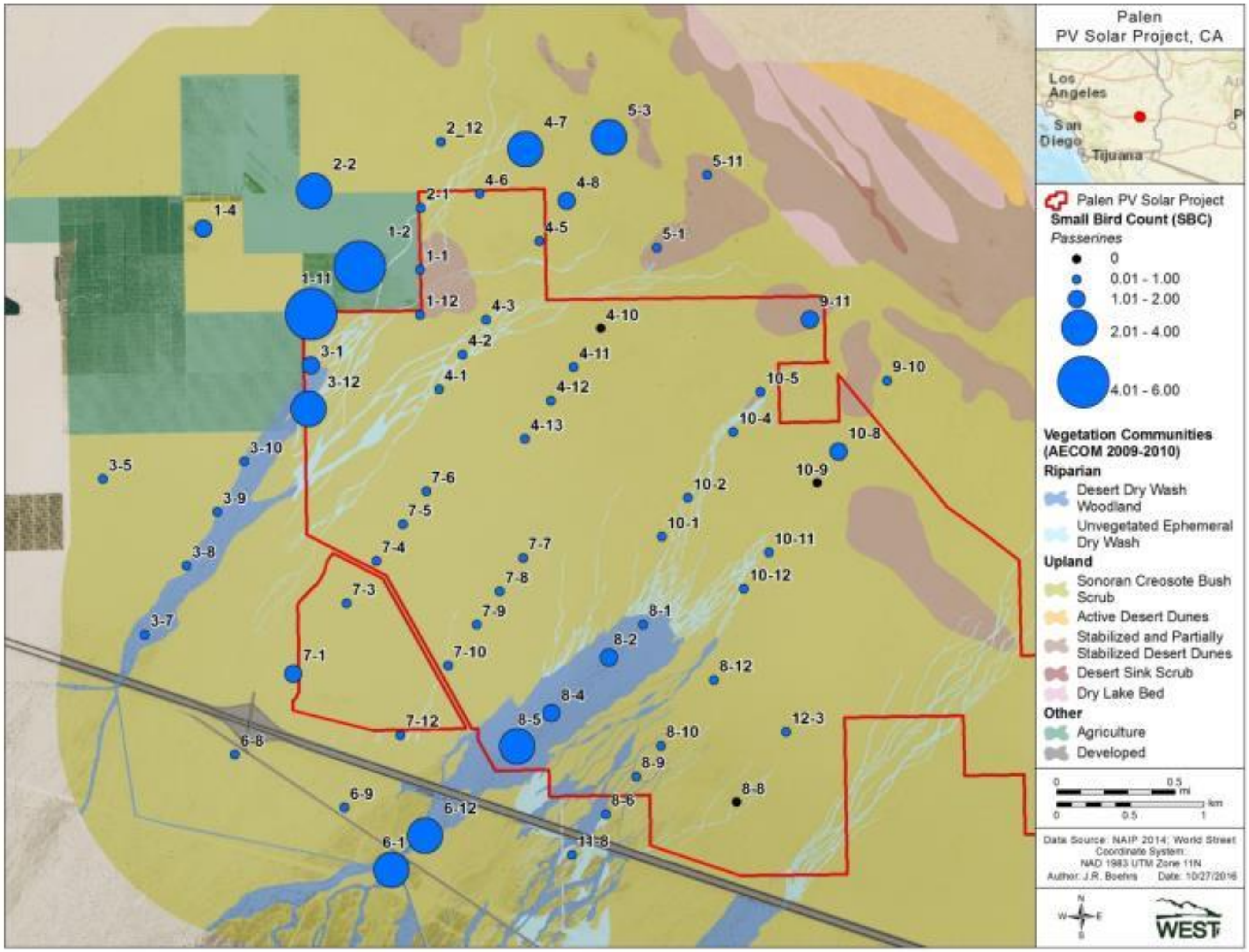


Figure 6c. Bubble plots of overall passerine use (number of birds/observer-hour/survey) by point during small bird count (SBC) surveys at the Palen Photovoltaic (PV) Solar Project, spring 2015.

2.3.1.3 Conclusions

The majority of the Project site supports desert scrub vegetation and among terrestrial habitats in North America, creosote bush scrub is noted for its low avian diversity (Raitt and Maze 1968). Furthermore, the creosote bush scrub habitat at the Project is common on the surrounding landscape. Avian use at stations in creosote bush scrub within the Project was generally comparable or lower than avian use in creosote bush scrub outside of the project (figures 6a, 6b, 6c).

Survey stations located in desert dry wash woodland habitat were among the lowest in overall bird and passerine use and species diversity in fall 2013 and spring 2014 (less than 4 birds / station-survey; Levenstein et. al 2014a, 2014b). During these seasons, use within the Project was low relative to stations outside of the Project (figures 6a, 6b). In contrast, mean bird use during the spring 2015 surveys within the project boundary was highest at the desert dry wash woodland stations (0.01 to 4 birds / station-survey). Overall use during the spring 2015 surveys within the Project was low relative to stations located outside of the Project (figure 6c). Consistent with SBC surveys conducted at the Project previously with similar methods (BBI 2013a, 2013b), the area of greatest use was located outside the north-western boundary of the site close to and within a date palm plantation. This area also includes three small agricultural ponds.

2.3.3 Mist-Net Surveys

2.3.3.1 Results

Spring 2013

From April 11 – May 4, mist net (MN) surveys were conducted for two days per week for a total of 507 MN survey hours. During this period 21 birds, comprising 11 unique species, were captured (BBI2013a). The overall capture rate for the 7-week period was 0.04 captures per net-hour, with daily capture rates ranging from zero to 0.16 captures per net-hour. The highest capture rates occurred at station 8, located within the dry wash woodland, while no birds were captured at stations 2, 6, and 7, all located within creosote scrub. The most common species captured included verdin (seven individuals) and black-tailed gnatcatcher (*Polioptila melanura*, five individuals). All nine other species captured were represented by one individual each. One species captured during this period of MN surveys, hermit warbler, was not recorded during any other type of survey during the spring 2013 effort.

Summer 2013

From May 9 – June 14, MN surveys were conducted weekly, for three days per week for a total of 1,322.4 Standard MN survey hours and an additional 59.8 extra MN survey hours. With roughly equal levels of survey effort, many more individuals (121 versus 26) and species (23 versus seven) were captured at MN stations in the palm plantation located northwest of the Project footprint compared to those in the Desert Dry Wash Woodland habitats on the Project Site (BBI 2013b). Sonoran Creosote Scrub habitat, which is by far the dominant habitat type on the Project site, was not sampled during this MN survey period because no birds were captured in this habitat during previous MN surveys despite a reasonably large sampling effort, equal to that in Desert Dry Wash Woodland habitats.

The overall capture rate for Standard mist nets was 0.09 captures per mist net hour. The overall capture rate for Extra mist nets was 0.55 captures per mist net hour. During this period, 114 birds comprising 24 unique species were captured in the Standard mist nets and 33 birds comprising 10 unique species were captured in the Extra mist nets. The most common species captured included Swainson's thrush (*Catharus ustulatus*; 22 individuals), verdin (21 individuals), Pacific-slope flycatcher (*Empidonax difficilis*; 16 individuals), and Wilson's warbler (15 individuals). Three species captured during this period of mist net surveys, northern waterthrush (*Parkesia noveboracensis*), yellow-breasted chat (*Icteria virens*), and swamp sparrow (*Melospiza georgiana*), were not recorded during any other type of survey during the spring 2013 effort.

<u>Fall 2013</u>

Fall MN surveys were conducted for three consecutive days per week from September 18 to October 30, 2013, for a total of 1,080 MN survey hours. During this period, 107 birds comprising 25 unique species were captured. The overall capture rate for the 7-week period was 0.10 captures per net-hour, with daily capture rates ranging from zero to 0.51 captures per net-hour. The highest capture rates occurred at station 4, located within the palm plantation, while no birds were captured at station 2, located within creosote scrub. The most common species captured included orange-crowned warbler (*Oreothlypis celata*; eight individuals), white-crowned sparrow (*Zonotrichia leucophrys*; eight individuals), Lincoln's sparrow (*Melospiza lincolnii*; six individuals), ruby-crowned kinglet (*Regulus calendula*; six individuals), and verdin (four individuals). Seven species were captured during MN surveys that were not recorded during any other survey type during the fall 2013 study effort (yellow-green vireo [*Vireo flavoviridis*], warbling vireo [*V. gilvus*], fox sparrow [*Passerella iliaca*], Pacific-slope flycatcher, western wood- pewee [*Contopus sordidulus*], red-naped sapsucker [*Sphyrapicus nuchalis*], and blue-headed vireo [*V. solitarius*]).

2.3.3.2 <u>Conclusions</u>

Using MN surveys, researchers were able to observe/capture 11 species that were not observed/captured during other types of surveys conducted concurrently; however, all 11 of species were observed at mist nets locations outside of the Project footprint. Four of these species, yellow-green vireo, blue- headed vireo, northern waterthrush, and swamp sparrow, are relatively uncommon in Riverside County and generally seen only during the fall and/or spring migration seasons. The yellow-green vireo is extremely uncommon and seen only during a brief window of time in the fall. None of the species are listed as threatened or endangered and none are considered species of concern. The yellow-breasted chat, which was captured during spring MN surveys and not seen during any other spring surveys, is regarded by the CDFW as a species of special concern (CDFW 2016). No mention was made in the BBI report (BBI 2013b) of the bird exhibiting breeding characteristics when it was captured and banded, therefore, this individual was likely migrating through the area to nest elsewhere.

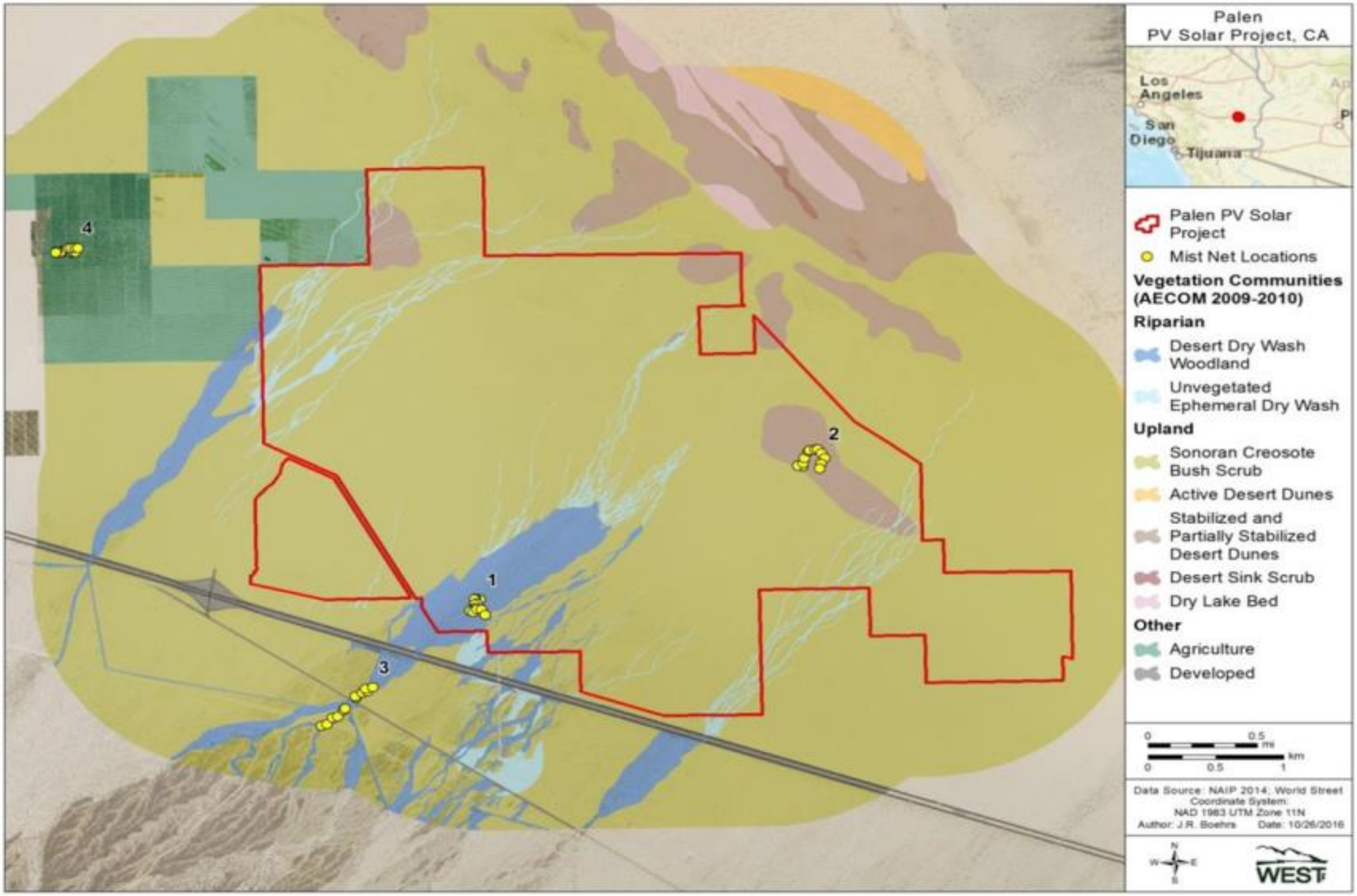


Figure 7. Location of fall 2013 mist net survey stations at the Palen Photovoltaic (PV) Solar Project.

2.3.4 Sensitive Species Observations

Thirty-six sensitive bird species were recorded during surveys conducted between August 19, 2013, and June 5, 2015 (Table 3). One sensitive bird species not previously recorded was observed during spring 2016: the black-tailed gnatcatcher, which is on the California State Watch List (Ironwood 2016). One federally listed (threatened) species was identified during surveys, the snowy plover (*Charadrius nivosus*; CDFW 2013). In addition, six listed or fully protected species in California were recorded (CDFW 2013a, 2013). These included two state-endangered species (willow flycatcher [*Empidonax traillii*] and Gila woodpecker [*Melanerpes uropygialis*]), two state-threatened species (Swainson's hawk [*Buteo swainsoni*] and bank swallow [*Riparia riparia*]), and two fully-protected species (golden eagle and peregrine falcon; Table 3). It should be noted that one subspecies of willow flycatcher, the southwestern willow flycatcher (*Empidonax traillii extimus*), is also a federal-endangered species (CDFW 2013); however, it is unknown which subspecies of willow flycatcher was observed during surveys. Other sensitive species recorded during surveys or incidentally included 18 state-designated species of special concern (CDFW 2016), 10 federal species of concern (USFWS 2008), and six federal priority shorebird species (USFWS 2004). Further, golden eagles are protected under the federal BGEPA (1940), and most bird species recorded during the study are protected under the federal MBTA (1918).

Table 4. Summary of sensitive species observed at the Palen Photovoltaic (PV) Solar Project during bird use count surveys, shorebird/waterfowl surveys, small bird count surveys, mist net surveys, and as incidental wildlife observations from August 19, 2013 – June 5, 2015.

Species	Scientific Name	Status	Flying or Perched Within the Project Boundary
American white pelican	*Pelecanus erythrorhynchos*	SSC	Yes
bank swallow	*Riparia riparia*	ST	Yes
Bell's vireo	*Vireo bellii*	FSC	No
black swift	*Cypseloides niger*	SSC	Yes
black-tailed gnatcatcher	*Polioptila melanura*	SW	Yes
black tern	*Chlidonias niger*	SSC	No
burrowing owl	*Athene cunicularia*	FSC, SSC	Yes
Costa's hummingbird	*Calypte costae*	FSC	Yes
crissal thrasher	*Toxostoma crissale*	SSC	Yes
ferruginous hawk	*Buteo regalis*	FSC	Yes
Gila woodpecker	*Melanerpes uropygialis*	FSC, SE	No
golden eagle	*Aquila chrysaetos*	EA, SFP	Yes
Lawrence's goldfinch	*Spinus lawrencei*	FSC	No
Le Conte's thrasher	*Toxostoma lecontei*	FSC	Yes
loggerhead shrike	*Lanius ludovicianus*	SSC	Yes
long-billed curlew	*Numenius americanus*	FSC, FPS	Yes
Lucy's warbler	*Oreothlypis luciae*	SSC	No

mountain plover	*Charadrius montanus*	FPS,SSC	No
northern harrier	*Circus cyaneus*	SSC	Yes
olive-sided flycatcher	*Contopus cooperi*	SSC, FSC	No
peregrine falcon	*Falco peregrinus*	FSC, SFP	Yes
prairie falcon	*Falco mexicanus*	FSC	Yes
purple martin	*Progne subis*	SSC	No
redhead	*Aythya americana*	SSC	Yes
sandhill crane	*Grus canadensis*	SSC	Yes
short-billed dowitcher	*Limnodromus griseus*	FPS	No
short-eared owl	*Asio flammeus*	SSC	Yes
snowy plover	*Charadrius nivosus*	SSC, FT	No
solitary sandpiper	*Tringa solitaria*	FPS	Yes
Swainson's hawk	*Buteo swainsoni*	ST	Yes
Vaux's swift	*Chaetura vauxi*	SSC	Yes
vesper sparrow	*Pooecetes gramineus*	SSC	No
western sandpiper	*Calidris mauri*	FPS	Yes
willow flycatcher	*Empidonax traillii*	SE	No
Wilson’s phalarope	*Phalaropus tricolor*	FPS	No
yellow warbler	*Setophaga petechia*	FSC, SSC	Yes
yellow-breasted chat	*Icteria virens*	SSC	No
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	SSC	Yes
Total	**37 Species**		

ST = State Threatened (CDFW 2013b); FSC = Federal Species of Concern within Bird Conservation Region 33 (USFWS 2008); SSC = State Species of Special Concern (CDFG 2013a); SW = State Watch-list (CDFW 2016); FPS = USFWS priority shorebird species (USFWS 2004); FT = Federal Threatened (USFWS 2008); SE = State Endangered (CDFW 2013a); EA = Bald and Golden Eagle Protection Act (BGEPA 1940); SFP = State Fully Protected Species (CDFG 2011).

Of the 36 sensitive species listed, eight are expected resident breeders (black-tailed gnatcatcher, Costa’s hummingbird [*Calypte costae*], loggerhead shrike, crissal thrasher [*Toxostoma crissale*], Le Conte’s thrasher [*Toxostoma lecontei*], golden eagle, prairie falcon [*Falco mexicanus*], and burrowing owl [*Athene cunicularia*]). Observations of these species have the potential to occur within the Project during all seasons. Prairie falcon and golden eagle require mountainous cliff habitat (or elevated manmade structures) for nesting, none of which exist within the Project. Mountains to the north and south of the Project site do support habitat necessary for golden eagle nests, as evidenced by the various golden eagle nest surveys (see Section 2.2.7); however, no active eagle nests were recorded within seven miles (11 km) of the site during any surveys between 2010 and 2015. Burrowing owl is found in open habitat, and this species could be expected within or near the Project. The five remaining resident breeders are desert shrub obligates and would be expected to be observed throughout the Project during all seasons. Ferruginous hawk (*Buteo* *regalis*), short-eared owl (*Asio flammeus*), northern harrier, and peregrine falcon (*Falco peregrinus*) are migrant species that may pass through the Project during winter months, though overall observations are expected to be low (fewer than 10 per season, based on incidental observations; Sullivan et al. 2009).

Besides Gila woodpecker and golden eagle, all other observed sensitive species are migrants that could be observed using the site during migration, possibly to or from the nearby Salton Sea. Gila woodpeckers are generally sedentary and show only short-distance seasonal movement. This species is known to be expanding its range into the Chuckwalla Mountains and the area around the Salton Sea; most observations (incidental) in the Chuckwalla Mountains have been associated with palm trees in the Corn Springs palm oasis (Sullivan et al. 2009). However, given that the only Gila woodpecker observation was recorded in 2013, greater than one mile from the project boundary, Gila woodpecker is not expected to use the site with any regularity, if at all (BBI 2013a, 2013b).

The federally threatened snowy plover was only observed during the pond surveys, which occurred outside of the Project, during spring 2015 monitoring. The snowy plover is a resident breeder throughout California. Some individuals have been observed to migrate inland during the spring (with associated return migration in the fall). The species is known to be a year-round breeding resident at the nearby Salton Sea (Patten et al. 2003).

The remaining listed species are migrants and not expected to breed or overwinter in the proposed site's vicinity. However, these species are likely to be observed annually as they pass through the area, and could use the area in and around the Project during migration. Some of these migrants are gregarious in nature (e.g., American white pelican [*Pelecanus erythrorhynchos*], Vaux's swift [*Chaetura vauxi*], sandhill crane [*Grus canadensis*]) and can be observed moving in large groups.

2.3.5 Winter 2013 Golden Eagle Surveys

2.3.5.1 <u>Results</u>

A single sub-adult golden eagle was present during all five weeks at bait station 6, feeding on the carcass two to three days each week, usually until the remainder of carcass was taken away at night by coyotes (*Canis latrans*). Although not all adult golden eagles will readily land at carcasses, it is probable that more than one eagle would have been observed over a 4-week period of camera trapping with four to seven stations had high numbers of eagles actually been present in the area. During six full-length visual survey sessions, no eagles were observed within the study area.

2.3.6 2012 and 2013 Regional Desert Surveys

Two regional surveys for raptors, including golden eagles, were conducted in 2012 and 2013 by the BLM (Duerr et al. 2015). In anticipation of the implementation of California's Desert Renewable Energy Conservation Plan (DRECP 2012a), Duerr et al. (2015) surveyed raptor populations within the proposed region. The surveyed region encompassed the entire proposed Project site. Experienced raptor biologists sampled 24 randomly selected, ground-based transects (each 25.6 km in length) for all raptor species. Each transect was sampled twice – one sample in January 2012 and one sample in January 2013.

Nine observations of individual golden eagles were recorded, for a total of 9 individual observations. From these observations, abundance per 25.6-km transect was calculated at 0.19 (raw) and 0.23 (adjusted for resight probability). Density (eagles per ha) was calculated at 0.000016 (raw) and 0.000022 (adjusted for resight probability). Compared to data collected in 1999, golden eagles populations showed a decrease in density of 0.18 for the region.

2.3.6.1 <u>Conclusion</u>

Winter eagle surveys found definitive evidence for use of the study area by only one golden eagle during the winter months. The results of this study and the 2012 and 2013 regional surveys suggest low eagle winter usage of the Project and surrounding region.

2.3.7 Eagle Nest Surveys

2.3.7.1 <u>Results</u>

Across the entire study area, only a single golden eagle observation was made during spring and summer 2013 golden eagle nesting surveys. This observation was of a third-year golden eagle flying around the cliffs in this southwestern portion of the Palen Mountains during an aerial survey conducted on April 6, 2013. Twelve golden eagle nests were observed in the study area during the surveys. None of these nests displayed any indications of activity during the 2013 breeding season. The locations of all golden eagle nests within the 10-mile buffer of the Project footprint, as well as those of other raptors and common ravens, are illustrated in Figure 8 (BBI 2013c).

During the 2014 surveys, all previously described golden eagle nests were monitored, as well as a number of additional nests. In total, 35 eagle nests were documented during the April and July surveys. None of the nests newly identified in 2014 showed signs of recent activity. Moreover, no golden eagles were observed during aerial or ground-based surveys (see Figure 9).

During the spring 2015 ground-based surveys, 20 previously observed golden eagle nests and one newly discovered nest were monitored. Sixteen nests showed no signs of occupancy, three nest territories were occupied by red-tailed hawks (*Buteo jamaicensis*) in early stages of visiting/refurbishing nests, and two nests were being actively occupied by red-tailed hawks incubating or raising young (Figure 10). The newly identified nest did not show signs of recent activity. In summary, none of the previously-identified golden eagle territories, which were visited in spring 2015, were determined to be occupied by golden eagles.

2.3.7.2 Regional Golden Eagle Nest Surveys

BioResource Consultants Inc. (Latta and Thelander 2013) were contracted by the BLM to conduct aerial and ground-based surveys for known and potential golden eagle nesting habitat within the BLM's California Desert District (CDD), which included the Project site. At the time of the study, the BLM supplied 412 historical golden eagle nest locations. 350 sites were ultimately selected for study, including sites surveyed specifically for the Project in the Palen and Chuckwalla mountains. Latta et al. (2013) performed 167 flight hours of aerial surveys, as well as ground based surveys totaling 30,205 miles (48,610 km), in the vicinity of the 350 previously documented nests. Of the 350 sites surveyed, 256 sites were visited by air, 61 sites by ground, and 33 sites by air and ground; sites were surveyed according to accepted guidelines in Pagel et al. (2010). The surveys identified 74 occupied sites (either by display of courtship, a pair present, or the nest being maintained), of which 44 were active (either incubation, eggs, brooding, chicks, and fledglings). There were no nest sites within 10 miles of the Project found to be occupied.

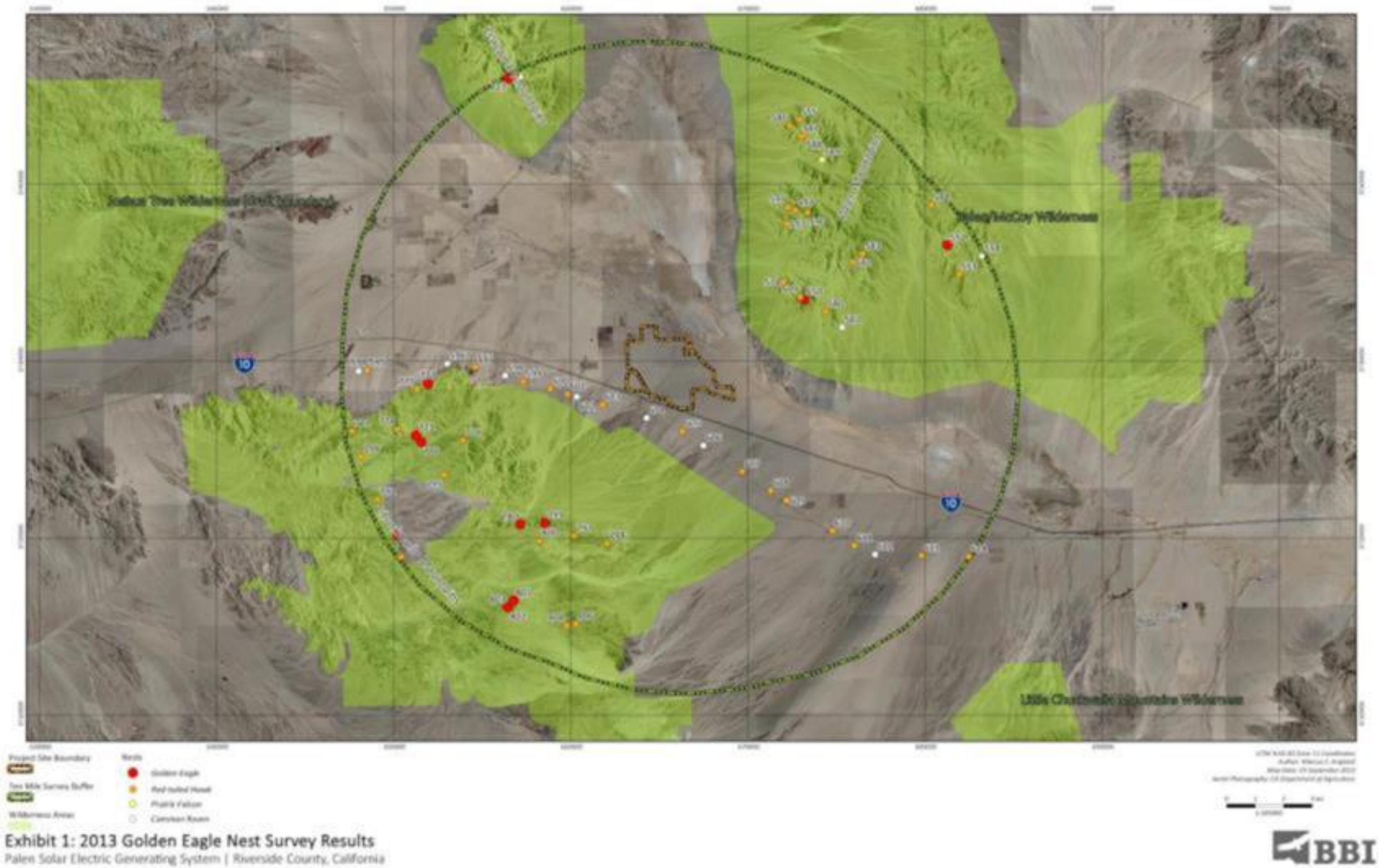


Figure 8. Eagle and other raptor nests located during 2013 eagle nest surveys at the Palen Photovoltaic (PV) Solar Project (BBI 2013c).

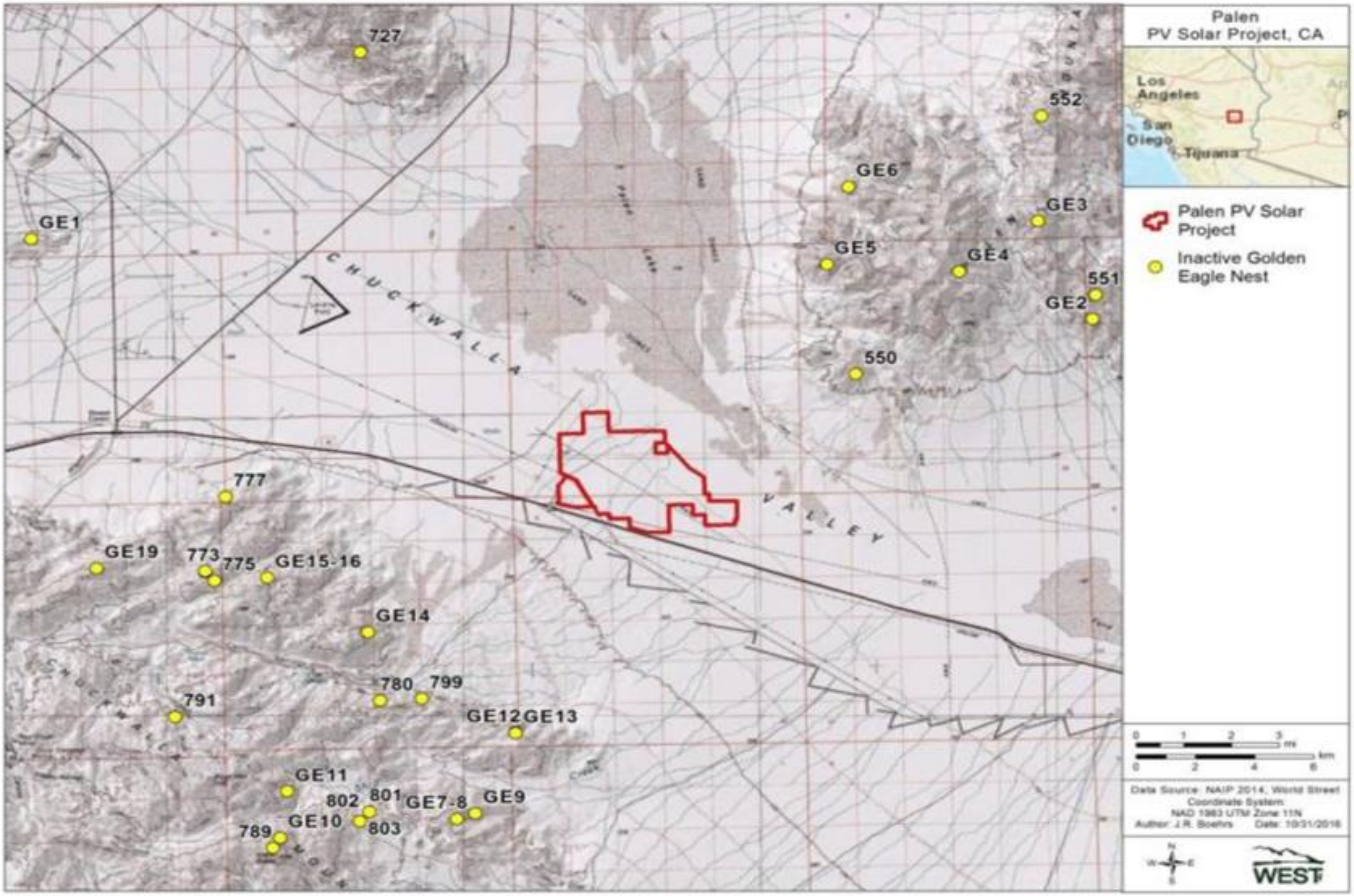


Figure 9. Eagle and other raptor nests located during 2014 eagle nest surveys at the Palen Photovoltaic (PV) Solar Project.

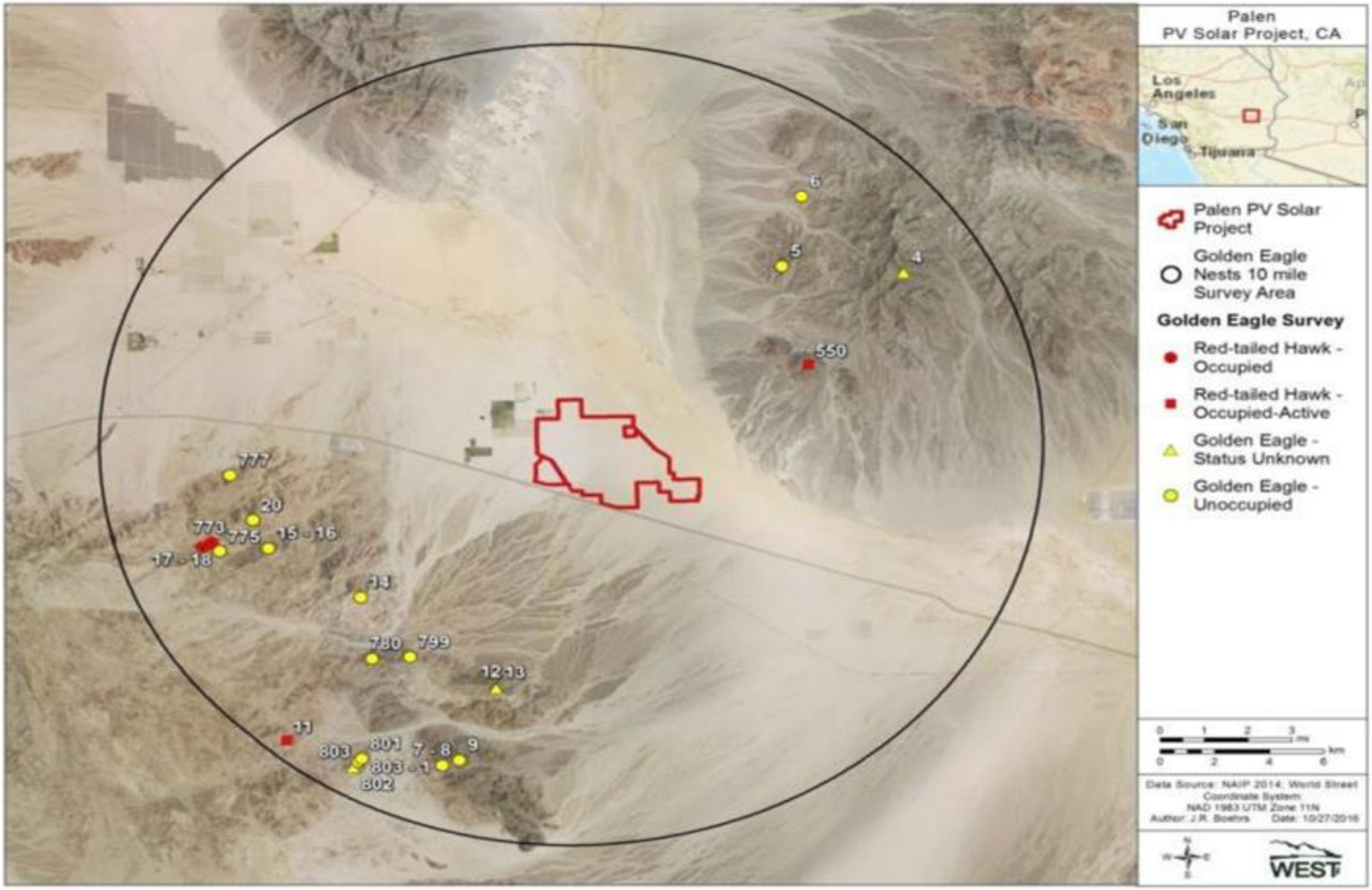


Figure 10. Eagle and other raptor nests located during 2015 eagle nest surveys at the Palen Photovoltaic (PV) Solar Project.

2.3.7.3 Conclusions

Based on results of spring and summer golden eagle nesting surveys, BBI estimated that approximately eight golden eagle nesting territories exist within the study area; however, none of the alternate nests within these eight territories were active or exhibited any signs of activity during the 2013 breeding season. The estimate of eight territories in the vicinity of the Project presents a likely maximum number of active golden eagle territories that would be expected under a moderate increase in the habitat quality in the region. However, in most regions, depending upon the expanse of the area studied, some eagle territories will normally always be inactive in any one year for a variety of natural and perhaps unnatural reasons. Overall, the result of BBI's site-specific work (i.e., low eagle use) aligns with the population estimates drawn from Duerr et al. (2015) and the results of the desert-wide nest survey (Latta et al. 2013).

Surveys conducted by BBI in this region over the previous decade indicate that the lack of golden eagle productivity in the 2013 breeding season in the Project study area is not an anomaly. BBI has conducted similar surveys, with 10-mile radius survey areas at three alternative energy projects that either overlap partially in area with the 10-mile buffer of the current Project, or are almost immediately adjacent to the Project, within the past four years, and no reproductively active eagle nests were discovered during those surveys. In addition, similar surveys conducted in 2010 for four solar projects in the same region revealed the presence of 14 golden eagle nesting territories, of which only one was documented to be reproductively active (Wildlife Research Institute [WRI] 2010). As of the conclusion of the 2015 monitoring effort, there were no known, occupied golden eagle nests within 2 miles of the facility. The observed relatively low numbers of golden eagles at any season in the desert may also be related to Mojave Desert ecology where golden eagle nesting territories are not occupied every year.

2.3.8 Golden Eagle Prey Abundance Surveys

2.3.8.1 Results

Over the 196.5 km (122 miles) of transects surveyed during prey abundance surveys, 17 black- tailed jackrabbits and one desert cottontail were observed. This computes to 0.086 and 0.005 individuals per km of transect, respectively. Investigation of the spatial data reveals two general areas within the Project footprint and surrounding 1-km buffer where nearly all jackrabbit observations occurred. The majority of observations occurred in the southeastern quadrant of the site, both north and south of I-10. A second, smaller cluster of observations occurred in the north-central part of the site, including observations at SBC stations 20, 35, and 37 (see exhibit 2, BBI 2013a). The only desert cottontail observation occurred near an abandoned house along the edge of the palm plantation on the northwest edge of the Project boundary, and close to SBC station 8.

2.3.8.2 Conclusions

The results of the golden eagle prey-abundance surveys suggest low use of the site by lagomorph species. The surveys were conducted during the morning hours (typically between 5:00 am – 11:00 am) in the course of conducting SBC surveys and may not be reflective of true lagomorph densities on-site if these species are more active at other times of day or night. However, the data provide information about spatial variation in relative density during the diurnal hours, which is when golden eagles primarily hunt.

2.3.9 Burrowing Owl Surveys

2.3.9.1 Results

Two nesting pairs of burrowing owls with juveniles were observed within the original PSPP during the spring of 2009 (AECOM 2009). One pair with juveniles was observed using two burrows near the center of the site, and a second pair with juveniles was observed using two burrows near the northwest corner of the site. Four additional burrows with burrowing owl sign were recorded within the site, and a fifth was recorded in the southeast corner of the 150-m buffer area. Follow-up visits were made to these locations, but no burrowing owls were observed.

During supplemental surveys in the spring of 2013, two burrowing owls were observed, both on buffer transects (Karl 2013). No owls or their sign were observed within the linear corridors. One adult burrowing owl was observed during desert tortoise (*Gopherus agassizii*) surveys on April 7 along the 400-m (1,312-ft) buffer transect east of the gen-tie and north of I-10, and a second burrowing owl observation was recorded on May 25 approximately 120 m (394 ft) east of the gas line and north of I-10. Despite a thorough search of both areas, no active burrows were found.

In 2016, five burrows with active sign were observed during transect surveys (Ironwood 2016). Breeding season surveys were not performed in 2016 due to similarity in results from 2009. No burrowing owls were observed during surveys in 2016.

2.3.9.2 Conclusions

The entirety of the Project site is suitable breeding habitat for burrowing owls. During surveys in 2009, two active burrowing owl nests were documented; however, the presence of at least there additional burrows with burrowing owl sign indicate burrowing owl occupancy either during previous years or by wintering owls. Surveys in 2016 results in a comparable number of burrows with sign (5).

The majority of the Project is considered suitable burrowing owl habitat, with numerous burrows potentially suitable for use by burrowing owl (more than 140) observed and mapped throughout the site and the surrounding 150-m buffer (AECOM 2009). Burrows where burrowing owls or their sign were observed were all located in flat, sparsely vegetated areas dominated by creosote. The density of nesting burrowing owls documented during surveys from 2009 to 2016 remained relatively consistent with approximately 4 to 5 active burrows (Ironwood 2016).

2.3.10 Agricultural Pond Surveys

2.3.10.1 Results

Fall 2013

Approximately 139 hours of surveys were conducted over the course of 17 visits to the agricultural ponds. A total of 3,169 bird observations in 754 separate groups were recorded, and 77 unique species were identified. Overall, water-dependent bird taxa (i.e., loons/grebes, waterbirds, waterfowl, shorebirds, gulls/terns, and rails/coots) composed 49.5% of total bird observations. The most frequently observed water-dependent species were eared grebe (*Podiceps nigricollis*; 191 observations), American coot (*Fulica americana*; 165 observations), American avocet (*Recurvirostra americana*; 152 observations), ring-billed gull (*Larus delawarensis*; 89 observations), common goldeneye (*Bucephala clangula*; 89 observations), and ruddy duck (*Oxyura jamaicensis*; 79 observations), which collectively composed 48.8% of all water-dependent bird observations and 24.1% of overall bird observations. The most common species observed during the shorebird/waterfowl surveys was turkey vulture (1,120 observations), which composed 26.6% of all observations. See Appendix C for additional details.

Spring 2014

Approximately 88 hours of surveys were conducted over the course of 11 visits to the agricultural ponds. A total of 1,309 bird observations in 335 separate groups were recorded, and 52 unique species were identified. Overall, water-dependent bird types composed 42.6% of total bird observations. The most frequently observed water-dependent species were least sandpiper (*Calidris minutilla*; 109 observations), Wilson's phalarope (*Phalaropus tricolor*; 96 observations), western sandpiper (*C. mauri*; 77 observations), ruddy duck (56 observations), spotted sandpiper (*Actitis macularius*; 43 observations), American coot (23 observations), and eared grebe (20 observations), which collectively composed 76.1% of all water-dependent bird observations and 32.4% of overall bird observations. The most common species observed during the shorebird/waterfowl surveys was turkey vulture, with 277 observations, which composed 21.2% of all observations. See Appendix C for additional details.

Spring 2015

Approximately 96 hours of surveys were conducted over the course of 13 visits to the agricultural pond survey point. A total of 1,958 observations in 338 separate groups were recorded, and 54 unique species were identified. Overall, water-dependent bird types composed 24.7% of total bird observations. The most frequently observed water-dependent species were American avocet (100 observations), white-faced ibis (*Plegadis chihi*; 78 observations), least sandpiper (46 observations), spotted sandpiper (41 observations), and killdeer (*Charadrius vociferous*; 41 observations), which collectively composed 63.2% of all water-dependent bird observations and 15.6% of overall bird observations. The most common species observed during the shorebird/waterfowl surveys was turkey vulture, with 861 observations, which composed 44.0% of all observations. See Appendix F for additional details.

2.3.10.2 Conclusions

The agricultural ponds provide a ready source of water for birds migrating through or resident in the area. Along with few other small bodies of water in the area (e.g., the Eagle Mountain Pump Plant, located approximately 13 miles [21 km] northwest of the Project, and Lake Tamarisk, located approximately nine miles [14 km] west-northwest of the Project), these ponds represent a rare resource in an otherwise dry desert environment and likely draw birds in from the surrounding area. Together with the irrigated palm plantation and its stands of citrus, this area
northwest of the Project footprint represents an unusually hospitable habitat for birds seeking cover and foraging opportunities.

2.3.11 Nocturnal Migration Radar Surveys

2.3.11.1 Results

Mean flight direction was southeast at 133.6 degrees, which is as expected for migrants heading south along the Pacific Flyway. Mean passage rate was 125.64 targets (targets per km per hour [hr]) in horizontal mode; and 562.31 targets/km/hr in vertical mode. Mean flight height of targets was 339.9 m (1,114.9 ft) above radar level (ARL) and approximately 45.3% of targets had flight altitudes less than or equal to the height of the proposed towers of the PSEGS project being considered at the time of the radar study (229 m [751 ft]). Most (approximately 54.7%) of the nocturnal migrants recorded passing over the radar study area (RSA) were flying above 229 m [751 ft].

2.3.11.2 Conclusions

The mean hourly passage rate (targets/km/hr) recorded by radar during the fall study (126 targets/km/hr) was in the 50th percentile of means calculated at available studies in the western US (Table 5). However, it is unknown how passage rates measured via radar may or may not correlate with risk to birds posed by any solar facilities. The original intent of the radar study was to measure nocturnal migrant passage rates to assess risk associated with tall, illuminated structures of the previously proposed PSEGS project, since nocturnal migrant bird fatalities have been detected at tall structures with non-flashing lights (e.g. communication towers, tall buildings; Longcore et al. 2012, 2013, Loss et al. 2014, 2016). The Project has no tall, illuminated structures, thus eliminating risk factors related to those structures.

Table 5. Results of radar studies at proposed and existing wind project sites and one proposed solar project site (Rio Mesa) in the western US, sorted by passage rate (high to low). Passages rates presented are for horizontal mode only.

Site	Passage Rates (targets/km/hr)	Mean Flight Height (m)	Reference
Fall Data			
Collinsville Montezuma Hills (High Winds), CA	464	467	Harvey and Associates 2010
Collinsville Montezuma Hills (Shiloh), CA	407	397	Harvey and Associates 2010
Sagebrush, MT	316	422	Tidhar et al. 2011

Table 5. Results of radar studies at proposed and existing wind project sites and one proposed solar project site (Rio Mesa) in the western US, sorted by passage rate (high to low). Passages rates presented are for horizontal mode only.

Site	Passage Rates (targets/km/hr)	Mean Flight Height (m)	Reference
Hatchet Ridge, CA	290	468	Mabee and Sanzenbacher 2008b
Bear River Ridge, CA	269	329	Sanzenbacher et al. 2007
Rio Mesa, CA	264	374	Levenstein et al. 2012
Coyote Crest, WA	196	454	Mabee et al. 2010
Palen, CA	125.6	339	Levenstein and Nations 2014
Norris Hill, MT	41	209	Harmata et al. 1998
Cotterel Mountain, ID	32	565	Cooper et al. 2004, Bureau of Land Management (BLM) 2006
Nine Canyon, WA	Short range (54.4 slow; 39.6 fast), Long range 10.5	127	Mabee and Cooper 2001, Erickson et al. 2001
Vansycle, OR (2001)	26.3	606	Mabee and Cooper 2004
Stateline, OR/WA (2001)	21.6	647	Mabee and Cooper 2004
Stateline OR/WA (2000)	20.8	NA	Mabee and Cooper 2004
Vansycle, OR (2000)	19.0	NA	Mabee and Cooper 2004
Upper Tanna River Valley, AK (1988)	NA	426	Cooper and Richie 1995
Upper Tanna River Valley, AK (1989)	NA	341	Cooper and Richie 1995
Mean Fall Data[1]	**171.54**	**416.57**	

[1] Excludes PSEGS data. Projects with NA were excluded from means. When multiple values were presented for a single project, those values were first averaged, then their average was used in the seasonal mean for all projects.

2.3.12 Acoustic Bat Surveys and Bat Roost Surveys

2.3.12.1 Results

During the 2009 and 2013 bat roost surveys, only a single roosting bat was observed wedged into the underside of a bridge crossing Corn Springs Road. No other bat roosts were identified. Bridges surveyed in the Project vicinity tended to be smooth cement and provided minimal to negligible roosting habitat (Dr. P. Brown, pers. comm.). Roosting habitat for several tree- and ground-roosting species is present throughout the Project in woodland microphyll habitats and crevices and burrows in the ground.

Table 6. Bat species observed within, or potentially occurring within, the Palen Photovoltaic (PV) Solar Project.

Common Name	Scientific Name	Status (Federal/State)*
High-Frequency (> 40 kiloherts [kHz])		
California myotis**	*Myotis californicus*	-/-
California leaf-nosed bat	*Macrotus californicus*	BLMS/SSC
canyon bat**	*Parastrellus hesperus*	-/-
cave myotis	*Myotis velifer*	BLMS/SSC
Yuma myotis	*Myotis yumanensis*	BLMS/-
Mid-Frequency (30-40 kHz)		
western yellow bat**	*Lasiurus xanthinus*	-/SSC

Low-Frequency (< 30 kHz)		
big brown bat	*Eptesicus fuscus*	-/-
big free-tailed bat**	*Nyctinomops macrotis*	-/SSC
hoary bat	*Lasiurus cinereus*	-/-
Mexican free-tailed bat**	*Tadarida brasiliensis*	-/-
pallid bat**	*Antrozous pallidus*	BLMS/SSC
pocketed free-tailed bat	*Nyctinomops femorosaccus*	-/SSC
Townsend's big-eared bat	*Corynorhinus townsendii*	BLMS/C, SSC
western yellow bat**	*Lasiurus xanthinus*	-/SSC
Very Low-Frequency (< 15 kHz		
western mastiff bat **	*Eumops perotis*	BLMS/SSC

*BLMS = Bureau of Land Management Sensitive Species (BLM 2010); SSC = state species of special concern (CDFG 2011); C = state candidate for listing (CDFW 2014).
**Detected during spring/fall acoustic surveys

During the 4-day acoustic survey effort in the spring of 2013, three bats identifiable to species were observed acoustically within the study area: pallid bat, canyon bat (*Parastrellus hesperus*), and Mexican free-tailed bat (*Tadarida brasiliensis*; Table 7). There were a large number of 50 kHz *Myotis* sequences (M50) attributed to a single Myotis species. California myotis is common at low elevations in California deserts and far more common in open habitats distant from surface water than any other *Myotis* species, so all M50 call sequences were interpreted as California myotis (Brown et. al 2013; Table 6). Across the 12 detector locations, a total of 989 identified bat call minutes were recorded for the four nights of the spring study (Table 7. In this relatively low activity sample there were few instances of two different species or sonotypes calling within the same minute at one location, so the value obtained by summing across species and sonotypes is a reasonable representation of relative activity per location. The highest number of call minutes (443) was recorded at Site 10 (Figure 11, the northern-most station located next to a large palo verde tree [*Cercidium floridum*]). Canyon bats were the most common species observed at all stations, followed closely by California myotis. Canyon bats were the earliest observation at most stations and nights, with many recorded approximately 30 min after sunset. Pallid bats and Mexican free-tailed bats were observed less frequently and were not observed at all stations (Table 6). Pallid bats were observed at six of the 12 stations concentrated along the western and northern Project boundaries (Table 6 and Figure 11).

Table 7. Minutes of bat activity per nighta by site and species or acoustic category for acoustic monitoring conducted at the Palen Photovoltaic (PV) Solar Project, May 11-14, 2014.

	Species/Acoustic Category[b]				
Station	**PAHE**	**M50**	**ANPA**	**TABR**	**Q25**
1	7	2	0	0	2
2	8	2	0	0	0
3	17	62	1	0	1
4	12	43	0	1	0
5	8	4	0	1	0
6	22	49	0	0	0
7	25	6	0	0	2
8	70	45	2	1	1
9	52	7	1	0	2
10	171	247	3	2	10

11	78	8	1	0	1
12	11	0	1	0	0
Total	**481**	**475**	**9**	**5**	**19**

[a]Count of 1-min intervals during the night that had at least one identified sequence file for a species or multispecies category

[b]PAHE = *P. hesperus*; M50 = *M. californicus*; ANPA = *A. pallidus*; TABR = *T. brasiliensis*; Q25 = non-diagnostic 25-35 kHz sequences;

During the 6-week fall survey effort in the fall of 2013, at least nine distinct bat species were observed acoustically within the study area (Table 6). This included the same five species/acoustic categories identified during the spring study, as well as an additional three species with call sequences identifiable to species: western yellow bat (*Lasiurus xanthinus*), western mastiff bat (*Eumops perotis*), and big free-tailed bat (*Nyctinomops macrotis*). In addition, several call sequences were attributable to either hoary or pocketed free-tailed bats, but lacked features that would allow identification to species. Both species have the same probability of occurring in the study area in the fall. As is typical of surface water sources, especially in arid areas, the highest number of call minutes and species were recorded at the artificial pond (station 13; Figure 11, Table 7). Canyon bats and California myotis were both common species at all detector locations, with Mexican free-tailed bats observed considerably less frequently. Pallid bats were observed at three stations in the fall and were most abundant at the pond (Table 8). Western yellow bats were observed only at the pond.

Table 8. Minutes of bat activity per night[a] by site and species or acoustic category for acoustic monitoring conducted at the Palen Photovoltaic (PV) Solar Project, October 7 – December 14, 2013.

	Species/Acoustic Category[b]								
Station	**PAHE**	**M50**	**ANPA**	**TABR**	**Q25**	**LAXA**	**EUPE**	**LACI/NYFE**	**NYMA**
3	17	849	0	26	21	0	3	6	0
5	29	13	1	18	12	0	3	7	1
10	208	212	2	8	23	0	1	6	1
13	3,778	4,714	85	69	1,396	93	14	21	1
Total	**4,032**	**5,788**	**88**	**121**	**1,452**	**93**	**21**	**40**	**3**

[a] Count of 1-min intervals during the night that had at least one identified sequence file for a species or multispecies category

[b] PAHE = *P. hesperus*; M50 = *M. californicus*; ANPA = A. *pallidus*; TABR = *T. brasiliensis*; Q25 = non-diagnostic 25-35 kHz sequences; LAXA = *L. xanthinus*; EUPE = *E. perotis*; LACI/NYFE = *L. cinereus* and/or *N. femorosaccus*; NYMA = *N. macrotis*

2.3.12.1 Conclusions

Seven distinct species of bat were observed during the spring and fall studies. Six additional species could be active on the Project site during at least one season, though two (California leaf-nosed bat and Townsend's big-eared bat [*Corynorhinus townsendii*]) have typically low- intensity echolocation signals that may not be readily detectable acoustically even when these species are present and calling. Hoary bats and/or pocketed free-tailed bats were also present, but overlap in call characteristics made species identification between the two impossible. Three special-status bat species are most likely to use the site: pallid bat, California leaf-nosed bat, and Townsend's big-eared bat. Other special-status bats known from the area (western mastiff bat) may pass through the Project, but this species is an inhabitant of rocky areas, and so would not be considered to be using the site. Some common bat species (e.g., canyon bat and California myotis) could roost in crevices, burrows, or tree cavities on site. Possible impacts to bats would be largely through removal of roosting and/or foraging habitat. Because the Project site does not contain mountainous terrain, direct impacts would be low to species (i.e., pallid bats and canyon bats) that roost in or under objects on the ground (e.g., rocks, woody debris), in crevices in soil, or standing wood. Direct impacts may also include the loss of foraging habitat for several species that roost in the rocky hills adjacent to the Project and in multiple abandoned mines within a 16-km radius of the Project.

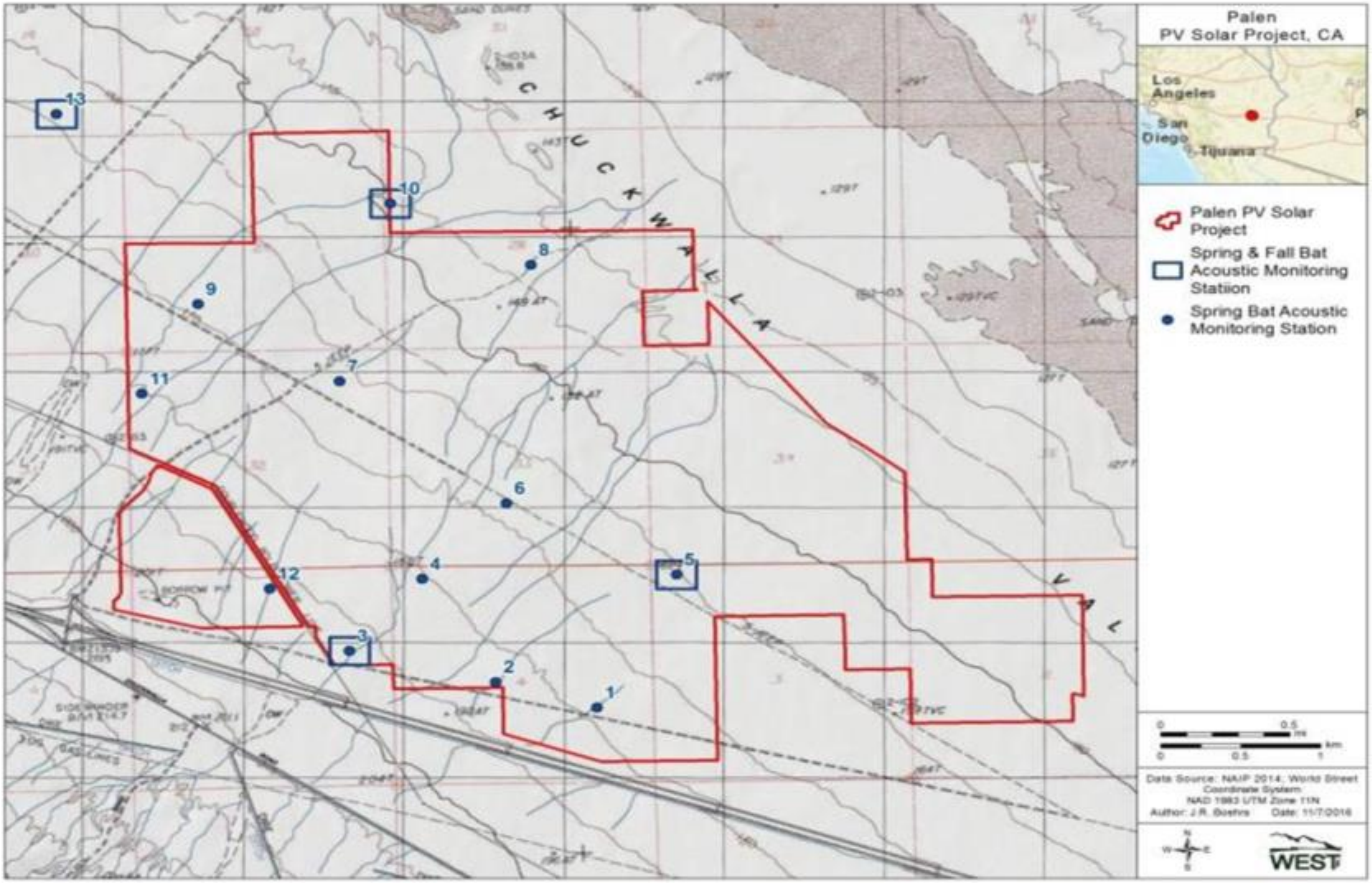


Figure 11. Location of acoustic bat sampling stations. Stations 1-12 shown as blue points were monitored in May 2013, and stations with blue rectangles, including an additional 13th station northwest of the Palen Photovoltaic (PV) Solar Project, were monitored in October – December 2013.

3.0 IMPACTS TO BIRDS AND BATS

The understanding of impacts to birds from the construction and operation of PV solar facilities is an evolving science. There has been a substantial increase in the quantity and quality of monitoring data available from PV solar facilities since 2014, particularly in the desert southwest. As of 2017, there are at least three PV solar facilities with one year or more of standardized fatality monitoring, all in California, and at least four more PV solar facilities which have initiated standardized monitoring within the last year. In the following section we will discuss potential risk factors related to habitat loss, noise, lighting, and direct mortality informed by the most recent publicly available data.

3.1 Specific Risk Factors

3.1.1 Habitat Loss

Construction of the Project will result in habitat loss for avian and bat species within the project boundary. The bird and bat assemblages documented using the Project are typical of the arid Mojave-Colorado desert habitat. A majority of the Project will be constructed in creosote scrub habitat, which has lower avian diversity and abundance during all seasons than other desert habitats (e.g., microphyll woodland) located at or adjacent to the Project site. Approximately 7% (235 of 3,381 acres) of the Project will be constructed in dispersed microphyll woodlands that typically have higher avian diversity and abundance relative to other desert habitats.

3.1.2 Noise

Prior to construction of the Project, ambient noise consists primarily of vehicle traffic on I-10, which lies adjacent to the southern border of the site. Other noise sources include equipment used in association with the palm and citrus plantations to the west of the Project, including generators powering irrigation equipment and more occasional vehicle traffic. During construction, noise impacts will be minimized by avoiding activities that generate over 65 A-weighted decibels (dBA) in nesting habitat between February 15 and April 15, unless the Designated Biologist (DB) provides documentation to the BLM indicating no active nests would be subject to over 65 dBA noise, or nests within range of 65 dBA (or greater) noise are monitored (as required by PSPP Mitigation Measure [MM] BIO-8, or SEIS measure VEG-8).

3.1.3 Lighting

Artificial lighting can be a source of disturbance to birds nesting nearby and may in some instances lead to nest abandonment. Artificial lighting has also been shown in several studies to serve as an attractant when deployed on artificial structures (e.g., communication towers, offshore oil platforms), which can result in night-migrating birds colliding with these structures (Poot et al. 2008, Gehring et al. 2009, Kerlinger et al. 2010). Prior to construction of the Project, sources of light in the vicinity includes traffic along the adjacent I-10 corridor, as well as lighting associated with the Desert Center Airport, a private facility (5.5 miles [8.9 km] away), the Chuckwalla Valley Raceway (6.25 miles [10.05 km]), the communities of Desert Center (9.0 miles [14.5 km]) and Lake Tamarisk (9.25 miles [14.89 km]), and the Chuckwalla Valley Prison and Ironwood State Prison (16 miles [26 km]), as well as lighting associated with a number of nearby palm and citrus plantations and related buildings. During construction, lighting will include lights from construction vehicles, when and if construction occurs during the overnight hours, lights on structures (e.g., office trailers), parking areas, site security facilities, and possible lighting associated with roads within the Project. Lights will be shielded and focused downward to minimize light exposure outside of the construction areas.

While the Project is in the operations phase, there will be down-shielded lights on buildings, and lights shall be installed and maintained to avoid projecting light on any wildlife habitat. Lighting in high-illumination areas which are not continuously occupied will use timers or motion detectors to ensure these areas are only lit when occupied. The addition of Project lighting in an area that previously had relatively few sources of artificial light could increase the potential for bats to collide with Project infrastructure (Orbach and Fenton 2010, McGuire and Fenton 2010). In addition, as insects may be attracted to artificial light, there exists the potential to increase prey for insect eating bats, further attracting them to the Project and, thereby, increasing the risk of collisions with infrastructure. However, thus far, post-construction monitoring at several projects has resulted in very few bat carcasses being encountered. For example, the Desert Sunlight (DSL) project had no bat fatalities documented during the first year of standardized monitoring (WEST 2016a), but three dead bats were found during construction and the first year of operations. Post-construction mortality monitoring should prove valuable in gaining more insight into this area of interest and adaptive management measures may be enacted to reduce impacts should they become evident.

3.1.4 Direct Mortality

Direct mortality could occur at the Project from several sources including:

- Collision with transmission lines, solar modules, buildings, fences, vehicles and equipment; or
- Electrocution

Although there has been an increase in the understanding of the spatial and temporal patterns of bird fatalities as well as the species that occurred as fatalities, risk factors that drive fatality patterns at solar facilities have not been investigated. Therefore, the number of fatalities at the Project and the occurrence of any specific species as a fatality cannot be predicted from existing fatality monitoring studies; however, patterns in the data can be examined and potential impacts can be inferred within the limits of the data. Thus, to evaluate potential collision risk at the Project, publically available data were reviewed to determine the general habitat associated with each project, the species guild detected (e.g., passerine, raptor, waterbird), and the proportion of each species guild of the overall total. The objective was to summarize patterns in fatalities and to extend observed patterns at operating solar projects to the Project with a suite of supported underlying assumptions.

As of June, 2017, there were three publicly available studies from utility-scale PV solar facilities with data collected under a standardized monitoring protocol for at least one year: California Valley Solar Ranch (CVSR; H. T. Harvey & Associates 2014), Topaz (Althouse and Meade 2014), and DSL (WEST 2016a). CVSR and Topaz are located in San Luis Obispo County, California, and have rated capacities of 250 and 550 MW, respectively; DSL is located in Riverside County, California, and has a rated capacity of 550 MW. Prior to 2016, CVSR and Topaz were the only two PV solar facilities with at least one year of publicly available, standardized avian fatality monitoring data. Both of these projects are located in a predominantly agricultural and grassland setting approximately 300 mi from the Palen project. In contrast, the DSL project is located in a desert environment approximately 10 mi from the Palen project. Thus data from the DSL project is likely most relevant to inferring fatality risk to birds and bats at the Palen project. For clarity, the term “detection” will be used herein to describe discovery of any carcass, partial carcass, feather spot, or injured birds as part of a standardized search, or an incidental discovery.

Few bat fatalities have been detected during systematic monitoring. For example, no bat fatalities were reported during the first year of standardized monitoring at DSL; three bats were discovered incidentally within the facility prior to initiation of operations, and all three were associated with buildings or fences (WEST 2014b, 2016). No bats were discovered during monitoring at CVSR (H. T. Harvey & Associates 2014). A single bat was detected incidentally at Topaz, however, it was discovered upon opening a shipping container for the first time, and was identified as a non-native species, and thus not attributable to the Topaz project (Althouse and Meade 2014). Although bat fatalities have been rare at a small number of studies at PV facilities, it should be noted that none of those facilities collected bat use data. Thus, it is only possible to infer that if bat use at the three sites discussed herein and the Project are similar, we would expect a similarly low number of bat detections.

During weekly post-construction monitoring at all elements (e.g., arrays, fences, overhead lines, background mortality references sites, and evaporation ponds) of CVSR, there were 368 detections. The most frequent bird type (taxonomic group) observed was passerines (56%), followed by doves and pigeons (30%). Only one water-associated bird detection was discovered (American coot) during the 12-month period analyzed and it was found during standardized searches under the gen-tie line, away from solar arrays. The most frequently found individual species were mourning doves (*Zenaida macroura*; 30%), horned larks (26%), house finches (14%), and western meadowlarks (*Sturnella neglecta*; 7%). There were a total of 4 raptor detections, including one red-tailed hawk (*Buteo jamaicensis*) and two American Kestrels (*Falco sparverius*) among the arrays, and one red-tailed hawk under the gen-tie. Of the 368 detections reported in the study, only 5 were sensitive species with potential to occur at the Project: two burrowing owls (*Athene cunicularia*) among the arrays, one burrowing owl under the gen-tie, and two loggerhead shrikes (*Lanius ludovicianus*) under the gen-tie. Overall, the majority of detections on regular weekly surveys occurred in the sampled arrays (approximately 55%). An adjusted fatality estimate (using Huso 2011) was only provided for a single array sampling unit, which was monitored for the entire year. Given the relatively small portion of the facility represented by one array sampling unit, it is difficult to interpret an estimate for that sampling unit in the context of an entire facility (e.g. the Project). See H.T. Harvey and Associates (2014) for additional details.

At Topaz, 66 bird fatalities were detected during the 12-month monitoring period analyzed (41 during surveys, and 25 incidental), with carcasses found in construction areas (prior to operations), reference sites outside of the facility, energized arrays, energized power equipment, and linear features (e.g., fences and overhead lines). Six fatalities were domestic chickens (*Gallus gallus domesticus*) from adjacent private land, likely brought into the project by a canid and thus not attributable to the project (Althouse and Meade 2014). Passerines constituted the largest percentage (33%) of the 60 fatalities potentially attributable to the project, followed by corvids (22%) and doves/pigeons (20%). The most frequently found individual species were common ravens (22%), horned larks (20%), and mourning doves (12%). Only 7% (four detections) of the birds found were water-associated birds and those were found in construction areas, along a road, or in a water retention pond. There were no detections of diurnal raptors during the study period. A single burrowing owl (*Athene cunicularia*) was the only sensitive species discovered during the study, with potential to occur at the Project. Of the 41 detections found on regular surveys, 34% of birds were found among arrays, 64% within reference sites, and 2% were found under overhead lines. The monitoring design implemented during the Topaz study precluded the estimation of fatalities adjusted for searcher efficiency, carcass persistence, and searched area using a typical fatality estimator (e.g. Huso 2011); thus, no fatality estimates are presented.

The first year of standardized monitoring at DSL which, like the Project, is situated in a desert habitat at a distance of 10 mi from the Project, was completed in February 2016 (WEST 2016a); 149 avian detections were recorded. Water-associated birds were the most frequently discovered species guild within sampled arrays during standardized searches, with 36 detections (52%), followed by passerines with 16 (23%). The most common water-associated birds observed were grebes (36% of water- associated birds in the arrays including western [*Aechmophorus occidentalis*], eared [*Podiceps nigricollis*], and pied-bill grebe [*Podilymbus podiceps*]), American coot (16%), common loon (*Gavia immer*; 7%), ruddy duck (*Oxyura jamaicensis*; 5%) and sora (*Porzana carolina*; 5%). A single diurnal raptor detection was found during monitoring, a cooper's hawk (*Accipiter cooperii*) among the arrays. There were three detections of sensitive species with any likelihood of occurring at the Project: two loggerhead shrikes (*Lanius ludovicianus*) among the arrays, and one vesper sparrow (*Pooecetes gramineus*) under the gen-tie. Of the 149 detections, 66% were found among arrays, 28% were found under the gen-tie, 2% were found at project buildings, and 5% were found along the fence.

The estimated density of fatalities for the DSL project components within the fence (solar arrays and fence) was approximately 0.19 fatalities/acre/year, or 1.05 fatalities/MW/year, which translates to an estimated 579 (90% confidence interval 485 - 860) fatalities within the facility during the first year of monitoring. The estimates of water-associated birds and passerine fatalities were nearly the same for the solar arrays (270 and 243 detections, respectively), with an estimated density of 0.07 and 0.06 birds/acre/yea, respectively. Estimates for other species guilds (e.g. doves/pigeons, corvids, etc.) were generally fewer than 10 birds, with the exception of doves and pigeons (22 detections). In other words, despite finding more water-associated bird carcasses or feather spots, the estimated fatalities per acre, per year for water-associated birds was similar to the rates for passerines because most water-associated birds are large-bodied animals that persist longer than small passerines, and are detected at relatively high rates within the solar arrays compared to small songbirds. Along the 20 mile gen-tie line, there were an estimated 1,022 (90% confidence interval 478 – 2,743), or 51 (90% confidence interval 23.9 – 136.7) birds per mile; however, the majority (59%) of detections along the gen-tie were either the result of predation or could not be associated with a specific cause. Given the uncertainty related to cause and the large confidence intervals associated with the gen-tie line estimate, it is difficult to infer the magnitude of gen-tie risk to avian species from the DSL gen-tie estimate, generated from a single year of data.

The most frequently detected species guild differed between the two grassland/agriculture projects and the desert project. At CVSR and Topaz, passerines were the most frequently detected species guild whereas at DSL waterbirds were most frequently detected. Based on the sample of one desert project, it cannot be inferred that the pattern of waterbird fatalities would occur at the Project. However, similarly, it cannot be concluded that waterbird fatalities will not occur at the Project because the correlates of risk for waterbird fatalities have not been studied. The lake effect hypothesis (Kagan et al. 2014) has been suggested to explain past occurrences of waterbird fatalities at PV solar projects, but the hypothesis cannot be used to predict if waterbird fatalities will occur at a newly developed PV project. Based on the patterns observed at all three projects described above, it can be inferred that passerine fatalities will likely occur at the Project, but the number of fatalities cannot be predicted. However, based on the similarity in habitat at DSL and the Palen project, if collision risk is similar between the projects, and bird use or passage through the area are similar, similar numbers of passerine fatalities per MW or per acre could be expected.

3.2 Potential Impacts to Threatened and Endangered Species

No suitable breeding or wintering habitat for bird species that are listed by CESA or FESA occurs within or adjacent to the Project; however, four listed bird species have been incidentally observed at other utility-scale solar projects in California and/or may have the potential to migrate or disperse in the vicinity of the Project (USFWS 2016). These species include:

- Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*);
- Southwestern willow flycatcher (*Empidonax traillii extimus*);
- Least Bell's vireo (*Vireo bellii pusillus*); and
- Ridgeway's [Yuma Ridgway's] rail (*Rallus obsoletus yumanensis* [*R. longirostris y*]).

3.2.1 Observations from Existing Utility Solar Projects

3.2.1.1 Western Yellow-Billed Cuckoo

Western yellow-billed cuckoo detections have been found in or adjacent to desert scrub habitat in the Ivanpah Valley and eastern Riverside County (Davis 2015 personal communication; Beeler 2015 personal communication - as cited in USFWS 2016). The USFWS has noted that the western yellow-billed cuckoo may be susceptible to major storms during migration (79 FR 19860). Two detections of western yellow-billed cuckoos have been noted to date at concentrating solar power facilities in California (USFWS 2016). These records occurred at Ivanpah Solar Electric Generating System, during construction in July 2012, and Genesis Solar Project, during operations in June 2015 (Davis 2015 personal communication; Beeler 2015 personal communication; WEST 2016a - as cited in USFWS 2016). The detection at Ivanpah was found outside of the facility fence, and the cause of death was unknown as site biologists found no evidence of trauma. The detection at Genesis was found in the power block (a facility feature associated with non-PV solar technology, which will not be present at the Project) and cause of death was not stated in the available information.

There is limited information regarding mortalities of western yellow-billed cuckoos at renewable energy facilities outside California (USFWS 2016). No mortalities of western yellow-billed cuckoos have been reported from renewable energy facilities in Nevada (Nicolai 2015 personal communication as cited in USFWS 2016). No mortalities of western yellow-billed cuckoos have been reported from solar PV facilities (Althouse and Meade 2014 [Topaz]; H. T. Harvey and Associates 2014 [California Valley Solar Ranch (CVSR)]; and WEST 2016b).

The closest known breeding habitat to the Project site is located approximately 35 miles away along the Colorado River (USFWS 2016). Migration stopover or dispersal habitat within the breeding range of the cuckoo is not fully understood; however, western yellow-billed cuckoos migrate across the desert and may use scrub habitat during migration (USFWS 2016). There have been no documented sightings of western yellow-billed cuckoos within the DRECP Development Focus Areas (DFAs; USFWS 2016).

3.3.1.2 Southwestern Willow Flycatcher

Willow flycatchers detections have been found at solar facilities and overhead powerlines in the California desert; however, none of the detections were identified as the listed southwestern willow flycatcher (personal communication Guigliano 2015; personal communication Dietsch 2015a; personal communication Dietsch 2015b; EDM International 2016 - as cited in USFWS 2016). There is limited information regarding mortalities of southwestern willow flycatchers at renewable energy facilities outside California (USFWS 2016). No mortalities of southwestern willow flycatchers have been reported from renewable energy facilities in Nevada (personal communication Nicolai 2015 as cited in USFWS 2016).

The closest known breeding habitat to the Project site is approximately 35 miles away along the Colorado River and adjacent to the Salton Sea (USFWS 2016). Southwestern willow flycatchers migrate through the Colorado Desert (USFWS 2016). Migrating willow flycatchers may use a wider range of habitats during migration than during breeding (Craig and Williams 1998 - as cited in USFWS 2016).

3.3.1.3 Least Bell's Vireo

There have been no reports of least Bell's vireos found dead or injured at renewable energy facilities; however, the USFWS has indicated that such incidents may have occurred but were not detected. (USFWS 2016).

The closest potential breeding habitat to the Project site is over 70 miles to the northwest in the Big Morongo Canyon (USFWS 2016). Least Bell's vireos are also uncommon breeders at the Anza Borrego Desert State Park, located approximately 70 miles southwest of the Project site (USFWS 2016). The subspecies Arizona Bell's vireo (V. b. arizonae) is not FESA-listed, but is CESA-listed as endangered, and is known to occur along the lower Colorado River, approximately 35 miles east of the Project site. Least Bell's vireos likely migrate through the Colorado Desert; however, there is little information on this species' migration behavior (USFWS 2016). It is presumed that this species may utilize patches of riparian habitat varying in size and possibly upland scrub habitat during migration (USFWS 2016).

3.3.1.4 Yuma Ridgway's Rail

Two detections of Yuma Ridgway's rails have been noted to date at solar facilities in California, one at the fixed PV Desert Sunlight Solar Project in Riverside County during construction in 2013 (cause of death unknown) and one at the single axis tracker PV Solar Gen 2 Project in Imperial County in 2014 (cause of death likely due to collision with chain link fence) (USFWS 2016). A live Yuma Ridgway's rail, observed to be uninjured, was recorded at the Blythe Solar PV Project during construction in 2015 (USFWS 2016). There is limited information regarding mortalities of Yuma Ridgway's rails at renewable energy facilities outside California (USFWS 2016). No mortalities of Yuma Ridgway's rails have been reported from known renewable energy facilities in Arizona or Nevada (personal communication Fitzpatrick 2015; personal communication Nicolai 2015 - as cited in USFWS 2016). No Ridgeway rails have been found during the two subsequent years of standardized monitoring at Desert Sunlight, or the first years of monitoring at the Blythe and McCoy projects.

The extent of dispersal or migration between populations is not well known (USFWS 2009b); therefore, is not possible to estimate when the rails would need to disperse with any degree of certainty. Outlier records across the desert (e.g.; Harper Dry Lake, East Cronese Dry Lake, and Desert Center) at great distances from known breeding areas suggest some degree of movement has historically occurred (USFWS 2016). The triggers for movements appear to be the need to find suitable habitat, the need to find mates, and/or the need to locate food (Eddleman 1989 as cited in CEC et. al 2014). Eddleman (1989 as cited in USFWS 2009b) suggested that availability of suitable habitat and food sources, specifically crayfish on the Lower Colorado River may influence the rail's need to disperse. Similar conditions and circumstances may be applicable to the population at the Salton Sea, where a large portion of a recent decline in the population from 2007 to 2014 appears to have been due largely to lack of sufficient water and routine maintenance to support suitable breeding conditions at the Imperial Wildlife Area (USFWS 2009b; personal communication Riesz 2015 - as cited in USFWS 2016).

It is currently presumed that a majority of the Yuma Ridgway's rail on the Lower Colorado River and Salton Sea do not migrate but rather remain in the general area year-round (AZGFD 2001, USFWS 2009b, CEC et. al 2014); however, if the Yuma Ridgway's reaches a population size at which individuals seek suitable habitat outside of the Salton Sea or Lower Colorado River, dispersing rails may seek refuge at area ponds. The potential for transient individuals, particularly dispersing birds, to fly to or over the Project in an attempt to find suitable habitat, over the operational life of the Project, does exist, which could provide an opportunity for transient individuals to be affected.

3.3 Summary of Potential Risks to Bird and Bat Species

Potential risks to listed birds that were initially associated with the previously proposed PSPP and PSEGS included evaporation ponds, entanglement with netting, and solar flux; however, the Project would not involve solar thermal technology, and subsequently, would not involve solar flux, evaporation ponds, netting, or highly reflective heliostats. If listed species were to occur in the Project vicinity, potential impacts include those described in Section 3.0 (Impacts to Birds): habitat loss, noise, lighting, or direct mortality from collisions or electrocution. Additional discussion with regard to listed birds is provided below.

As concluded by the USFWS (2016) assessing all DFAs (over 388,000 acres) within the LUPA, loss of habitat would not likely adversely affect migration of listed species primarily because affected habitat would not include essential breeding habitat (i.e., riparian or marsh), loss of habitat would comprise less than 1% of the total land within the LUPA, and solar facilities would not impose a substantial barrier to individuals during migration or preclude their movement across the desert.

Above-ground infrastructure that may add to collision risk includes solar panels, meteorological towers, power lines, fences, buildings, and large equipment. The Project would consist of PV technology and would not involve collision risks associated with turbines, heliostats, or power towers. Due to their expected rarity of occurrence within the Project vicinity, the potential for listed birds to collide with Project infrastructure would likely be less than other migratory or resident bird species. Electrocution may occur if birds encounter aboveground, electrified powerlines including the gen-tie line; however, with regard to these the four listed birds, electrocution potential is extremely low due to their narrow wing span thus limiting the risk of the birds touching two electrified phases.

Southwestern willow flycatcher, least Bell's Vireo, and yellow-billed cuckoo are known to migrate at night. Yuma Ridgway's rail dispersal behavior is less understood, but this species is also thought to migrate at night. Artificial lighting may serve as an attractant when deployed on artificial structures (e.g., communication towers and offshore oil platforms), which can result in night-migrating birds colliding with these structures (Poot et al. 2008, Gehring et al. 2009, Kerlinger et al. 2010 – as cited in WEST 2017a). During construction, artificial lighting typically includes lights from construction vehicles when and if construction occurs during the overnight hours, lights on structures (e.g., office trailers), parking areas, site security facilities, and possible lighting associated with project roads. During operations, artificial lighting typically includes lights on buildings and site security facilities.

Three agricultural ponds are located on the date plantation to the northwest with a single operational pond located just over one mile west of the Project. Kagan et al. (2014) and other studies (Argonne and NREL 2015, WEST 2014b) have inferred that the presence of open water ponds in the vicinity of PV facilities having documented waterbird fatalities may have influenced the results, identifying a smaller percentage of water bird mortality at other solar facilities without open water available to waterfowl and shorebirds. Kagan et al. (2014) suggested a link between PV panel-related impact trauma and predation of birds that make their primary habitat on water and Argonne National Laboratory (Argonne) and the National Renewable Energy Laboratory (NREL; Argonne and NREL 2015) further suggested waterfowl that are more dependent on water for their landing surface, such as grebes, coots, and loons, are more likely to be susceptible to collisions with solar panels. Waterfowl may also undergo stress, dehydration, hyperthermia, or predation if unable to take off.

The hypothesis that bird species might interpret solar facilities as water has been proposed by Kagan et al. (2014), Walston et al. (2015), and Huso et al. (2016); thus, further emphasizing the concerns related to injuries and deaths of birds because water-dependent birds may not be able to take off after landing, as they are adapted to take off from water, not dry land, and/or because they may suffer injuries from the collision with solar arrays.

The Project would use a tracking system that would move the solar panels throughout the day, rather than fixed panels as was the case at the Desert Sunlight Solar Project, which may reduce the likelihood of adverse effects resulting from the lake effect hypothesis, should the hypothesis prove correct. A nighttime stow angle (position of the modules) would be similar to the morning position, between approximately 45 and 60 degrees facing east. Modules would never face directly south, which may further reduce the likelihood of adverse effects resulting from the lake effect hypothesis for bird migration occurring in the south-to-north direction.

Ultimately, existing data are inconclusive with respect to supporting or refuting the lake effect hypothesis. Further studies are needed to explore the lake effect hypothesis in terms of the causal mechanisms and how birds perceive solar energy facilities (WEST 2017b). Additional discussion on the lake effect hypothesis is included in the technical memorandum prepared for the Project and attached hereto as Appendix I (WEST 2017b). Data from three publicly available studies at PV solar facilities suggest that avian fatalities were generally distributed across numerous species, typically passerines, doves, and pigeons (Section 3.1.4). No water-associated bird fatalities were discovered among arrays at two of the three sites, CVSR and Topaz (H. T. Harvey and Associates 2014; Althouse and Meade 2014). Water-associated bird fatalities were discovered at the fixed PV Desert Sunlight Solar Project; however, overall estimates of water-associated bird mortality did not differ significantly from estimates of non-water associated bird mortality among arrays (WEST 2016b). Thus, it is difficult to predict how fatalities found at the Project may or may not resemble those found at DSL during the first year.

Limited information is available on the potential for bat collision risk at PV facilities; however, bat carcasses are uncommon at static structures such as communication and television towers (Crawford and Baker 1981). During the construction and early operations phases of DSL, three bat carcasses were found, including a pallid bat, a western mastiff bat, a Townsend's big-eared bat, and a California myotis (WEST 2014b). Cause of death was uncertain for these bats, but the carcasses were not located in the solar arrays; one was located near a transmission tower, another near the perimeter fence, and two near project buildings. No bats were found during the first year of standardized monitoring at the DSL facility. Bat carcasses were not discovered during systematic carcass searches for both birds and bats at the CVSR (H. T. Harvey & Associates 2014) or at Topaz (Althouse and Meade 2014). Although bats did differentiate a smooth metal surface from water in an experiment (Greif and Siemers 2010), the metal plates used in the experiment differ from the substrate and configuration of the solar panels proposed for the Project. Further, Grief and Siemers (2010) did not report bat casualties as part of their study, and bat carcasses could not be attributed to the solar array or were not detected during monitoring at other solar facilities. Thus, based on this limited data, risk associated with collision with the solar panels appears limited.

The predominant habitat type present in the Project site is creosote bush-white bursage (*Ambrosia dumosa*) desert scrub, a widespread habitat type in the Mojave Desert. O'Farrell (2009, 2010) conducted acoustic bat monitoring in similar habitat in the Mojave Desert and found that bat activity recorded over a two-year sampling period was an order of magnitude lower than areas sampled that contained attractant features (e.g., riparian corridors). Thus, the permanent removal of creosote bush-white bursage desert scrub is not expected to represent a loss of high quality bat foraging habitat. Further, as documented by O'Farrell (2009, 2010), 96% of the bat activity was represented by four common and widespread species in the Southwestern US. Thus, the species most likely affected by habitat removal for the Project are common species. As construction will take place during the day, it is not expected that normal bat activity patterns, such as movement between roosting and foraging areas, will be disturbed by construction traffic or noise associated with construction activities.

4.0 CONSERVATION MEASURES

Palen Solar III, LLC has designed the Project and will implement avoidance and minimization measures in the construction and operations phases to avoid and minimize Project-related bird and bat injury and fatalities. Implementation of a number of Conditions of Certification/MM is required to comply with the BLM ROW Grant issued for the Project. To avoid duplication, specific plans pertaining to monitoring, management, and control of resources during construction and operations are referred to within this document.

4.1 Project Design

4.1.1 Utility Poles and Lines

In order to minimize impacts on birds, the utility lines have been designed to prevent bird injury and fatalities due to electrocution. Utility lines will be built following Avian Power Line Interaction Committee (APLIC) Guidelines (APLIC 2012) to minimize electrocution and collision. The APLIC Guidelines include recommended distances that phase conductors should be separated as a minimum of 152 centimeters (cm; 60 inches), or the use of specifically designed avian protection materials in areas where this distance is not feasible (APLIC 2012). The 230-kV transmission line transformers will be more than 152 cm apart, thus minimizing the risk for electrocution of golden eagles and other large raptors. To further minimize impacts to birds, structures will be monopole or dual-pole design versus lattice tower design to minimize perching and nesting opportunities.

4.1.2 Lighting

The Project will be designed to minimize lighting, as required by PSPP MM BIO-8 (SEIS measure VEG-8) and in accordance with Condition of Certification VIS-3. To the extent feasible consistent with safety and security considerations, all permanent exterior lighting and all temporary construction lighting will be designed to minimize night-sky impacts to the extent practicable during construction and operations. In particular: a) lamps and reflectors are not visible from beyond the project site, including any off-site security buffer areas; b) lighting does not cause excessive reflected glare; c) direct lighting does not illuminate the nighttime sky; d) illumination of the project and its immediate vicinity is minimized; and e) the plan complies with local policies and ordinances. Specific design features, as described in PSPP MM BIO-8 (SEIS measure VEG-8), include the following:

- Low-pressure sodium light sources will be used to reduce light pollution.
- Full cut-off luminaires will be used to minimize uplighting.
- Lights will be directed downward or toward the area to be illuminated.
- Light fixtures will not spill light beyond the Project boundary.
- Lights in highly illuminated areas that are not occupied on a continuous basis will have switches, timer switches, or motion detectors so that the lights operate only when the area is occupied.
- Where practicable, vehicle mounted lights will be used for night maintenance activities.
- Where practicable, consistent with safety and security, lighting will be kept off when not in use.

4.2 General Avoidance Measures and Management Practices

The Project will implement several measures to reduce or avoid potential Project impacts on birds and other wildlife during construction and operations.

Speed Limits. To minimize the likelihood for vehicle strikes of wildlife during construction and operations, and the occurrence of carcasses that may attract eagles, ravens, or other scavengers, a speed limit of 40 km per hour (kph; 25 miles per hour [mph]) has been established for travel on all dirt Project access roads. Signs are posted at appropriate locations (as required by PSPP MM BIO-8, or SEIS measure VEG-8).

Trash Abatement. During construction and operations, all trash and food-related waste is contained in secure, closed lid (raven- and coyote- [*Canis latrans*] proof) containers to reduce the attractiveness of the site to opportunistic predators, such as common ravens and coyotes, and to prevent trash from being exposed or blown around the Project. During construction operations, all trash will be removed on a daily basis (as required by PSPP MM BIO-8, or SEIS measure VEG-8).

Minimize Disturbance Impacts. Equipment and vehicle travel is limited to existing roads or specific construction pathways during construction. Construction traffic, parking, and lay-down areas occur within previously disturbed lands to the extent feasible (as required by MM BIO-8, or SEIS measure VEG-8).

Worker Environmental Awareness Program (WEAP). A site-specific WEAP informs Project personnel about biological constraints of the Project. The WEAP is presented by a Project biologist and all Project personnel must attend the training prior to working on-site. The WEAP includes information regarding sensitive biological resources, restrictions, protection measures, individual responsibilities associated with the Project, wildlife incident reporting procedures, and the consequences of non-compliance. Written material is provided to employees at orientation and participants sign an attendance sheet documenting their participation (as required by PSPP MM BIO-6, or SEIS measure VEG-6).

Minimize Standing Water. The minimal amount of water needed is applied to dirt roads and construction areas (trenches or spoil piles) for dust abatement to meet safety and air quality standards in an effort to prevent the formation of puddles, which could attract birds and other wildlife (as required by PSPP MM BIO-8, or SEIS measure VEG-8).

Dispose of Road-Killed Animals. During construction and operations, road-killed animals or other carcasses detected by personnel within the Project are reported and removed promptly. Appropriate permits are obtained prior to the removal of road kill (as required by PSPP MM BIO-8, or SEIS measure VEG-8).

4.3 Other Avian-Specific Measures

Golden Eagle Monitoring. The potential impacts of the Project on golden eagles will be monitored through annual inventory surveys during construction within two mile of the Project. If surveys indicate that golden eagles are nesting within two mile of the Project, Palen Solar III will produce and implement a Golden Eagle Monitoring and Management Plan per PSPP MM BIO-25 (SEIS measure WIL-11).

Burrowing Owl Relocation and Mitigation. The potential impacts of the Project on burrowing owls will be minimized through the implementation of the Project's Approved Burrowing Owl Relocation and Mitigation Plan (as required by PSPP MM BIO-18, or SEIS measure WIL-9).

Nest Avoidance. For construction that occurs February 1 through July 31, Palen Solar III will conduct nest surveys prior to initiation of construction activities to locate nesting bird species, in accordance with PSPP MM BIO-8, BIO-15, and BIO-16 (SEIS measures VEG-8, WIL-6, and WIL-7). Nest surveys will occur within 4-7 days prior to construction activities. On the day construction/maintenance activities commence, an additional walk-through of the immediate construction/maintenance site will be conducted. If nesting birds are observed, biologists will implement the avoidance measures, as outlined below, and details of which can be found in the Nesting Bird Monitoring and Management Plan:

- If active nests (nests with eggs or young) or suspected active nests are discovered in the construction, the Applicant will establish appropriate buffer distances, as determined by methods set forth in the Nesting Bird Management Plan.
- The DB will monitor the nest until he or she determines that nestlings have fledged and dispersed; activities that might, in the opinion of the DB, disturb nesting activities, will be prohibited within the buffer zone until such determination is made.

Nest Management. Birds may utilize Project facilities for nesting. Any bird nests found will not be touched until the DB is consulted. If a nest is found, the DB will check the nest for activity. Nests that contain eggs or young are considered active and are protected for species listed under the MBTA. Therefore, active nests will be left in place and standard nest buffers will be established consistent with Table 4 (Buffers for Horizontal and Vertical Ground and Helicopter Construction) in *West of Devers Upgrade Project: Nesting Bird Management Plan* (California Public Utilities Commission 2015). Under certain circumstances, nest buffers may be adjusted by the DB after the following factors have been evaluated: species, protected status, nest location, bird behavior, disturbance tolerance, and nature of proposed disturbance. Modified buffers must adequately protect active nests so that nesting activity is not adversely affected by construction or operational activities. The nest buffer will be sufficiently marked in the field.

If the safety of the migratory birds, nest, or eggs is at risk or the migratory birds, nest, or eggs pose a threat to serious bodily injury or a risk to human life, including a threat of fire hazard, mechanical failure or power outage, the Project will consult with the BLM Authorized Officer, CDFW, and USFWS if an active nest or a nest belonging to an eagle or threatened or endangered species is found. Nests that are confirmed to be inactive (i.e., do not contain eggs or young), do not belong to eagles or other threatened or endangered species, and that will cause operational problems, will be removed.

Raven Monitoring, Management, and Control. The risk of attracting common ravens to the Project, which could result in increased predation pressures on prey species, will be controlled through implementation of the Common Raven Monitoring, Management, and Control Plan (as required by PSPP MM BIO-13, or SEIS measure WIL-5).

Incidental Mortality Monitoring During Construction and Operations. During construction and operations, onsite personnel will notify the DB when an injured or dead bird or bat is observed. The Project will implement a Wildlife Incident Reporting System (WIRS) at the start of construction, and it will remain active for the life of the Project. The purpose of the WIRS is to standardize the actions taken by site personnel in response to wildlife incidents encountered at the Project and to fulfill the obligations for reporting wildlife incidents. The WIRS will be utilized by site operations and maintenance personnel who encounter dead or injured wildlife incidentally while conducting general facility maintenance activities. The WIRS is designed to provide a means of recording and collecting (but only if the appropriate permits such as a SPUT permit have been previously obtained) fatalities at the Project to increase the understanding of solar panel and wildlife interactions. Data collected for detections found via the WIRS will be comparable to that collected during standardized monitoring (see section 5.2.5).

During the standardized post-construction monitoring studies, any carcass found incidentally by site operations and maintenance personnel will be reported to the contractor conducting the post-construction monitoring studies so that the contractor can process the carcass (see Appendix H for example of standard WIRS reporting form). Additionally, injured wildlife found within the Project may be taken to the nearest appropriate wildlife rehabilitation facility (see Section 5.3). Any incident (i.e., mortality or injury) involving a federally listed threatened or endangered species or a bald or golden eagle must be reported to the USFWS within 24 hours of identification. Palen maintains an ongoing commitment to investigate wildlife incidents involving company facilities and to work cooperatively with federal and state agencies in an effort to prevent and mitigate future bird and wildlife fatalities. It will be the responsibility of employees of the Project and subcontractors to report all avian incidents to their immediate supervisor.

After the formal monitoring program has concluded, operations and maintenance personnel will trained and instructed to complete a wildlife incidental reporting form for all injured or dead wildlife that are found on or near Project facilities. This incident form will include, but not be limited to, the following information: date, time, weather, observer, location, habitat description, photographic documentation (including scale), and description of fatality (i.e., condition, any/all observations). Incident reports will be entered into a spreadsheet or searchable database. All incident reports will be reviewed for quality control issues by the site supervisor and periodically by Palen's environmental manager. Upon request, Palen will also periodically provide summary reports of all incidental finds to the USFWS

Standardized Reporting as Requested by USFWS. At the request of USFWS, Palen Solar III will obtain a SPUT Permit and abide by the reporting requirements of the permit.

5.0 POST-CONSTRUCTION MONITORING

This section outlines a standardized approach to document known and projected bird and bat fatalities and injuries, and to estimate seasonal and annual post-construction fatality rates associated with Project features. Post-construction monitoring builds on standards and guidelines developed for the electric-utility and renewable-energy industries to quantify the risk of fatality and injury for birds and bats that may result from interactions with energy-related infrastructure (e.g., Anderson et al. 1999; APLIC 2005, 2006, 2012; CEC and CDFG 2007; USFWS 2010, 2012; Huso et al. 2016b). This section of the BBCS outlines a statistically sound spatial and temporal sampling design, including protocols for independently estimating and correcting for quarterly searcher-efficiency and seasonal (i.e., at least quarterly) scavenger (avian and mammalian) removal rates. It describes specific data to be collected during scheduled carcass searches, protocols for handling any dead or injured birds and bats that are found, and procedures for reporting incidents to relevant government agencies.

5.1 Goals and Objectives

Primary goals of the post-construction fatality monitoring program are to:

1. Estimate overall annual avian and bat fatality rate and species composition associated with the Project infrastructure. This estimate will include mortality associated with solar arrays, overhead lines including the gen-tie, perimeter fence, and other features of the Project that may result in injury and fatality.
2. Determine whether there are spatial and temporal/seasonal patterns of mortality associated with project infrastructure (e.g., different fatality rates near panels on the edge of the arrays versus the interior area of the arrays).
3. Provide information that will assist the BLM, in consultation with the USFWS and CDFW, in understanding which species and potentially which regional populations are at risk.
4. Collect data in such a way that the BLM, in consultation with the USFWS and CDFW, may make comparisons with other solar sites.

These goals are structured in a way that provide information on seasonal differences in fatality rates, and information about which taxonomic groups are most vulnerable. Fatality estimates will be adjusted to address carcass persistence and searcher efficiency as they change through seasons. Additionally, carcass persistence trials will inform search intervals.

Consistent with the above goals, the specific objectives of post-construction monitoring are as follows:

1. Conduct fatality searches for a minimum of two years according to a spatial and temporal sampling plan that provides representative and statistically sound coverage of the solar arrays, consistent with monitoring required of other industries. The need for additional monitoring beyond the second year will depend on an evaluation

of the survey results from the first two years to determine if the goals of the monitoring program have been met. If other publicly available data are available, they will be reviewed to support the discussion on additional monitoring. The need to extend the monitoring period will be determined by the BLM in consultation with the USFWS and CDFW. Implementation of any agency required pre-monitoring meetings, training, and searcher efficiency/carcass removal trials may delay the start of monitoring after the BBCS is deemed final. Upon agency approval of the BBCS, but no sooner than construction is completed on a whole phase, composed of at least 50% of the entire project solar array field, post-construction monitoring (as outlined in Section 5.2) will begin on all sampled units that have been turned over from construction management to operations management and are transmitting power to the grid. The 2-year minimum monitoring period for each phase will start when monitoring starts on all blocks in that phase.

2. Conduct statistically sound, seasonal assessments to quantify and evaluate carcass persistence rates (i.e., carcass removal, destruction including dismemberment, or burial in sand due to scavengers, decay, or other abiotic [e.g., wind] or human-related [e.g., vehicle activity] factors) and support calculation of adjusted fatality rates that account for variation in carcass persistence by season and carcass type/size classes. These assessments will also be used to guide search intervals.

3. Use current, scientifically validated and accepted methods for calculating fatality rates adjusted for searcher-efficiency, carcass removal rates, and spatial and temporal sampling intensity. At present, the best methods are distance sampling combined with searcher efficiency and carcass persistence bias adjustments and a fatality estimator, such as the Huso (2011) estimator, but it should be noted that fatality estimation is an area of active research and 'best methods' are changing rapidly. Therefore, as data are collected, the study design and monitoring protocol may be adapted to reflect knowledge gained while implementing the current design. Study design adaptations will follow the process outlined in Section 7.0 (Adaptive Management).

4. Summarize the species composition of fatalities according to taxonomic family, and ecological guild (e.g., raptors, water-associated birds, passerines, etc.) to aid in understanding species or species guilds at risk.

5. To the extent possible, summarize the composition of fatalities according to their likely propensity to collide with Project components during the day versus during the night based on known migratory patterns for the particular species.

6. Aid in identifying potential fatality causes and correlates by including additional information that is readily available beyond that which is under the SPUT Permit, such as the weight of fresh whole birds, or summaries of preceding weather conditions which would have made migration likely (e.g., low pressure systems moving cross-continent to the north of the Project area, followed by periods of high pressure systems).

5.2 Monitoring Methods

A monitoring program will be implemented for at least two years post-construction as specified below. Survey results and analysis will inform adaptive management decisions regarding any additional appropriate and practicable Bird and Bat Conservation Measures to avoid, minimize, and/or mitigate for observed impacts.

5.2.1 Post-Construction Monitoring of Solar Arrays

The fundamental characteristics of a sampling program designed to produce valid estimates of fatality rates for a PV solar facility (including the number of arrays to be searched, the search interval, the seasonal extent of coverage, and the number of years of sampling) are determined based on several factors. These factors include the questions of interest, the species of interest (e.g., resident, migratory, and/or wintering species) in the Project area, desired precision, best estimates of carcass-removal rates, searcher efficiency, the Project size and layout, and other relevant environmental (i.e., seasonal patterns), landscape, and habitat characteristics.

The following hierarchical terminology is useful for describing the spatial and temporal sampling design used to monitor solar panels:

1) Panel Cartridge: An engineered assembly of solar panels installed as a single unit.
2) Row: A collection of panel cartridges arrayed side-by-side on a common, linear support structure.
3) Array: A collection of approximately 25 rows of trackers that represent one-fourth of a typical block; dimensions are typically uniform within arrays, but may vary slightly among arrays. In most cases, arrays comprise structurally continuous rows surrounded by an unpaved road.
4) Block: Collections of commonly energized arrays each approximately 8,046 panels, separated in four quadrants. There will be a total of approximately 200 blocks.

5.2.2 Survey Strategy

Sampling strategies used in carcass searches have typically involved transect sampling, whereby searchers walk or drive along pre-defined transects and search for carcasses in a swath where width depends on visibility, target taxa, and other factors. The layout of PV facilities presents problems for a transect-sampling approach because rows of panels are close together (i.e., less than 5 m [16 ft] at the Project). Because the panels track the sun, a searcher walking or driving a transect between two rows can only effectively search one side of the transect (a 2.5-m [8.2-ft] swath) in the morning, and the other side is obscured by the edge of a PV cartridge; the other side of the transect would need to be searched in the evening when the panels were in a different position. However, traveling perpendicular to panel rows along the edges of the rows allows observers to see a greater distance of the ground beneath the panels. Surveyors will drive the lines in vehicles or walk, depending on visibility conditions and the safety/logistics of driving within the array field. Survey methods (driving or walking) will be evaluated with the BLM and USFWS pending final facility design. Searcher efficiency trials will be conducted and monitored to identify potential issues with the survey method. Other accommodations may be required to enable completion of surveys during high temperatures, such as shifting surveys to dawn and dusk.

The layout of PV facilities is often well-suited to a distance-sampling approach. Distance sampling involves searching a transect line and assumes that searcher efficiency decreases (possibly dramatically) as a function of distance from the observer, and is ideally suited to situations in which animals (or carcasses) are sparsely distributed across a landscape (Buckland et al. 1993). If the landscape at the Project is flat and relatively clear of vegetation, a distance sampling design is well supported, as demonstrated at other PV solar facilities (WEST 2015, Huso et al. 2016b).

Distance sampling adjusts carcass counts for variable searcher efficiency by calculating the *effective* searcher efficiency along a transect. Effective searcher efficiency is the average probability of detection in the searched area, derived from the detection function. As a highly simplified example, if a searcher walks a 10-m (33-ft) long transect line and detects 90% of all carcasses within 10-m of the line, and 60% of carcasses that are 10 to 30 m (33 to 99 ft) from the line, then the effective searcher efficiency between zero and 10 m would be 0.9 and the effective searcher efficiency between 10 and 30m be 0.6. For the total 10 by 30-m area, the effective searcher efficiency would be

$$\frac{0.9 + 0.6}{100\,m^2 + 200\,m^2} = 0.5.$$

In practice, searcher efficiency is modeled as a continuous function of distance, and the detection function can be estimated from the carcass data or a bias trial. The searcher efficiency bias trials can be used to augment or replace carcass data for the detection function. An advantage to the use of data from bias trials is that the assumption that carcasses are randomly distributed within the search area (typical of most distance sampling designs) becomes unnecessary. An advantage to a data-driven detection function is that it is not necessary to specify a transect width: the detection function includes information about the distance at which searcher efficiency drops to near zero. The detection function is used to determine the overall probability of detection as well as to inform the approximate effective view shed of non-zero detection probability for observers.

5.2.3 Spatial Sampling Design

Under the proposed sampling plan, precision is expected to vary based on carcass detectability: less precision is expected for estimates of small-bird fatality compared to estimates of large-bird fatality. The sampling design is based on similar designs utilized at DSL, Blythe (WEST 2016b), and McCoy (WEST 2016c) solar projects, and is consistent with guidance provided in Huso et. al (2016). The monitoring plan will encompass approximately 40% of the completed solar arrays as summarized in Table 9.

Table 9. Solar array sampling area characteristics.

Total fenced area	1,700 ha
Solar field	1,659 ha (approximately 200 2.5-MW blocks)
Proportion sampled	40% ± 2%
Sampling unit	~8.3-ha, spatial equivalent of 1 block
Number of sampling units	Approximately 80
Migration season search interval (March 1 thru May 31, September 1 thru October 31)	7 days unless adjusted by BLM and wildlife agencies based on results carcass persistence trials
Non-migration season search interval (June 1 thru August 31, November 1 through Feb 28/29)	21 days unless adjusted by BLM and wildlife agencies based on results of carcass persistence trials
Anticipated surveys per year	Approximately 31 surveys
Duration of sampling	Minimum 2 years

Because both the presumed layout of the solar arrays and the landscape of the Project (i.e., mostly flat and free of vegetation) are largely uniform, a relatively simple random sampling design is likely to be adequate for sampling the arrays. However, in the absence of data, a spatially balanced sampling design will be used. Samples will be selected in a stratified random design to ensure a spatially balanced sampling design and an approximately 40% sample of each type of array. Because spatially balanced designs ensure that sample effort is distributed over the whole study area, they help to ensure that spatially organized trends in mortality (should they exist) can be extracted from the data. The drivers of spatial variation in avian activity may be important to the statistical sampling design if avian use patterns affect the distribution of mortalities on the Project site. As an example, factors that may affect avian use patterns include: 1) habitat variation around the Project site; 2) the possibility that distinct movement corridors variably concentrate birds over certain areas of the Project site (e.g., migrating or commuting water-associated birds); or 3) use of distribution lines (and other gen-tie line infrastructure) as roosting sites. Distribution lines within the solar field may also pose a collision risk to birds. To achieve spatially balanced sampling, the site will be divided into seven approximately equal-sized sampling areas and sampling will be stratified among those areas.

The sampling units for the surveys consist of areas equivalent in size to four sub-arrays. Within sampling areas, individual sampling units will be randomly selected to compose a 40% sample (± 2%). Sampling units will be surveyed from the outer edges of sub-arrays (collections of continuous solar panel rows) and scan between each row for fatalities, with each side-specific survey covering at least half the width of the sampling unit, depending on the length of the row. Observers will drive along east-west roads that bisect sampling units and scan left (out of the driver's window), and then turn around at either an inverter or main road where space allows. The observer will look left on the return trip, searching the opposite side of the unit. However, alternatively, to potentially reduce the risk of vehicle incidents, the observer may survey the unit from the south looking north, and then drive to the north side of the unit and survey looking south. Most sampling units are planned to consist of four sub-arrays, each forming a structurally continuous unit composed of approximately 25 panel rows of panel strings. In these cases, two east-west routes will comprise the sampling-unit survey, with each route involving scanning across the entire length of a single subarray row (Figure 12). Distance sampling and resulting data will be used to calculate detectability curves to calculate the average detection probabilities, and taking into account the potential for different detection curves depending on the direction of the survey view shed.

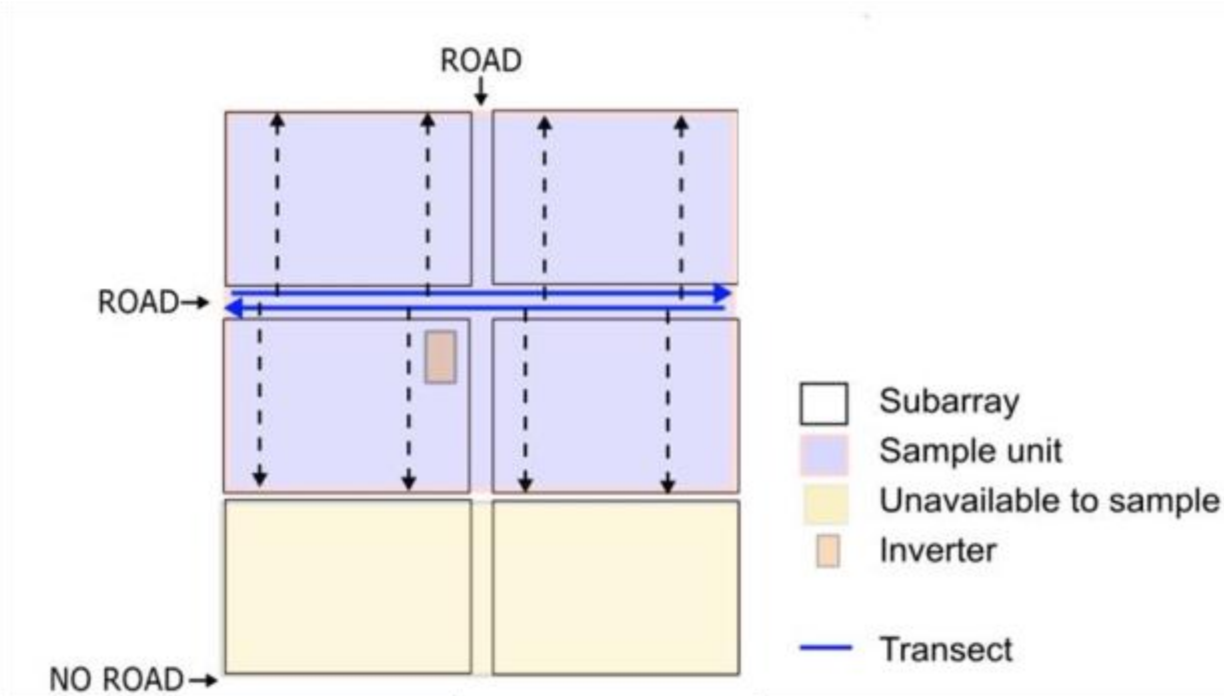


Figure 12. Example illustration of generic photovoltaic sampling unit and perimeter survey with travel routes and search areas ("observation perspectives").

This survey design reflects two concerns:

1. Minimizing movement between rows of solar panels. Because the area between electrified panel rows is an area of elevated risk, best practices dictate that personnel do not enter elevated risk zones unnecessarily; and
2. Achieving an effective balance between logistic efficiency and sampling rigor given the constraints of transect spacing due to the width of panel rows.

Not being able to detect most small-sized to many medium-sized carcasses over a substantial portion of the solar facility would comprise a problematic bias if the probability of carcass occurrence was non-random within arrays (i.e., within sample units). In other words, the bias would create a problem for achieving representative sampling if the probability of mortality due to panel collisions varied in some predictable fashion relative to the distance from array edges, or if there was a tendency for fatalities to be clustered in the interior of the panel areas.

On this basis, fatality sampling will proceed using distance-sampling survey techniques and analytical methods, which include estimating and accounting for distance-related variation in the probability of detection based on the carcass data and bias trial data. In addition, searcher- efficiency trials that are tailored to include evaluating the influence of distance on the probability of detection will be conducted to ensure that searcher efficiency can be calculated.

5.2.4 Temporal Sampling Design

The appropriate frequency of fatality surveys depends on the species of interest and average carcass persistence times (Smallwood 2007, Strickland et al. 2011, USFWS 2012). Large birds, and to a greater extent raptors, tend to persist and remain detectable for extended periods (weeks to months) due to low scavenging rates and relatively slow decay rates. If only large species were of interest, extended search intervals of 20-40 days might be appropriate; however, some small and medium-to-large sized birds may disappear at faster rates, so shorter search intervals are required to ensure effective documentation of fatality rates among these species.

Publicly available data from three wind energy studies in the nearby Mojave Desert region of California and western Arizona provide additional, relevant insight (Chatfield et al. 2009, 2010; Thompson and Bay 2012). These studies recorded average persistence times of 17.5-46.8 days for large birds (average 29.0 days, median 22.6 days) and from 5.6-17.4 days (average 9.9 days, median 6.5 days) for small birds. If the median carcass-persistence time for small- and medium-sized birds and bats on the Project site is low, a 7-day search interval may be required to effectively document fatality rates for small birds and bats. If, however, median small-sized bird and bat carcass persistence rates are greater than seven days, then a longer search interval may be more appropriate.

Based on these considerations and preliminary data, and based on the simulation analyses discussed previously, the search interval for fatality monitoring will be variable depending on season. Searches will be conducted every seven days during standard spring and fall migration periods (March 1 – May 31, and September 1 – October 31, respectively), and every 21 days during summer and winter (June 1 – August 31, and November 1 – February 28/29, respectively). After the first six months of fatality monitoring and concurrent carcass removal trials (see below) have been conducted, the search interval may be adjusted based on estimates of carcass persistence. Some migration for some species may occur outside these periods and this will be considered when evaluating the data regarding timing of mortality for species found as fatalities.

Adjusting fatality counts for carcass removal works best when the search interval remains constant through time (Huso 2011); however, within survey periods, season-specific estimates of carcass persistence can be calculated and incorporated in the overall estimation process when variable search intervals are used in different seasons (Shoenfeld 2004, Huso 2011). In addition, survey schedules will ensure that fatality surveys are evenly spaced in time to maximize detection of potential, unusual fatality events (Strickland et al. 2011). For these reasons, a standard schedule for completing the surveys has been developed, such that some surveys will occur during most weeks of the year and all sampling units are surveyed on a regular schedule, as dictated by the season.

Survey blocks will be added as phases of the Project become operational over the first year of monitoring. Specifically, blocks will be added in parallel with each phase being turned over to operations management, beginning with the first phase or phases covering at least 50% of the entire project solar array field. Monitoring at each sampled block in a phase will begin at the start of the season (as defined above) immediately following turnover to operations, to ensure monitoring effort is consistent within a season.

5.2.5 Survey and Data Collection Protocols

Fatality surveys will be conducted with the observers striving for a consistent pace/speed and approach, and a uniform search effort throughout the search. Searchers will use binoculars at their discretion to survey for carcasses between each row of panels. The Project has rigorous safety protocols in place that address heat and other safety issues. When a potential carcass is detected, the observer will immediately proceed down the row to confirm the detection and, if valid, fully document and bag it according to standard protocols (see below). Depending on the size and nature of the carcass, the observer will either immediately collect the carcass (smaller, easily collected and transported packages) or flag it for pick-up once the sampling-unit survey is completed (larger, messier, or otherwise complicated collections) or to identify it to species. All carcasses will be stored in freezers on-site until the BLM and USFWS determine the ultimate disposition.

All bird and bat injuries and fatalities discovered during, or incidental to, the standard carcass surveys will be documented according to the requirements and standards reflected in the USFWS Avian Injury and Mortality Reporting Form. The form is a reporting requirement of the USFWS Special Purpose – Utility (SPUT) Permit issued to the Project to authorize the handling of dead or injured birds. In addition, finds will be classified as a fatality according to standards commonly applied in California (Altamont Pass Avian Monitoring Team 2007, CEC and CDFG 2007). For detections that only include feathers, to be classified as a fatality, each find must include a feather spot of at least five tail feathers or two primary flight feathers within five m or less of each other, or a total of 10 feathers concentrated together in an area of three square m (1 m^2; 32 square ft [ft2]). Feathers with tissue still attached are considered a carcass detection, not a feather spot. Searchers will make their best attempt to classify feather spots by bird size according to the sizes or identifying features of the feathers. A separate fatality estimate will be made for feather spots for which size classification is impossible. Digital photographs will be taken to document all incidents in situ with a minimum 12-megapixel camera, showing the dorsal, ventral, and head area. When possible, plausible cause of death will be indicated on data sheets based on evidence (such as blood or fecal smears on solar panels, burns that may indicate electrocution, or blunt trauma that may indicate collisions). All carcasses will be examined and, where possible, cause of death will be recorded with some measure of certainty (e.g. observed, probable, possible, unknown, etc.). An avian biologist will make decisions on likely cause of death and this will be reviewed by the lead biologist overseeing the program. If a clear cause of death is not apparent, this will also be noted.

All fatalities will be assigned to a size class, a taxonomic family, and an ecological guild and weight categories (e.g., 0-100 grams; 101-999 grams; and 1,000+ grams). Species will also be classified as resident, overwintering, or whether they are diurnal or nocturnal migrants (or both). It is necessary to know size classes to appropriately correct for searcher efficiency and scavenging, and data about taxonomic family, ecological guild, and time of day when the species are typically active are relevant to the specific USFWS and Project goals of the post- construction monitoring plan (Plan).

To ensure accurate documentation of the fatality locations, the observer will record the array number, GPS coordinates in latitude/longitude of the carcass location using a handheld device accurate to ± 3.0 to 4.0 m (9.8 to 13.1 ft), and a measurement of the distance from the fatality location to the end of the panel row from which the carcass was detected. When an observer proceeds down panel rows to confirm and document detected fatalities, they may detect other fatalities that they did not observe based on the perimeter-only survey. Including such detections in the fatality estimate will bias estimation of fatality density based on application of standard distance-sampling analytical methodology. Therefore, all such supplementary detections will be classified as “incidental” finds (discussed further below). Carcasses that are found within standardized search areas but incidental to the distance sampling searches can be used as an additional validation of the detection functions; the detection function specifies the distribution of found carcasses, but it also specifies the distribution of missed carcasses, and incidentals should follow the latter distribution.

Data records for each survey will also include: 1) full first and last names of all relevant surveyors in case of future questions; 2) start and stop times for each individual sampling-unit survey; 3) a standardized description of the current habitat and visibility classes represented within each sampling unit; and 4) a description of any search-area access issues, if relevant. Data collected will also include all appropriate fields contained in the SPUT Permit.

Surveyors will record data for each detection on a standardized form. To conform to requirements from wildlife agencies, data collection will include:

- Surveyor name
- Discovery date and time
- A unique identification code

- Species
- Sex and age (if determined)
- Cause of death or injury (if determined)
- GPS waypoint of find (WGS84 datum)
- Nearest project component (PV array, power line, power line structure, building, fence, pond, materials storage, vehicle /equipment, other)
- Distance to nearest project component
- Distance to nearest PV panel
- Identifiers for photographs taken in situ (close and wide)
- Observed weather (% cloud, temperature, wind)
- precipitation within previous 24 hours
- Sustained high winds during previous 24 hours
- Condition of specimen
  - alive, no sign of physical trauma
  - dead and intact
  - dismembered
  - feather spot*
  - injured but alive
- Disposition of live bird
  - released
  - sent to rehab
- Time since death
  - < 1 day (no rigor mortis)
  - 1 day (rigor mortis, no odor)
  - 2-3 days (odor present, eyes dried /missing)
  - 3-5 days (strong odor, decomposing)
  - Unknown (feather pile*/other)
  - N/A (animal still alive)
- Evidence of scavenging (Y/N)
- Additional relevant comments to support the recorded information.

*A feather spot consists of at least five tail feathers or two primary flight feathers within five meters (16.4 ft) or less of each other, or a total of 10 feathers of any type (i.e., including body feathers).

All personnel involved in implementing this Plan will be included as sub-permittees under the Project's USFWS SPUT Permit, issued either to the Project or a consultant authorized by the Project. If the CDFW does not consider coverage under the USFWS SPUT Permit sufficient, all personnel implementing this Plan will also be covered under any applicable CDFW Scientific Collecting Permit, if provided, and issued either to the Project or its consultant. Ideally, the relevant state and federal permits will allow fatalities discovered during the study to be removed from the field, stored on-site in a freezer, and used in searcher-efficiency and carcass-removal bias trials. Necessary exceptions will apply to all special-status species (see below). Otherwise, surveyors will place all discovered carcasses or body parts that are not of a special-status species and are not part of an ongoing bias trial in plastic zipper storage bags, clearly label each bag with the incident number, and deliver the bags for storage in the designated freezer at the Project facility.

5.2.6 Fence Line Monitoring

The inside of the perimeter fence is subject to inspections approximately once every seven days during spring and fall migration, and approximately once every 21 days during winter and summer periods with intervals adjusted as necessary based on carcass persistence trials. A searcher will drive areas accessible by vehicle close to the inner perimeter of the fence, scanning for fatalities within an approximate 6- to 10-m (20- to 33-ft) strip transect centered on the fence. There may be some environmentally sensitive areas along the fence with access restrictions. These areas will not be sampled as long as the restrictions are in place. Travel speed will be no greater than five mph (eight kph) while searching to ensure quality detection and safety. Personnel conducting fence checks will document bird and bat injuries and fatalities discovered along the inner fence line. Injuries and fatalities along the fence line will be documented in the same manner as used for those discovered during the array carcass surveys, and will be reported to the USFWS and CDFW as part of the same overall reporting process. Searcher efficiency trials will be conducted along the inside of the fence. Carcass removal trials conducted at solar arrays will include areas near the inside of the fence as well.

5.2.7 Gen-tie Line Monitoring

The gen-tie line will be built to APLIC Guidelines (2005, 2006, 2012); however, there is still a collision risk for birds. The 11-km (7-mile) gen-tie line will be broken up into 500-m (1,640-ft) segments, and every other segment will be sampled. Some segments may be eliminated from consideration for sampling if they cannot be easily reached by a vehicle (e.g., too sandy). If a segment that was selected is inaccessible, a new unit will be selected to be sampled in its place. A 50% sample of the gen-tie line will be monitored every seven days during spring and fall migration, and approximately every 21 days during summer and winter, with intervals adjusted as necessary based on the carcass persistence trials. Searchers will drive or walk 50% of the gen-tie line during each visit, scanning for birds within 15 m (about 50 ft) from the line. Injuries and fatalities along the gen-tie line will be documented in the same manner as used for those discovered during the array carcass surveys, and will be reported to the USFWS and CDFW as part of the same overall reporting process.

Some overhead electrical feeder and distribution power lines are co-located within the solar arrays and these co-located power lines may be searched as part of the regular monitoring schedule at arrays. Fatalities that are determined to have been caused by the power lines (as determined by the nature of injuries) will be reported as such to the USFWS and CDFW as part of the same overall reporting process and included in overall fatality estimates.

5.2.8 Clearance Surveys

A one-time clearance survey will be conducted within two weeks of the date on which a sampled phase (or the entire facility) is considered completed, energized, and turned over to operations. The purpose of this survey will be to clear the survey area of any accumulated carcasses that may be present. The sequence of clearance surveys will mirror the schedule for the first official survey to ensure that the interval between the clearance survey and the first standard survey is the same for all sampling units. This is necessary to ensure that carcasses detected during the first round of surveys represent only fatalities that occurred during a preceding interval equivalent to the search interval that will apply afterward. Carcasses that are missed during the clearance survey may cause an upward (conservative) bias in the fatality estimate. Additionally, some estimators (such as the Huso estimator described above) become biased if carcasses that are not detected during a trial are still available during subsequent trials. This “bleed through” effect can be ameliorated by including only fresh carcasses in the fatality estimate, where “fresh” means a carcass that has arrived since the previous search. Carcasses that cannot reliably be aged (potentially many carcasses and most feather spots) will be assumed to have occurred within the search interval, resulting in an upward (conservative) bias in the fatality estimate.

5.3 Bird Rescue

Searchers will record any injured or rescued birds or bats located during surveys. Birds will be assessed by a qualified biologist to determine if it is appropriate to transport the individual to the nearest CDFW permitted rehabilitation facility for proper care, or to release them. Injured raptors will be handled only by experienced personnel and will be taken only to rehabilitation facilities that are permitted to handle raptors; this provision is particularly important for eagles. From the Project site, the closest rehabilitation facilities capable of handling all avian species are:

- Coachella Valley Wild Bird Center, 46500 Van Buren, Indio, California, 92201; Phone: 760-347-2647; Contact: Linda York, Executive Director; Hours of Operation: 9:00 am -1 2:00 pm, seven days a week. http://coachellavalleywildbirdcenter.org/

- The Living Desert Zoo & Gardens, 47900 Portola Avenue, Palm Desert, California, 92260; Phone: 760-346-5694 x8 x1; Contact: Sheila Lindquist, North American Manager; Hours of operation: 8:00 am - 1:30 pm (June-September), 9:00 am - 5:00 pm (October-May), seven days a week (closed Christmas Day). http://www.livingdesert.org/animals/wildlife-rehabilitation/
- Hope Wildlife Rescue, 18950 Consul Avenue, Corona, California 92881; Phone: 951- 279-3232; Contact: Bill Anderson or Cyndi Floreno.
- All God's Creatures Wildlife Rescue & Rehabilitation, Chino Hills, California, Phone: 909- 393-1590; Contact: Lori Bayour; http://www.allgodscreatures.net/index.html; no address available, contact by phone.
- International Bird Rescue, Los Angeles Center, San Pedro, California, 90731; Phone: 310-514-2573; Hours: 8:00 am - 5:00 pm. International Bird Rescue specializes in waterbird rescue.
- A list of wildlife rehabilitators maintained by the CDFW: http://www.dfg.ca.gov/wildlife/WIL/rehab/facilities.html
- The California Council for Wildlife Rehabilitators: http://www.ccwr.org/resources/rehabilitation-facilities-region-6.html

If stranded, but apparently uninjured, water-associated birds are discovered at any time during surveys, the searcher will take immediate steps to notify an on-call biologist, and assist with efforts to secure the bird and have it transferred as expediently as possible to Lake Tamarisk for release into the water. If a qualified biologist is not available, all stranded birds (injured or apparently uninjured) should be immediately taken to a rehabilitator for evaluation. Injured or exhausted water-associated birds should be taken to International Bird Rescue, which specializes in the care and rehabilitation of water-associated birds. If a mass event involving many such birds is observed, the searcher, if not an approved biologist, will immediately notify the on-call biologist or other biological personnel working on the site and request their assistance identifying injured versus non-injured birds and transporting injured birds to the nearest rehabilitation facility. International Bird Rescue can also assist with mass stranding events. Rehabilitation facilities would be compensated by Palen Solar III for the costs associated with each bird put under their care.

If a searcher discovers a dead individual of a species that is fully protected by the state or federally or state-listed as threatened or endangered, and for which handling is not specifically authorized under the applicable salvage permits, he/she will collect data and photos as for any other fatality, but then flag the carcass to mark its location, cover it with a bucket or another way to secure its location, and leave it in place. If it has been confirmed as a federally listed species under the ESA, the searcher will immediately call a USFWS Office of Law Enforcement special agent to determine the appropriate follow-up action.

5.4 Searcher Efficiency Trials

Estimating searcher-efficiency (distance-related detection functions) is a standard component of the distance-sampling approach. Moreover, because estimating detection functions is applied to all survey data and can be organized to variably adjust in relation to covariates of interest (e.g., season, habitat, and carcass size classes), application of this approach will account for typical factors of interest for fatality studies (CEC and CDFG 2007, Huso 2011, Korner-Nievergelt et al. 2011, USFWS 2012, Smallwood 2013). In this case, independent searcher-efficiency trials per season will be conducted to help assess and adjust for potential spatial bias in the distribution of fatalities among arrays. Separate trials will be conducted to assess detection probability associated with fence and gen-tie searches.

The desert landscape in which this Project is located generally changes little with the seasons, save for brief periods following winter and spring rains when floods may occur and blooming plants may flourish. A recent meta-analysis involving data from more than 70 wind-energy projects suggested that including habitat visibility class as a predictive variable generally eliminated any otherwise apparent seasonal effects on searcher efficiency (Smallwood 2013).

Nevertheless, the supplementary searcher efficiency trials for this Project will be repeated seasonally (winter, spring, summer, and fall) and trials will be organized so that all search personnel participate in bias trials. Placement of trial specimens will be timed to limit the number of trial carcasses placed on the landscape at any one time (minimizing the chance of artificially attracting scavengers or, conversely, scavenger swamping; Smallwood 2007). This approach will also ensure that any new surveyors that join the crew participate in searcher efficiency trials. The trials will also be managed to ensure effective quantification of searcher efficiency in relation to predefined habitat visibility classes (low, medium, and high, if relevant), size classes of birds (small, medium, and large), and detection distance.

The bias-trial sample sizes required to produce precise, adjusted fatality estimates are not well established, in part because needs may vary substantially depending on actual project-specific searcher efficiency, carcass removal, and fatality rates. However, using searcher-efficiency trials to help evaluate the efficacy of perimeter-only surveys and the distance-sampling approach used in this investigation will require larger sample sizes to produce a sampling design that effectively accounts for distance as a key covariate of interest. In addition, if growth of new ruderal vegetation, or substrate heterogeneity caused by flood events, is sufficient to create a new visibility class under the arrays, the specimen numbers would need to increase to effectively account for this factor. It will also be necessary to ensure that the estimates of searcher efficiency encompass variation among multiple surveyors. The influence of individual surveyors will not be accounted for in a formal, statistical sense by including “surveyor” as a covariate in the estimation model; however, all surveyors will be tested similarly. Each surveyor will be exposed to multiple test specimens of each size class, and at similar repeated levels if testing in different habitat visibility classes is required. A minimum of 25 carcass samples per small size class, 15 for medium, and 10 for large is anticipated within the solar array per season, while 15 small, 10 medium, and 10 large carcasses are anticipated along the fence line and gen-tie line sampling areas, per season. Searcher efficiency will be summarized for each individual searcher, but to avoid needlessly inflating the variance of the estimate, individual searcher effects will not be included in the fatality estimation model.

Besides representing birds of different sizes, another important factor to consider in searcher- efficiency and carcass-removal trials is the bird species to use as trial specimens. Ideally, all carcasses used for both searcher-efficiency and carcass-removal trials should reflect the range of species likely to be encountered as fatalities in the Project area (CEC and CDFG 2007). Because obtaining sufficient samples of “natural” carcasses often is difficult, researchers frequently resort to using readily available, non-native surrogate species in bias trials; however, this practice may result in biased results when compared to studies that use only “natural” specimens (Smallwood 2007). For all bias trials, this program will maximize use of representative native or naturalized species authorized by permits, either found during the study or gathered elsewhere, as needed, and from diverse sources where possible, but all trial carcasses will be obtained and deployed in a manner that are consistent with applicable regulatory requirements.

Another factor that influences carcass detectability is how fresh and intact the carcass is (Smallwood 2007, 2013). If multiple pieces of a depredated or scavenged carcass are scattered over a modest area, in some cases the fatality may be more easily detected; however, detectability generally decreases when only remnants of a carcass are present, or when the carcass is aged and degraded. Nevertheless, in contrast to wind energy projects, there is little expectation that this Project will cause injuries and fatalities that result in dismembered carcasses, so this factor is not expected to influence searcher efficiency bias or carcass removal rates (Smallwood 2013). Therefore, bias trials conducted in this study will involve primarily intact carcasses. The searcher-efficiency trial specimens may range from freshly thawed to partially decayed (i.e., selected, subject to availability, to mimic the range of carcass decay that typically accrues over 7-day periods).

A field supervisor or other technician not involved in the standard surveys will place the trial specimens and will recover any specimens missed by the surveyors. All trial specimens will be placed according to a sampling plan that randomly allocates carcasses of different sizes among survey plots and survey days within the assessment areas, but is stratified to ensure equitable representation of different surveyors, and fence line versus solar arrays versus gen-tie versus seasons. To minimize the possibility of unnecessarily attracting scavengers or, conversely, contributing to scavenger swamping, which could affect ongoing carcass-removal trials (Smallwood 2007, Smallwood et al. 2010), placement of searcher-efficiency trial specimens will be distributed throughout the year (appropriately organized to provide season-specific estimates with adequate samples to provide a robust estimate of searcher efficiency), with few specimens placed at any one time. Carcasses will be placed carefully to minimize disturbance of substrates that may bias carcass detection.

Sample size and frequency of trials in the second year may be changed (i.e., reduced or increased) if warranted by results of the first year of monitoring and approved by overseeing agencies.

All trial specimens will be inconspicuously marked with a piece of black electrical tape wrapped around one leg, in a manner that allows the surveyor to readily distinguish trial specimens from new fatalities, but without rendering the specimen unnaturally conspicuous (Smallwood 2007, USFWS 2012). To ensure a degree of "natural" placement, carcasses need to be represented by placing them between rows of panels, under panels, near I-beams supporting the panels, or in the open. Therefore, carcasses will be tossed towards the designated, randomly chosen placement spot from a distance of three to six m (10 to 20 ft). Documentation of each location will include GPS coordinates, notes about the substrate and carcass placement, and a digital photo of the placement location.

Surveyors will have only one opportunity to discover placed specimens. Any missed specimens will be recovered as quickly as possible after surveys have been completed in a given area, and after the surveyor(s) have become aware of the trial through discovery of one or more specimens. Some researchers have argued for leaving missed specimens in place to enable possible discovery in a subsequent survey and thereby mimic the natural situation in which "bleed-through" is possible (e.g., Smallwood 2013, Warren-Hicks et al. 2013; discussed further below). Although this approach may have merit in some situations, its potential value for this Project is offset by the need to avoid attracting ravens because they may prey on desert tortoises in the area (Tetra Tech 2014).

5.5 Carcass Persistence Trials

The degree to which carcasses persist on the landscape depends on a variety of factors reflecting seasonal variation in landscape/climatic conditions and the scavenger community. The composition and activity patterns of the scavenger community often vary seasonally as birds migrate, new juvenile birds and mammals join the local population, and mammalian scavengers variably hibernate or estivate. Seasonally variable climatic conditions also may contribute to variation in carcass decay and removal rates due to variation in temperatures, solar insolation, wind patterns, and the frequency of flooding events. Therefore, to ensure accurate treatment of this bias factor, carcass-persistence rates will be assessed on a semi-annual basis during the first year that fatality surveys are conducted (CEC and CDFG 2007, USFWS 2012, Smallwood 2013), and during the second year as needed. It is also imperative that carcass-persistence trials effectively account for the influence of carcass type/size, given that persistence times may vary widely depending on the species and size class involved (Smallwood 2013).

To quantify carcass persistence, target sample sizes of 30 small, 20 medium, and 10 large carcasses will be randomly placed and monitored within the solar arrays (including the fence line), and 25 small, 15 medium, and 10 large along 50% of the gen-tie line each season. A minimum of 15% of the carcasses in the solar arrays will be monitored, using motion-triggered, digital trail cameras (e.g., see Smallwood et al. 2010) while the remaining will be visited on foot; carcasses will be monitored for 30 days or until the carcass has deteriorated to a point where it would no longer qualify as a documentable fatality. For carcasses not set up with cameras, the carcass will be visited once a day for the first four days, and then every three to five days until the end of the 30-day trial is reached. Fake cameras, cameras without bias trial carcasses, or decoy carcasses will also be placed to avoid training ravens and other scavengers to recognize cameras as "feeding stations". Periodic ground-based checking of carcasses also will occur to guard against misleading indicators of carcass removal, such as wind blowing the carcass out of the camera's field of view. To minimize potential bias caused by scavenger swamping (Smallwood 2007, Smallwood et al. 2010), carcass-persistence specimens will be distributed across the entire Project, not just in areas subject to standard surveys, and small numbers of new specimens will be placed every two to three weeks.

Trial specimens will include only intact, fresh (i.e., estimated to be no more than one or two days old and not noticeably desiccated) bird carcasses that are either discovered during the study or are acquired from other sources after having been frozen immediately following death. If permits allow, preference will be to use carcasses of species that occur in the area. Surrogates (such as upland game birds and waterfowl), that are similar in size and appearance to native species that occur in the area, will be obtained from commercial sources and used if necessary to meet the required sample sizes. However, domestic waterfowl or upland game birds that are white or brightly colored (e.g., male ring-necked pheasants [*Phasianus colchicus*]) will not be used. Scavenging rates for some surrogates (e.g., medium- to large-sized game birds that are used to represent raptors) may be artificially high (Smallwood 2007, 2013) and may lead to conservative fatality estimates (i.e., an overestimate) for some taxa/bird types.

To reduce possible biases related to leaving scent traces or visual cues that may unnecessarily alert potential scavengers, all carcasses used in carcass-persistence trials will be handled with latex gloves, and handling time will be minimized. All trial specimens will be inconspicuously marked with fingernail polish on the bill and legs to distinguish them from both unmarked fatalities and searcher efficiency trial specimens.

Upon conclusion of the relevant monitoring period, each trial specimen will be classified into one of the following categories:

- **Intact**: Whole and un-scavenged other than by insects;
- **Scavenged/depredated**: Carcass present but incomplete, dismembered, or flesh removed;
- **Feather spot**: Carcass scavenged and removed, but sufficient feathers remain to qualify as a fatality, as defined above; or
- **Removed**: Not enough remains to be considered a fatality during standard surveys, as defined above.

5.6 Estimating Adjusted Fatality Rates

The sampling design will enable calculation of fatality estimates adjusted for searcher-efficiency, carcass-removal rates, and proportion of area sampled. The adjustment for searcher efficiency will occur by virtue of applying standard methods for analyzing detection data collected using distance-sampling methods, with the data partitioned by season and standardized carcass size classes. The fatality estimates will be adjusted for variation in carcass persistence, by applying seasonal and carcass-size-specific correction factors to the fatality estimates that have been adjusted for distance-related variation in the probability of detection.

The analytical approach used to calculate adjusted fatality estimates will be similar to that applied in cases where the fatality estimates are derived from strip transects. For illustrative purposes, we summarize here the basic formulation of the Huso estimator (Huso 2011), the first part of which pertains to fatality estimation for different strata, or groups. Essentially, the smallest group for which fatalities are estimated can be considered a stratum, with stratum *k* representing, for example, a set of similarly sized birds within a defined habitat visibility class. Note that strata should be defined to ensure minimum variance in detection probabilities within individual strata, whereas probabilities may vary considerably among strata (e.g., for small versus large birds, or in habitats of low versus high visibility). Depending on the circumstances, there can be strata based on species groups, size classes, seasons, habitats, and/or infrastructure types (also could conceivably model distance categories as another covariate).

For a particular stratum *k* for a given survey plot and search interval, fatality can be estimated as:

$$\hat{F}_k = \frac{c_k}{\hat{\pi}_k}$$

where c_k is the number of observed carcasses and g_k is the probability of detecting a carcass. The detection probability *g* typically is the product of three variables: the probability of a carcass persisting (*r*), the probability of a carcass being observed given that it persists (*p*), and the effective proportion of the interval sampled (*v*):

$$\widehat{\pi_k} = \widehat{p_k} \cdot \widehat{r_k} \cdot \hat{v}_k$$

5.6.1 Estimation of Searcher Efficiency Rates

Searcher efficiency rates, $\hat{p}$, are estimated for each size class using a logistic regression model. Additional covariates for this logistic regression model may include season, ground visibility, and the interactions between these variables. The logistic regression models the natural logarithm of the odds of finding an available carcass as a function of the above covariates. The model assumes that searchers have a single opportunity to discover a carcass. The best model is selected using an information theoretic approach known as AICc, or corrected Akaike Information Criteria (Burnham and Anderson 2002).

5.6.2 Estimation of Carcass Persistence Rates

Estimates of carcass persistence rates are used to adjust carcass counts for removal bias. Carcass persistence is modeled as a function of carcass size, and possibly other variables including plot type, season, ground visibility, and the interactions between these variables. The average probability of persistence of a carcass, $\hat{r}$, is estimated from an interval censored survival regression model. Exponential, log-logistic, lognormal, and Weibull distributions are fit and the best model is selected with AICc.

5.6.3 Carcasses Excluded from Fatality Estimation

One of the underlying assumptions of the Huso model is that searchers have a single opportunity to discover a carcass (Huso et al. 2016a). In practice, particularly when carcass persistence times are long, carcasses may be discovered that have been available for more than one search. In order to meet the assumptions of the Huso model, the estimated time since death is determined for each carcass, in the field. A carcass is excluded from fatality estimation if the estimated time since death is longer than the search interval associated with that carcass; in other words, a carcass with estimated time since death longer than the search interval is assumed to have been available for more than one search.

5.6.4 Adjusted Facility-Related Fatality Rates

The estimated probability that a carcass in category *k* was available and detected is:

$$\widehat{\pi_k} = \widehat{p_k} \cdot \widehat{r_k} \cdot \hat{v}_k$$

where $\widehat{v_k}$ = min(1, $\ddot{I}_k/I_k$). The model assumes that searchers have a single opportunity to find each carcass, even though some carcasses may persist through multiple searches before being detected. Therefore, a carcass is included in adjusted fatality estimates if it has been available since the last search, and no longer. The probable time since death, recorded in the field, is used to evaluate each carcass for inclusion in the final fatality estimates.

The total number of fatalities $(\widehat{f_k})$ in category *k,* based on the number of carcasses found in category *k* is given by:

$$\widehat{f_k} = \frac{c_k}{\widehat{\pi_k}}.$$

Adjusted fatality estimates for the Project may be expressed per unit area (e.g., acres or arrays) per year, or overall (extrapolated from the sample units) per year.

5.7 Incidental Fatality Documentation

Once post-construction fatality monitoring begins, all subsequent bird and bat injuries and fatalities detected incidentally to the standardized post-construction monitoring program will be classified as "incidental finds," documented using similar procedures as are used for specimens discovered during the standardized surveys (see section 5.2.5), and integrated with records from the standardized surveys for summary reporting and evaluation purposes. Incidental finds that occur outside of standard search areas will not be included in calculations of adjusted post-construction fatality estimates, but will be summarized within semi-annual reports (discussed below).

From a statistical standpoint, a bias will occur if carcasses that are found in standard search areas, but not during standardized surveys, are recorded and removed prior to the next search of that array. Per USFWS direction, and to be consistent with the Raven Monitoring, Management, and Control Plan, these carcasses will be reported directly to an authorized biologist. These incidental finds will be documented using the same procedures as those discovered during standardized surveys. Data from incidental finds within standardized search areas will be included in analyses, when otherwise appropriate, to estimate mortality as a conservative approach. Appropriate caveats can be included within the semi-annual reports to document the potential magnitude of any biases created by including these carcasses in fatality estimates.

5.8 Minimum Credentials of Monitoring Personnel and Training

The fatality monitoring program will be overseen by an Avian Biologist, approved by the BLM in consultation with wildlife agencies, who has demonstrated the ability to accurately identify the pecies of birds and bats potentially impacted by the Project. Additional biologists will be approved by the BLM in consultation with the wildlife agencies for the purpose of accurately identifying species of birds and bats potentially impacted by the Project. The approved biologists will assist with fatality monitoring and will be available to respond to incidents at the Project that require expert assistance (e.g., uncertain species identification, possible listed species, or injuries) within 24 hours. In addition, a biologist (with a minimum of a Bachelor's of Science in wildlife sciences) will be on-site during days of standardized monitoring.

Monitoring personnel may include solar facility staff, if approved by agencies after being evaluated for effectiveness prior to monitoring. Monitors will be trained in distance-sampling search methodology, correct identification and documentation of carcasses, implementation of carcass removal trials, and notification of a rehabilitation center in the event of injured birds or bats. Only staff/technicians that are listed under the SPUT Permit will be allowed to handle carcasses. Accurate identification of rare, special-status species will be emphasized during training. All surveyors will have photo cards to classify specimens and will take photographs of all finds. All data collection will be standardized and the approved Avian

Biologist will decide which to report as survey observations; however, all observations that were not conclusive will be reported.

The trainer, curriculum, and training materials for training of non-biologist personnel in monitoring methods will be approved by the BLM in consultation with the wildlife agencies and will be conducted by the approved Avian Biologist prior to initiation of the study. Training materials may be augmented by wildlife agency input. Components of the training program will include:

- A classroom-based portion with lecture and handout materials, and photographic or specimen-based (if available) species identification;
- A field-based portion that allows trainees the opportunity to practice and receive feedback on conducting carcass searches and trials, identification of species, completing data forms, and following protocols for assessing and assisting injured birds and bats;
- Assessment of learning outcomes for each participant; and
- A training log to be updated with each trainee's name and contact information upon successful completion of the course.

The Avian Biologist that will conduct the training will, minimally, have a Master's degree in biological sciences, zoology, botany, ecology, or a related field, and at least one year of field experience with avian or bat research or monitoring in the region. All reference material should be maintained and provided to the agencies in the event that there are questions about species identification.

6.0 REPORTING

6.1 Reporting During Construction

The Project will report all documented bird and bat injuries and fatalities to the BLM, CDFW and USFWS using the required Avian Injury and Mortality Reporting Form that is a reporting requirement of the USFWS SPUT Permit issued to the Project to authorize the handling of dead or injured birds. SPUT Permit reporting will be submitted monthly or in accordance with the terms of the permit. Similar reporting to the CDFW will be accomplished as a condition of any relevant Scientific Collecting Permit that the CDFW may issue to authorize the handling of dead or injured birds under state law.

6.2 Reporting During Operations

All injury and fatality incidents discovered outside of the standardized carcass surveys will be documented in the same manner as used for those discovered during the carcass surveys, and will be reported to the USFWS and CDFW as part of the SPUT Permit process. Special-status or listed species will also be handled in a way that is consistent with Project-specific SPUT Permit conditions.

6.2.1 Summary Reports

Semi-annual electronic summaries of all biological monitoring activities will be submitted to the BLM, USFWS, and CDFW throughout the monitoring period. After the completion of each year of monitoring, a biologist representing the Project will assist the Project in preparing and submitting an annual report that summarizes dates, durations, and results of all fatality monitoring conducted, to the BLM, CDFW, and USFWS. During each monitoring year there will be one interim report and one final annual report.

To address the specific objectives of the monitoring plan, semi-annual reports will include summaries of fatalities detected, searcher efficiency trials, carcass persistence trials, and may include recommendations for possible adaptive management actions; adjusted fatality estimates will only be presented in the final, annual report. All reports will present summaries of detection by species and project component. Special status species, if detected, will be treated separately.

The final annual report will present summaries of all data collected during fatality monitoring over the previous year, including adjusted fatality estimates by seasons and for the entire year. In addition, to the extent possible, fatality rates will be estimated and reported for likely diurnal, and likely nocturnal species, and for ecological guilds of interest (e.g., raptors, water-associated birds, passerines). Summary reports will also include (if sample sizes are sufficient) spatial analyses of the data that address whether fatalities are randomly distributed throughout the facility. All raw field notes, field data, photographs, and Geographic Information System (GIS) data will be submitted to the agencies with the annual report. After the first year of monitoring has passed, results from the annual report will be reviewed to determine if adjustments to the monitoring frequency are warranted based on searcher efficiency and carcass persistence trial results.

7.0 ADAPTIVE MANAGEMENT

PSH will implement an adaptive management approach at the Project from pre-construction through the period of post-construction monitoring. Adaptive management will follow a data-driven approach whereby problems are assessed in the context of other sources of anthropogenic impact to avian and bat species, in particular other solar facilities. The guiding principles associated with adaptive management are:

- Recommendations will be made based on best available science and existing approvals and permits to address specific issues resulting from the Project;
- Recommendations will be assessed by all agencies involved, as well as representatives for the Project;
- Provide sufficient flexibility to adapt as more is learned about the Project as well as strategies to reduce avian impacts, if warranted;

- Review results of fatality monitoring;
- Review annual report on status of compliance with mitigation measures and permit conditions and provide recommendations to the BLM and Riverside County equivalent, as necessary.
- Implement adaptive management program measures of Applicant Proposed Measure (APM) 52 to reduce or offset mortalities caused by the Project.
- Evaluate effectiveness of implemented adaptive management strategies and provide the BLM and Riverside County equivalent with recommendations based on findings.

Per APM 52: "*The Project owner shall implement a bird and bat adaptive management program that includes potential measures the Project owner can implement to adaptively respond to detected mortality and injuries attributable to the Project. Adaptive actions undertaken will be discussed and evaluated in survey reports prepared under the Project's BBCS. Any impact reduction measures must be commensurate (in terms of factors that include geographic scope, costs, and scale of effort) with the level of avian or bat mortality or injury that is specifically and clearly attributable to the Project facilities, consistent with the nexus and proportionality requirements of California statutory and constitutional law and of U.S. constitutional law.*

a. Performance Standards. Appropriate performance standards for mitigation of impacts to any species regulated by BGEPA, ESA, and CESA exist through required consultation with USFWS and CDFW under their respective regulatory and permitting frameworks, as specified in Tier 1 Measures, below. For impacts to all other special status avian and bat species, adaptive management measures must reduce or offset mortalities caused by the Project to a level that avoids a substantial, long-term reduction in the demographic viability of the population of the species in question, as estimated through implementation of the Project BBCS, which employs the structured approach set forth in the USFWS Land-Based Wind Energy Guidelines (USFWS 2012).
b. Impact Reduction Measures.
i. Tier 1 Measures.
In addition to the monitoring requirements described in the Project BBCS, the following measures shall be implemented to achieve the above performance standards:
1) The Project owner shall initiate consultation with USFWS and CDFW if there is a Project attributed injury or mortality to any species regulated by BGEPA, ESA or CESA.
2) PSPP MM BIO-1: Designated Biologist Selection and Qualifications
3) PSPP MM BIO-2: Designated Biologist Duties
4) PSPP MM BIO-3: Biological Monitor Selection and Qualifications
5) PSPP MM BIO-4: Biological Monitor Duties
6) PSPP MM BIO-6: Worker Environmental Awareness Program (WEAP)
7) PSPP MM BIO-8: Impact Avoidance and Minimization Measures (e.g., 1. Limit disturbance areas; 2. Minimize road impacts; 3. Minimize traffic impacts; 4. Monitor during construction; 5. Minimize impacts of transmission/pipeline alignments, roads, and staging areas; 6. Avoid use of

toxic substances; 7. Minimize lighting impacts; 8. Minimize noise impacts; 12. Minimize standing water; 13. Dispose of road-killed animals; 14. Minimize spills of hazardous materials; 15. Worker guidelines; 17. Monitor ground disturbing activities prior to pre-construction site mobilization; 18. Control unauthorized use of the project access roads; 20. Avoid spreading weeds)

8) PSPP MM BIO-12: Desert Tortoise Compensatory Mitigation

9) PSPP MM BIO-13: Raven Management Plan and Fee

10) PSPP MM BIO-14: Weed Management Plan

11) PSPP MM BIO-15: Pre-Construction Nest Surveys and Avoidance Measures

12) PSPP MM BIO-16: Avian Protection Plan

13) PSPP MM BIO-18: Burrowing Owl Impact Avoidance, Minimization, and Compensation Measures

14) BIO-19: Special-Status Plant Impact Avoidance, Minimization and Compensation

15) PSPP MM BIO-21: Mitigation for Impacts to State Waters (e.g., 1. Acquire offsite state waters)

16) PSPP MM BIO-25: Golden Eagle Inventory and Monitoring

17) PSPP MM BIO-26: Evaporation Pond Netting and Monitoring

18) PSPP MM VIS-03: Temporary and Permanent Exterior Lighting (e.g., minimize visibility, minimize glare, minimize illumination)

19) PSPP MM VIS-04: Project Design (e.g., minimize the number of structures, reduce the amount of disturbed area)

20) APM-1: Designated Biologist

21) APM-2: Worker Education Program

22) APM-4: Integrated Weed Management Actions

2/2/2017 13 Palen Solar PV Project

23) APM-6: Noise Controls for Special-Status Species

24) APM-7: Standard Practices to Protect Special Status Species (e.g., prohibition of domestic pets)

25) APM-16: Bendire's Thrasher Monitoring

26) APM-17: Passive Burrow Exclusion

27) APM-18: Golden Eagle Nest Avoidance

28) APM-19: Golden Eagle Compensation

29) APM-20: Contribution to Golden Eagle Monitoring Program

30) APM-42: Manage Visual Resources as VRM Class IV

31) APM-45: Visual Design Standards

32) APM-46: Required Visual Resource BMPs

ii. Tier 2 Measures.

If Tier 1 measures do not achieve the performance standards described above, the monitoring results of the Project, as well as those of other PV projects and the results of their respective impact reduction efforts, will be analyzed to formulate additional impact reduction measures to achieve the performance standards. Such measures may include, but not be limited to:

1) Use of a secure cover or floating, high-density plastic balls to cover construction ponds, as recommended by the Federal Avian Administration's "Wildlife Hazard Management at Airports" manual.

2) Passive avian diverter installations along the perimeter or at other locations within the Project to reduce or minimize bird use of the site.
3) The use of sound, light or other means to discourage site use consistent with applicable legal requirements.
4) Onsite habitat management or prey control measures consistent with applicable legal requirements.
5) Modifications to support structures or other facilities to exclude nesting birds (e.g., netting or shielding around framework; capping open pipes or tubing).
iii. Tier 3 Measures.
In the event Tier 1 and Tier 2 avoidance and minimization measures do not meet the above performance standards, or upon election of the Project owner, the Project owner shall implement compensatory mitigation on terms and at ratios deemed appropriate by USFWS and/or CDFW to meet the performance standard applicable to the species in question. Such measures shall be approved by USFWS and/or CDFW and may include, but not be limited to:
1) Restoration of degraded off-site habitat with native vegetation.
2) Restoration of off-site agricultural fields to bird habitat.
3) Management of off-site agricultural fields to enhance bird populations.
4) Retrofitting of structures to minimize collisions.
5) Support for avian and bat research and/or management efforts conducted by entities approved by the USFWS and CDFW within the Project's mitigation lands or other approved locations.
6) Funding efforts to address avian diseases or depredation due to the expansion of predators in response to anthropomorphic subsidies that may adversely affect birds that use the mitigation lands or other approved locations.
7) Contributions to the Migratory Bird Conservation Fund managed by the Migratory Bird Conservation Commission."

If deemed warranted by agencies, a technical advisory group (TAG) will be formed to facilitate the adaptive management approach described in APM 52. If a TAG is formed, the TAG will consist of one member of the BLM, USFWS, and CDFW. Two additional non-voting members, representing PSH, would serve as members of the TAG. Person(s) with scientific expertise may be invited by TAG members, if deemed appropriate. In addition, representatives from the Project and the consultants involved in the conduct of the studies will typically be invited to attend and participate in TAG meetings. The TAG will provide advice and recommendations to the BLM on developing and implementing effective measures to monitor, avoid, minimize, and mitigate impacts to wildlife species and their habitats related to operations. The BLM will evaluate any recommendations of the TAG, including discussions with PSH concerning new measures or measures that are not completely detailed in this BBCS, requisite effectiveness monitoring, and make a decision on what measure(s) and monitoring to require for implementation. It is assumed that cost will be a factor when recommending any changes to the monitoring protocol. Accordingly, any adaptive management measures should strive to identify monitoring modification(s) that offset costs with no net change. Palen Solar III and the agencies (or TAG, if created) will also meet at the end of the second year of monitoring to determine if continued/focused monitoring is warranted.

8.0 REFERENCES

16 United States Code (USC) 703-711. 1973. Title 16 - Conservation; Chapter 7 - Protection of Migratory Game and Insectivorous Birds; Subchapter II - Migratory Bird Treaty; Sections (§§) 703-711. 16 USC 703-711.

16 United States Code (USC) §§ 668 - 668d. 1940. Title 16 - Conservation; Chapter 5a - Protection and Conservation of Wildlife; Subchapter II - Protection of Bald and Golden Eagles; Sections (§§) 668-668d - Bald and Golden Eagles. 16 USC 668-668d. (June 8, 1940, Chapter [Ch.] 278, § 1,54 Statute [Stat.] 250; Public Law [Pub. L.] 86–70, Section [§] 14, June 25, 1959, 73 Stat. 143; Pub.L. 87–884, October 24, 1962, 76 Stat. 1246; Pub. L. 92–535, §1,October 23, 1972, 86 Stat.1064).

16 United States Code (USC) §§ 1531-1599. 1973. Title 16 - Conservation; Chapter 35 – Endangered Species; Sections (§§) 1531-1599. Endanged Species Act. 16 USC 1531-1599. P.L. 93-205, 84 Stat. 884 (codified as amended).

50 Code of Federal Regulations (CFR) 21. 2000. Title 50 - Wildlife and Fisheries; Chapter I -United States Fish and Wildlife Service, Department of the Interior; Part 21 - Migratory Bird Permits. 50 CFR 21: 523-549, revised October 1, 2000.

50 Code of Federal Regulations (CFR) 402. 1986. Title 50 - Wildlife and Fisheries; Chapter IV-Joint Regulations (United States Fish and Wildlife Service, Department of the Interior and National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce); Endangered Species Committee Regulations; Subchapter a; Part 402 - Interagency Cooperation. 50 CFR 402; 51 Federal Register (FR) 19957, June 3, 1986.

50 Code of Federal Regulations (CFR) § 22.26. 2009. Title 50 - Wildlife and Fisheries; Chapter I - United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 22 - Eagle Permits; Subpart C - Eagle Permits; Section (§) 22.26 - Permits for Eagle Take That Is Associated with, but Not the Purpose of, an Activity. 50 CFR 22.26. [74 FR 46877, September 11, 2009, as amended at 79 FR 73725, December 9, 2013].

AECOM. 2009. Palen Solar Power Project Biological Technical Report. Riverside County, California. Submitted to Solar Millennium, LLC, Berkeley, California, and Chevron Energy.

AECOM. 2010. Fall Botanical Surveys. Palen Solar Power Project. CEC Docket No. 09-AFC-7. TN 58879. May 17, 2010.

Altamont Pass Avian Monitoring Team. 2007. Altamont Pass Wind Resource Area Bird and Bat Monitoring Protocols. APWRA Bird Mortality Monitoring . M1 - June 5, 2007.

Althouse and Meade, Inc. 2014. Topaz Solar Farms 2013 Fourth Quarter/Second Annual Report for Avian and Bat Protection Plan and Bird Monitoring and Avoidance Plan. Prepared for Topaz Solar Farms LLC, Santa Margarita, California. Prepared by Althouse and Meade, Inc., Paso Robles, California. March 2014.

Anderson, R., M. Morrison, K. Sinclair, D. Strickland, H. Davis, and W. Kendall. 1999. Studying

Wind Energy/Bird Interactions: A Guidance Document. Metrics and Methods for Determining or Monitoring Potential Impacts on Birds at Existing and Proposed Wind Energy Sites. Avian Subcommittee, National Wind Coordinating Collaborative (NWCC),Washington, D.C. 87 pp.

ArcGIS. GIS Software. ESRI, Redlands, California.

Argonne National Laboratory (Argonne) and National Renewable Energy Laboratory (NREL). 2015. A Review of Avian Monitoring and Mitigation Information at Existing Utility-Scale Solar Facilities. Prepared for the United States Department of Energy (DOE) SunShot Initiative and Office of Energy Efficiency and Renewable Energy. April 2015. Available online at: http://www.evs.anl.gov/downloads/ANL-EVS_15-2.pdf

Arizona Game and Fish Department (AZGFD). 2001. Unpublished abstract compiled and edited by the Heritage Data Management System, AZGFD, Phoenix, Arizona. 10 pp.

Avian Power Line Interaction Committee (APLIC). 2005. Avian Protection Plan (APP) Guidelines. A Joint Document prepared by the Edison Electric Institute's Avian Power Line Interaction Committee (APLIC) and the US Fish and Wildlife Service (USFWS).

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Public Interest Energy Research Program (PIER) Final Project Report CEC-500-2006-022. Edison Electric Institute, APLIC, and the California Energy Commission. Washington D.C. and Sacramento, California.

Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC, Washington D.C.

Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code (USC) § 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, Section (§) 2, 54 Statute (Stat.) 251; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. As amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.

Bibby, C. J., N. D. Burgess, and D. A. Hill. 1992. Bird Census Techniques. Academic Press, New York.257 pp.

BirdLife International. 2014. *Rallus crepitans*. Species Factsheet. BirdLife International, Birdlife Global Office, Cambridge, United Kingdom. Accessed January 22, 2017. Information available online at: http://datazone.birdlife.org/species/factsheet/clapper-rail-rallus-crepitans

Bloom Biological, Inc. (BBI). 2013a. Palen Solar Electric Generating Facility Spring 2013 Avian Survey Results. Prepared for Palen Solar Holdings, Inc., Oakland, California. Prepared by BBI, Lake Forest, California. July 2013.

Bloom Biological, Inc. (BBI). 2013b. Palen Solar Electric Generating Facility Summer 2013 Avian Survey Results. Prepared for Palen Solar Holdings, Inc., Oakland, California. Prepared by BBI, Lake Forest, California. August 2013.

Bloom Biological, Inc. (BBI). 2013c. Palen Solar Electric Generating System 2013 Golden Eagle

Nesting Survey Results. Prepared for Palen Solar Holdings, Inc., Oakland, California. Prepared by BBI, Lake Forest, California. October 2013.

Bloom Biological, Inc. (BBI). 2013d. Palen Solar Electric Generating System Winter 2013 Golden Eagle Survey Results. Prepared for Palen Solar Holdings, Inc., Oakland, California. Prepared by BBI, Lake Forest, California. March 2013.

Brown, P. E. and W. E. Rainey. 2013. Bat Habitat Assessment for Palen Solar Electric Generation System. Conducted for Alice E. Karl and Associates. Conducted by Brown-Berry Biological Consulting. July 20, 2013.

Brown, P. E. and W. E. Rainey. 2014. Bat Habitat Assessment for Palen Solar Electric Generation System. Conducted for Alice E. Karl and Associates. Conducted by Brown-Berry Biological Consulting. May 17, 2014.

Buckland, S. T., D. R. Anderson, K. P. Burnham, and J. L. Laake. 1993. Distance Sampling: Estimating Abundance of Biological Populations. Chapman & Hall, London, United Kingdom.

Bureau of Land Management (BLM). 2010. Cdca Plan Amendment/FEIS. July 2010. Available online at:https://energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/EIS-0416-FEIS-2010.pdf

Bureau of Land Management (BLM). 2013. Plan Amendment/Final EIS for the Palen Solar Power Project. Information available online at: http://www.energy.ca.gov/sitingcases/palen/

Bureau of Land Management (BLM). 2014. Supplemental EIS for the Palen Solar Power Project. Information available online at: http://www.energy.ca.gov/sitingcases/palen/

Burnham, K. P. and D. R. Anderson. 2002. Model Selection and Multimodel Inference: A Practical Information-Theoretic Approach. 2nd Edition. Springer, New York, New York.

California Burrowing Owl Consortium (CBOC). 1993. Burrowing Owl Survey Protocol and Mitigation Guidelines. Prepared by the CBOC. April 1993.

California Department of Fish and Game (CDFG). 2011. Special Animals (898 Taxa). State of California Natural Resources Agency, Biogeographic Data Branch, California Natural Diversity Database (CNNDB). January 2011.

California Department of Fish and Game (CDFG). 2012. Staff Report on Burrowing Owl Mitigation. State of California, Natural Resources Agency, Department of Fish and Game. March 7, 2012.

California Department of Fish and Wildlife (CDFW). 2013a. Special Animals List. Periodic publication. California Natural Diversity Database.

California Department of Fish and Wildlife (CDFW). 2013b. State & Federally Listed Endangered and Threatened Animals of California. Biogeographic Data Branch, California Natural Diversity Database. January 2013. Available online at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109405

California Department of Fish and Wildlife (CDFW). 2014. State & Federally Listed Endangered and Threatened Animals of California. March 2014.

California Department of Fish and Wildlife (CDFW). 2016. Special Animals List. CDFW California Natural Diversity Database. Periodic publication. October 2016. 65 pp.

California Endangered Species Act (CESA). 1984. Fish and Game Code §§ 2050 - 2115.5.

California Energy Commission (CEC). 2010. Commission Decision: Palen Solar Power Project.

California Energy Commission (CEC) and California Department of Fish and Game (CDFG). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. CEC, Renewables Committee, and Energy Facilities Siting Division, and CDFG, Resources Management and Policy Division. CEC-700-2007-008-CMF.

California Public Utilities Commission (CPUC). 2015. West of Devers Upgrade Project: Nesting Bird Management Plan. Available online at: http://www.cpuc.ca.gov/environment/info/aspen/westofdevers/feir/apps/ap14.pdf

Calvert, A. M., C. A. Bishop, R. D. Elliot, E. A. Krebs, T. M. Kydd, C. S. Machtans, and G. J. Robertson. 2013. A Synthesis of Human-Related Avian Mortality in Canada. Avian Conservation and Ecology 8(2): 11. doi: 10.5751/ACE-00581-080211.

Chatfield, A., W. Erickson, and K. Bay. 2009. Avian and Bat Fatality Study, Dillon Wind-Energy Facility, Riverside County, California. Final Report: March 26, 2008 - March 26, 2009. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 3, 2009.

Chatfield, A., W. P. Erickson, and K. Bay. 2010. Final Report: Avian and Bat Fatality Study at the Alite Wind-Energy Facility, Kern County, California. Final Report: June 15, 2009 – June 15, 2010. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Chesser, R. T., R. C. Banks, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, A. G. Navarro-Sigüenza,P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, D. F. Stotz, and K. Winker. 2014. Fifty-Fifth Supplement to the American Ornithologists' Union Check-List of North American Birds. Auk 126(3): 705-714.

Conway, C. J., W. R. Eddleman, S. H. Anderson, and L. R. Hanebury. 1993. Seasonal Changes in Yuma Clapper Rail Vocalization Rate and Habitat Use. Journal of Wildlife Management 57(2): 282-290.

Cooper, B.A. and R.J. Ritchie. 1995. The Altitude of Bird Migration in East-Central Alaska: A Radar and Visual Study. Journal of Field Ornithology 66(4): 590-608.

Cooper, B.A., R.J. Blaha, T.J. Mabee, and J.H. Plissner. 2004. A Radar Study of Nocturnal Bird Migration at the Proposed Cotterel Mountain Wind-Energy Facility, Idaho, Fall 2003. Final Report. ABR, Inc., Prepared for Windland, Inc., Boise, Idaho.

Crawford, R. L. and W. W. Baker. 1981. Bats Killed at a North Florida Television Tower: A 25-

Year Record. Journal of Mammalogy 62: 651-652.

Desert Renewable Energy Conservation Plan (DRECP). 2012a. Desert Renewable Energy Conservation Plan Framework.

Desert Renewable Energy Conservation Plan (DRECP). 2012b. Draft Species Profile Yuma Clapper Rail (*Rallus longirostris yumanensis*). March 2012. 21 pp.

Duerr, A. E., T. A. Miller, K. L. Cornell-Duerr, M. J. Lanzone, A. Fesnock, and T. E. Katzner. 2015. Landscape-Scale Distribution and Density of Raptor Populations Wintering in Anthropogenic- Dominated Desert Landscapes. Biodiversity and Conservation 24(10): 2365-2381.

EDAW AECOM. 2009a. Palen Solar Power Project Biological Technical Report. Riverside County, California. Submitted to Solar Millennium, LLC, Berkeley, California, and Chevron Energy.

EDAW AECOM. 2009b. Palen Solar Power Project Burrowing Owl Technical Report. July 2009.

EDAW AECOM and Bloom Biological, Inc. (BBI). 2009. Palen Solar Power Project Avian Point Count Survey Technical Report. Prepared for Solar Millennium, LLC, and Chevron Energy Solutions. August 2009.

Eddleman, W. R. 1989. Biology of the Yuma Clapper Rail in the Southwestern United States and Northwestern Mexico. Report prepared for the US Bureau of Reclamation. Yuma, Arizona.

Endangered Species Act (ESA). 1973. 16 United States Code (USC) §§ 1531-1544, Public Law (PL) 93- 205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 *et seq.*]; 50 Code of Federal Regulations (CFR) 402.

Endangered Species Act (ESA) § 7. 1973. Section 7 - Interagency Cooperation. [As amended by P.L. 94- 325, June 30, 1976; P.L. 94-359, July 12, 1976; P.L. 95-212, December 19, 1977; P.L. 95-632, November 10, 1978; P.L. 96-159, December 28, 1979; P.L. 97-304, October 13, 1982; P.L. 98-327, June 25, 1984; and P.L. 100-478, October 7, 1988; P.L. 107-171, May 13, 2002; P.L. 108-136, November 24, 2003.].

Erickson, W.P., E. Lack, M. Bourassa, K. Sernka, and K. Kronner. 2001. Wildlife Baseline Study for the Nine Canyon Wind Project, Final Report May 2000-October 2001. Technical report prepared for Energy Northwest, Richland, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon.

Erickson, W. P., M. M. Wolfe, K. J. Bay, D. H. Johnson, and J. L. Gehring. 2014. A Comprehensive Analysis of Small Passerine Fatalities from Collisions with Turbines at Wind Energy Facilities. PLoS ONE 9(9): e107491. doi: 10.1371/journal.pone.0107491.

ESRI. 2016. World Imagery and Aerial Photos. ArcGIS Resource Center. ESRI, producers of ArcGIS software. Redlands, California.

Executive Order (EO) 13186. 2001. Responsibilities of Federal Agencies to Protect Migratory Birds. EO 13186 of January 10, 2001. 66 Federal Register (FR) 11: 3853-3856. Published in the FR January 17, 2001. Available online at: https://www.fws.gov/migratorybirds/Partnerships/migbrdeo.pdf

Fish and Game Code (FG Code) § 3503. Division 4 - Birds and Mammals; Part 2 - Birds; Chapter 1 - General Provisions; Section (§) 3503. Available online at California Attorney References: http://law.onecle.com/california/fish/3503.html

Fish and Game Code (FG Code) § 3503.5. Division 4 - Birds and Mammals; Part 2 - Birds; Chapter 1 - General Provisions; Section (§) 3503.5. Available online at California Attorney References: http://law.onecle.com/california/fish/3503.5.html

Fish and Game Code (FG Code) § 3511. Division 4 - Birds and Mammals; Part 2 - Birds; Chapter 1 - General Provisions; Section (§) 3511. Available online at California Attorney References: http://law.onecle.com/california/fish/3511.html

Fish and Game Code (FG Code) § 3513. Division 4 - Birds and Mammals; Part 2 - Birds; Chapter 1 - General Provisions; Section (§) 3513. Available online at California Attorney References: http://law.onecle.com/california/fish/3513.html

Fish and Game Code (FG Code) § 4150. Division 4 - Birds and Mammals; Part 3 - Mammals; Chapter 3 - Nongame Mammals and Depredators; Article 1 - Nongame Mammals (4150-4155); Section (§) 4150. Available online at California Attorney References: http://law.onecle.com/california/fish/4150.html

Fish and Game Code (FG Code) § 4700. Division 4 - Birds and Mammals; Part 3 - Mammals; Chapter 8 - Fully Protected Mammals; Section (§) 4700. Available online at California Attorney References: http://law.onecle.com/california/fish/sec-4700.html

Fish and Game Code (FG Code) § 5050. Division 5 - Protected Reptiles and Amphibians; Chapter 2 - Fully Protected Reptiles and Amphibians; Section (§) 5050. Available online at California Attorney References: http://law.onecle.com/california/fish/sec-5050.html

Fish and Game Code (FG Code) § 5515. Division 6 - Fish; Part 1 - Generally; Chapter 1 - Miscellaneous; Section (§) 5515. Available online at California Attorney References: http://law.onecle.com/california/fish/5515.html

Fish and Game Code (FG Code) §§ 2050-2098. Division 3 - Fish and Game Generally; Chapter 1.5 - Endangered Species; Article 1. General Provisions Sections (§§) 2050-2098.

Floyd, T., C. S. Elphick, G. Chisholm, K. Mack, R. G. Elston, E. M. Ammon, and J. D. Boone. 2007. Atlas of the Breeding Birds of Nevada. University of Nevada Press, Reno, Nevada. 581 pp.

Gehring, J., P. Kerlinger, and A.M. Manville, II. 2009. Communication Towers, Lights, and Birds: Successful Methods of Reducing the Frequency of Avian Collisions. Ecological Applications 19(2): 505-514.

Greif, S. and B. M. Siemers. 2010. Innate Recognition of Water Bodies in Echolocating Bats. Nature Communications 2(1:107): doi: 10.1038/ncomms1110.

Hallingstad, E. 2014. Palen Solar Electric Generating Project 2014 Golden Eagle Nest Monitoring

Report. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Harmata, A., K. Podruzny, and J. Zelenak. 1998. Avian Use of Norris Hill Wind Resource Area, Montana. Technical Report NREL/SR-500-23822. July 1998. National Renewable Energy Laboratory. Golden, Colorado. 77 pp.

H. T. Harvey & Associates. 2014. California Valley Solar Ranch Project Avian and Bat Protection Plan Annual Postconstruction Fatality Report: 16 August 2012 – 15 August 2013. Project # 3326-03. Prepared for HPR II, LLC, California Valley Solar Ranch, Santa Margarita, California. Prepared by H.T. Harvey & Associates, San Luis Obispo, California. March 28, 2014.

Hawk Migration Association of North America (HMANA). http://hmana.org

Hinojosa-Huerta, O. S., J. J. Rivera-Díaz, H. Iturribarría-Rojas, and A. Calvo-Fonseca. 2008. Population Trends of Yuma Clapper Rails in the Colorado River Delta, Mexico. Studies in Avian Biology 37: 69-73.

Huso, M. 2011. An Estimator of Wildlife Fatality from Observed Carcasses. Environmetrics 22(3): 318- 329. doi: 10.1002/env.1052.

Huso, M., D. H. Dalthorp, T. Miller, and D. Bruns. 2016a. Wind Energy Development- Methods for Assessing Post-Construction Bird and Bat Mortality. Human-Wildlife Interactions 10(1): 62-70.

Huso, M., T. Dietsch, and C. Nicolai. 2016b. Mortality Monitoring Design for Utility-Scale Solar Power Facilities. US Geological Survey (USGS) Open-File Report 2016-1087. 44 pp.

Ironwood Consulting, Inc. (Ironwood). 2016. Draft Biological Resources Technical Report, Palen Solar PV Project, BLM Case File Number CACA-48810, Riverside County, California. Prepared for EDF Renewable Energy, Oakland, California.

Kagan, R. A., T. C. Viner, P. W. Trail, and E. O. Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory, US Fish and Wildlife Service (USFWS), Ashland, Oregon. April 2014. Available online at: http://docketpublic.energy.ca.gov/publicdocuments/09-afc-07c/tn202538_20140623t154647_exh_3107_kagan_et_al_2014.pdf

Karl, A. E. 2013. Palen Solar Electric Generating System Supplemental Spring 2013 Biological Surveys. Prepared for Palen Solar Holdings, LLC. July.

Kerlinger, P., J. L. Gehring, W. P. Erickson, R. Curry, A. Jain, and J. Guarnaccia. 2010. Night Migrant Fatalities and Obstruction Lighting at Wind Turbines in North America. Wilson Journal of Ornithology 122(4): 744-754.

Klem, D. Jr. 2009. Avian Mortality at Windows: The Second Largest Human Source of Bird Mortality on Earth. Pp. 244-251. *In*: T. D. Rich, C. Arizmendi, D. Demarest, and C. Thompson, eds. Proceedings of the 4th International Partners in Flight Conference: Tundra to Tropics. McAllen, Texas.

Korner-Nievergelt, F., P. Korner-Nievergelt, O. Behr, I. Niermann, R. Brinkmann, and B. Hellriegel. 2011. A New Method to Determine Bird and Bat Fatality at Wind Energy Turbines from Carcass Searches. Wildlife Biology 17: 350-363.

Latta, B. and C. Thelander. 2013. Results of 2012 Golden Eagle Nesting Surveys of the California Desert and Northern California Districts. Final Report to Bureau of Land Management, California State Office. Contract No. L11PXO2234. BioResource Consultants, Inc., Ojai, California. 13 pp. + appendices.

Levenstein, K., Z. Courage, D. Solick, and M. Sonnenberg. 2012. Nocturnal Migration Studies for the Proposed Rio Mesa Solar Energy Facility, Riverside County, California: Final Report: Spring and Fall, 2012. Prepared for URS Corporation, LaJolla, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Levenstein, K. and C. Nations. 2014. Fall 2013 Nocturnal Migration Surveys for the Palen Solar Electric Generating System, Riverside County, California. Final Report. Prepared for Palen Solar Holdings, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Levenstein, K., A. Chatfield, W. P. Erickson, and K. Bay. 2014a. Fall 2013 Avian Field Surveys for the Palen Solar Electric Generating System, Riverside County, California. Final Report. Prepared for Palen Solar Holdings, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Levenstein, K., A. Chatfield, W. P. Erickson, and G. DiDonato. 2014b. Fall 2013 and Spring 2014 Avian Field Surveys for the Palen Solar Electric Generating System, Riverside County, California. Draft Report: August 19, 2013 - June 5, 2014. Prepared for Palen Solar Holdings, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Levenstein, K., W. Erickson, and G. DiDonato. 2015. Spring 2015 Avian Field Surveys for the Almasol Generating Station, Riverside County, California. Final Report. Prepared for Abengoa Solar. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Longcore, T., C. Rich, P. Mineau, B. MacDonald, D.G. Bert, L.M. Sullivan, E. Mutrie, S.A. Gauthreaux, Jr., M.L. Avery, R.L. Crawford, A.M. Manville, II, E.R. Travis, and D. Drake. 2012. An Estimate of Avian Mortality at Communication Towers in the United States and Canada. PLoSONE 7(4): e34025. doi: 10.1371/journal.pone.0034025.

Longcore, T., C. Rich, P. Mineau, B. MacDonald, D. G. Bert, L. M. Sullivan, E. Mutrie, S.A. Gauthreaux, Jr., M. L. Avery, R. L. Crawford, A.M. Manville, II, E. R. Travis, and D. Drake. 2013. Avian Mortality at Communication Towers in the United States and Canada: Which Species, How Many, and Where? USDA National Wildlife Research Center - Staff Publications. Paper 1162. http://digitalcommons.unl.edu/icwdm_usdanwrc/1162

Loss, S. R., T. Will, S. S. Loss, and P. P. Mara. 2014. Bird-Building Collisions in the United States: Estimates of Annual Mortality and Species Vulnerability. Condor 116: 8-23. doi: 10.1650/CONDOR-13-090.1.

Loss, S.R. 2016. Avian Interactions with Energy Infrastructure in the Context of Other Anthropogenic Threats. The Condor: Ornithological Applications 118:424-432.

Loss, S. R., T. Will, and P. P. Marra. 2013a. Estimates of Bird Collision Mortality at Wind Facilities in the Contiguous United States. Biological Conservation 168: 201-209.

Loss, S. R., T. Will, and P. P. Marra. 2013b. The Impact of Free-Ranging Domestic Cats on Wildlife of the United States. Natural Communications 4: 1396.

Mabee, T.J. and B.A. Cooper. 2001. Nocturnal Bird Migration at the Nine Canyon Wind Energy Project, Spring 2001. Final Report. Prepared for Western EcoSystems Technology, Inc. and Energy Northwest by ABR Inc, Forest Grove, Oregon. September 2001. 11 pp.

Mabee, T.J. and B.A. Cooper. 2004. Nocturnal Bird Migration in Northeastern Oregon and Southeastern Washington. Northwestern Naturalist 85(2): 39-47.

Mabee, T.J. and P.M. Sanzenbacher. 2008. A Radar Study of Nocturnal Bird and Bat Migration at the Proposed Hatchet Ridge Wind Project, California, Fall 2007. Prepared for Hatchet Ridge Wind, LLC, Portland, Oregon, and Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. Prepared by ABR, Inc., Forest Grove, Oregon.

McGuire, L. P. and M. B. Fenton. 2010. Hitting the Wall: Light Affects the Obstacle Avoidance Ability of Free-Flying Little Brown Bats (*Myotis lucifugus*). Acta Chiropterologica 12: 247-250.

Migratory Bird Treaty Act (MBTA). 1918. 16 United States Code (USC) §§ 703-712. July 13, 1918.

Miller, B. W. 2001. A Method for Determining Relative Activity of Free-Flying Bats Using a New Activity Index for Acoustic Monitoring. Acta Chiropterologica 3: 93-106.

National Environmental Policy Act (NEPA). 1970. 42 United States Code (Usc) 4321-4370h. Public Law 91-190, § 2, January 1, 1970, 83 Statute 852.

National Geographic Society (National Geographic). 2016. World Maps. Digital Topographic

Map. North American Datum (NAD). 1983. NAD83 Geodetic Datum.

O'Farrell, M. J. 2009. Baseline Acoustic Monitoring of Bat Populations within the Duke Energy Searchlight Wind Energy Project Site, Clark County, Nevada. Final Progress Report: April 2008 - April 2009.

O'Farrell, M. J. 2010. Baseline Acoustic Monitoring of Bat Populations within the Duke Energy Searchlight Wind Energy Project Site, Clark County, Nevada. Final Report: May 2009 - April 2010.

Orbach, D. and B. Fenton. 2010. Vision Impairs the Ability of Bats to Avoid Colliding with Stationary Obstacles. PLosONE 5: 11.

Pagel, J. E., D. M. Whittington, and G. T. Allen. 2010. Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance. US Fish and Wildlife Service

(USFWS). February 2010. Available online at: http://steinadlerschutz.lbv.de/fileadmin/www.steinadlerschutz.de/terimGoldenEagleTechnicalGuidanceProtocols25March2010_1_.pdf

Patten, M., G. McCaskie, and P. Unitt. 2003. Birds of the Salton Sea: Status, Biogeography, and Ecology.University of California Press.

Patten, M. A. 2005. Yuma Clapper Rail: *Rallus longirostris yumanensis*. Species account prepared for the Bureau of Land Management, County of San Bernardino, and City of Barstow in support of the Final Environmental Impact Report and Statement for the West Mojave Plan: A Habitat Conservation Plan and California Desert Conservation Area Plan Amendment.

Poot, H., B. J. Ens, H. de Vries, M. A. H. Donners, M. R. Wernand, and J. M. Marquenie. 2008. Green Light for Nocturnally Migrating Birds. Ecology and Society 13(2): 47.

Raitt, R. and R. L. Maze. 1968. Densities and Species Composition of Breeding Birds of a Creosotebush Community in Southern New Mexico. Condor 70(3): 193-205.

Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A Variable Circular-Plot Method for Estimating Bird Numbers. Condor 82(3): 309-313.

Sanzenbacher, P.M., T.J. Mabee, and B.A. Cooper.2007. A Radar and Visual Study of Nocturnal Bird and Bat Migration at the Proposed BearRiver Windpark, California, Fall 2006.Unpublished report prepared for Shell WindEnergy Inc., Houston, TX, by ABR, Inc.,Forest Grove, Oregon. 41 pp.

Shoenfeld, P. 2004. Suggestions Regarding Avian Mortality Extrapolation. Technical memo provided to FPL Energy. West Virginia Highlands Conservancy, HC70, Box 553, Davis, West Virginia, 26260. Available online at: https://www.nationalwind.org/wp-content/uploads/2013/05/Shoenfeld-2004-Suggestions-Regarding-Avian-Mortality-Extrapolation.pdf

Sibley, D. A. 2003. The Sibley Field Guide to Birds of Western North America. Knopf Publishing, New York.

Smallwood, K. S. 2007. Estimating Wind Turbine-Caused Bird Mortality. Journal of Wildlife Management 71: 2781-2791.

Smallwood, K. S. 2013. Comparing Bird and Bat Fatality-Rate Estimates among North American Wind- Energy Projects. Wildlife Society Bulletin 37(1): 19-33.

Smallwood, K. S., D. A. Bell, S. A. Snyder, and J. E. DiDonato. 2010. Novel Scavenger Removal Trials Increase Wind Turbine-Caused Avian Fatality Estimates. Journal of Wildlife Management 74: 1089-1097. doi: 10.2193/2009-266.

Strickland, M. D., E. B. Arnett, W. P. Erickson, D. H. Johnson, G. D. Johnson, M. L. Morrison, J. A. Shaffer, and W. Warren-Hicks. 2011. Comprehensive Guide to Studying Wind Energy/Wildlife Interactions. Prepared for the National Wind Coordinating Collaborative (NWCC), Washington, D.C., USA. June 2011. Available online at: http://www.batsandwind.org/pdf/Comprehensive_Guide_to_Studying_Wind_Energy_Wildlife_Interactions_2011.pdf

Sullivan, B. L., C. L. Wood, M. J. Iliff, R. E. Bonney, D. Fink, and S. Kelling. 2009. Ebird: A Citizen-Based Bird Observation Network in the Biological Sciences. Biological Conservation 142: 2282-2292.

Tetra Tech. 2014. Common Raven Management and Control Plan for the Modified Blythe Solar Power Project, Riverside County, California.

Thompson, J. and K. Bay. 2012. Post-Construction Fatality Surveys for the Dry Lake II Wind Project: February 2011 – February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 6, 2012.

US Department of Agriculture (USDA). 2014. Imagery Programs - National Agriculture Imagery Program (NAIP). USDA - Farm Service Agency (FSA). Aerial Photography Field Office (APFO), Salt Lake City, Utah. Last updated September 2014. Information available online at: http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index

US Fish and Wildlife Service (USFWS). 2004. High Priority Shorebirds - 2004. US Shorebird Conservation Plan. High Priority Shorebirds list available online at: http://www.shorebirdplan.org/wp-content/uploads/2013/01/Priority-Shorebirds-Aug-04.pdf

US Fish and Wildlife Service (USFWS). 2005. Final List of Bird Species to Which the Migratory Bird Treaty Act Does Not Apply. Notice of Availability. United States Fish and Wildlife Service, Department of the Interior. 70 Federal Register (FR) 49: 12710-12716. March 15, 2005. Available online at: https://www.fws.gov/policy/library/2005/05-5127.html

US Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. December 2008. Division of Migratory Bird Management. Arlington, Virginia. Available online at: https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf

US Fish and Wildlife Service (USFWS). 2009a. Title 50 - Wildlife and Fisheries. Chapter I - United States Fish and Wildlife Service, Department of the Interior (Continued). Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants (Continued). Part 22 - Eagle Permits. Subpart C - Eagle Permits: Permits for Eagle Take That Is Associated with, but Not the Purpose of, an Activity. 50 CFR § 22.26 (a)(2). October 1, 2009.

US Fish and Wildlife Service (USFWS). 2009b. Yuma Clapper Rail (*Rallus longirostris yumanensis*) Recovery Plan. Draft First Revision. USFWS, Southwest Region, Albuquerque, New Mexico.

US Fish and Wildlife Service (USFWS). 2010. Region 8 Interim Guidelines for the Development of a Project- Specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities. USFWS, Region 8, Sacramento, California.

US Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online at: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 -

Land- Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online at: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf

US Fish and Wildlife Service (USFWS). 2014. Yuma Clapper Rail (*Rallus longirostris yumanensis*). Species Profile. USFWS Environmental Conservation Online System (ECOS). Updated December 2014. ECOS available at: http://ecos.fws.gov/ecos/indexPublic.do; Yuma clapper rail species profile available online at: http://ecos.fws.gov/ecp0/profile/speciesProfile?sId=3505

USA Topo. 2016. USA Topo Maps. US Geological Survey (USGS) topographical maps for the United States. ArcGIS. ESRI, producers of ArcGIS software. Redlands, California.

Walston, L., Jr., K. E. Rollins, K. P. Smith, K. E. LaGory, K. Sinclair, C. Turchi, T. Wendelin, and H. Souder. 2015. A Review of Avian Monitoring and Mitigation Information at Existing Utility-Scale Solar Facilities. Argonne National Laboratory and National Renewable Energy Laboratory, ANL/EVS-15/2, http://www.evs.anl.gov/downloads/ANL-EVS_15-2.pdf

Warren-Hicks, W., J. Newman, R. Wolpert, B. Karas, and L. Tran. 2013. Improving Methods for Estimating Fatality of Birds and Bats at Wind Energy Facilities. Public Interest Energy Research (PIER) Program CEC-500-2012-086. Final Project Report. Prepared for the California Energy Commission, Prepared on behalf of the California Wind Energy Association (CalWEA). February 2013. Available online at: http://www.energy.ca.gov/2012publications/CEC-500-2012-086/CEC-500-2012-086.pdf

Weissenfluh, D. 2012. Ash Meadows National Wildlife Refuge Yuma Clapper Rail Summary Report: 2007-2012. July 31, 2012. 9 pp.

Welty, J. C. and L. Baptista. 1998. The Life of Birds. Fourth edition. Sunders College Publishing, New York.

Western EcoSystems Technology, Inc. (WEST). 2014a. Desert Sunlight Bird and Bat Conservation Strategy. Technical Document Prepared for Desert Sunlight LLC, and submitted to the Bureau of Land Management (BLM).

Western EcoSystems Technology, Inc. (WEST). 2014b. Sources of Avian Mortality and Risk Factors Based on Empirical Data from Three Photovoltaic Solar Facilities. Prepared by WEST. June 17, 2014.

Western Ecosystems Technology, Inc. (WEST). 2015. Post-Construction Monitoring at the Desert Sunlight Solar Project. WEST, Cheyenne, Wyoming.

Western Ecosystems Technology, Inc. (WEST). 2016a. Avian and Bat Monitoring at the Desert Sunlight Solar Farm Project Riverside County, California, 2015 - 2016 Annual Report [Draft]. Prepared for Desert Sunlight 250, LLC and Desert Sunlight 300, LLC, Juno Beach, Florida. Prepared by WEST, Cheyenne Wyoming.

Western EcoSystems Technology, Inc. (WEST). 2016b. Bird and Bat Conservation Strategy, Blythe Solar Energy Project, Riverside County, California. 57 pp.

Western EcoSystems Technology, Inc. (WEST). 2016c. Bird and Bat Conservation Strategy, McCoy Solar Energy Project, Riverside County, California. 57 pp.

Wildlife Research Institute (WRI). 2010. Golden Eagle Surveys Surrounding Four Proposed Solar Developments in Eastern Mojave Desert, Riverside and San Bernardino Counties, California. Prepared for Tetra Tech EC. June 22.

Appendix A. Summary of Study Methods for Pre-project Surveys

Bird Use Count Surveys

Methods

Bird use count (BUC) surveys were conducted by BBI during the spring (April 8 – May 4; BBI 2013a) and summer (May 5 – June 1; BBI 2013b) of 2013 and by Western EcoSystems Technology, Inc. (WEST) during the fall of 2013 (August 20 – December 13; Levenstein et al. 2014a), spring of 2014 (March 24 – June 05; Levenstein et al. 2014b), and spring 2015 (March 09 – June 05, 2015; Levenstein et al. 2015). The objective of the BUC surveys was to estimate the spatial and temporal use of the Project by medium to large birds, particularly vultures and diurnal raptors (i.e., kites, accipiters, buteos, northern harriers [Circus cyaneus], eagles, falcons and osprey [Pandion haliaetus]). Point counts using circular plots (similar to those described by Reynolds et al. 1980, Bibby et al. 1992) were conducted at six BUC observations points established throughout the PSEGS site and surrounding 0.6-mile buffer, through fall 2013; two of the six original BUC observation points in the interior of the Project footprint were surveyed during the spring 2014 season (points 3 and 5, Figure 4). Each survey plot was an 800-m (2,625-ft) radius circle centered on the point. From April 8 to May 4, and from August 20 – December 13, surveys at each observation point were conducted for approximately eight continuous hours per day (between approximately 6:00 am and 7:00 pm), four days per week. From May 5 to June 1, surveys at each observation point were conducted for approximately eight continuous hours per day (between approximately 6:00 am and 7:00 pm), one day per week.

Survey methods were consistent with those used by the Hawk Migration Association of North America, with observers continuously scanning the sky and surrounding areas for target species within the survey area. Observations of birds beyond 800-m radius were recorded, but were not included in statistical analyses. For each observation, the following data were recorded: observation number, start and end time of each observation, species or best possible identification, number of individuals, sex and age class (if possible), altitude above ground level (AGL) when first observed, highest and lowest altitude AGL, distance from plot center when first detected, closest distance, general flight direction, activity (behavior), and habitat(s). Flight or movement paths for all raptors and vultures were mapped onto US Geological Survey (USGS) base maps, given corresponding observation numbers, and digitized using ArcGIS software. Additionally, for each golden eagle observed, data were recorded every minute that the bird was within view, as recommended in the USFWS Eagle Conservation Plan Guidance (USFWS 2013).

Small Bird Count Surveys

Methods

To date, six seasons of small bird count (SBC) surveys have been conducted at the Project site. At the original PSPP, SBC surveys were conducted by EDAW AECOM and BBI (2009) in the spring of 2009. While the Project was known as the PSEGS, SBC surveys were conducted by BBI during the spring of 2013 (April 9 – June 29; BBI 2013a) and by WEST during the fall of

2013 (August 19 – November 14; Levenstein et al. 2014a) and spring of 2014 (March 24 – June 05; Levenstein et al. 2014b). While the project was known as AGS, surveys were conducted in

the spring of 2015 (March 16 – June 05; Levenstein et al. 2015). The objective of the SBC surveys was to characterize use by migrant and resident birds, particularly songbirds, within the site and surrounding area during the spring and fall migration periods. While data collection methods and survey point locations were generally consistent between survey year and seasons, the number of overall survey points varied somewhat. In 2009, a total of 48 points, located along six transects within the PSPP project boundary, were surveyed between April 12 and May 8. During the spring, summer, and fall of 2013, 120 points, 176 points, and 150 points, respectively, were surveyed throughout the PSEGS site and surrounding 1.0-mile (1.6-km) buffer. During the spring of 2014, a reduced survey effort was implemented and only 72 of the 150 points surveyed during the fall of 2013 were sampled (Figure 5a). The spring 2015 survey was further reduced the number of survey points to 64 of the 150 fall 2013 survey stations (Figure 5b); however, these stations were chosen to accommodate the substantially smaller footprint of the AGS project (Levenstein et al. 2015).

During the spring of 2013 (April 9 – May 1) a total of 120 points were surveyed. During the summer of 2013 (May 2 – June 29), the survey effort was increased to include 186 points. For the fall 2013 survey effort (August 19 – November 14), the number of points was reduced to 150. During each season, points were separated by at least 810 ft (247 m) to ensure independence of observations. The SBC points were surveyed once per week during the spring 2009, spring and summer 2013, and fall 2013 study periods, with all surveys conducted between 15 minutes (min) before dawn and six hours after dawn to maximize the probability of detecting the target species (i.e., passerines). Surveys at each station consisted of a 10-min passive listening survey, during which time all species seen or heard were recorded. Though birds of all sizes and at all distances from the observer were recorded, an emphasis was placed on detecting all birds within 100 m (328 ft) of the observer. For each bird detected, the following data were recorded: station number, species, sex (if known), age (if known), distance from point count station, direction from station, flight height upon initial observation, flight direction, mode of detection (visual, song, call, other), and activity. If a sensitive species was detected, additional data, such as location (Universal Transverse Mercator [UTM] coordinates), were recorded.

Mist-Net Surveys

Methods

Avian mist-net (MN) surveys were conducted by BBI during the spring (April 11 – May 4; BBI 2013a) and summer (May 9 – June 14; BBI 2013b) of 2013 and by WEST during the fall of 2013 (September 18 – October 30; Levenstein et al. 2014a). The MN surveys were conducted as a supplement to SBC surveys to increase the probability of detecting inconspicuous birds that might otherwise go undetected. From April 11 – May 4, MN surveys were conducted for eight days at eight MN stations, with each MN station consisting of net arrays placed around three adjacent SBC point count stations in the same habitat type. A total of 12 standard 2.6 x 12 m

(8.5 x 39 ft) MN were used daily at each MN station, with four nets placed within 50-100 m (164-328 ft) to the north, south, east, and west, respectively, of each of the three SBC stations that comprised the single MN station. The eight MN stations were equally divided among habitat types, with four each in Desert Dry Wash Woodland and Sonoran Creosote Scrub, and equally divided in regard to areas of proposed Project permanent impact, with four MN stations in areas of proposed permanent disturbance and four in areas adjacent to proposed permanent disturbance. The MN surveys were conducted twice per week, with one survey at a MN station in Desert Dry Wash Woodland and the other in Sonoran Creosote Scrub habitat.

From May 9 – June 14, one of six MN stations was surveyed each week for three consecutive days. Three of these stations were situated in Desert Dry Woodland Wash habitat within the Project boundary and three were situated within the palm plantation immediately adjacent to and on the northwest edge of the Project site, in an area where the overstory consisted of date palm trees (Phoenix dactylifera) and the understory consisted of cultivated citrus trees with dense foliage. At each MN station, a total of 12 standard 2.6 x 12 m mist nets were arranged in two or three lanes, each with four to six nets strung together. On occasion, more than 12 nets were set up at a station to take advantage of active areas that were discovered after setting up the initial net lanes. These “Extra” nets were in addition to the 12 “Standard” nets and were sometimes placed outside of the targeted habitat for a MN station. As such, the results for Standard and Extra net lanes are presented separately. Net lanes were generally arranged within 50-100 m of one another at a given MN station, and placed among vegetative features at the MN station so as to minimize visibility and maximize the probability of capture. All MN lanes were arranged along the east-west axis.

During the fall study, MN surveys were conducted for three consecutive days (ambient conditions permitting) each week at one of four rotating stations. Two MN stations were located within Desert Dry Wash Woodland (stations 1 and 3) one station was located within Sonoran Creosote Scrub (station 2), and one station was located within the palm plantation (station 4; Figure 7). At each MN station, during both spring and fall studies, 12 standard 2.6 x 12 m MN were used with nets placed so as to minimize detection by small birds (e.g., out of direct sunlight to the extent possible, proximate to shrubs and/or trees when present). At each station, nets were opened at approximately dawn (between 6:00 am and 7:00 am) and remained open for approximately four hours or until conditions (i.e., temperature, wind, precipitation) required nets to be closed. All birds captured in nets were removed carefully, banded with a unique aluminum USFWS leg band, and released. Additionally, information recorded for all captured birds included: date, time, station, net number, bander’s name, species, band number, molt, level of stored fat, and feather/plumage characteristics, and when possible, age and sex.

Winter 2013 Golden Eagle Surveys

Methods

Winter golden eagle surveys were conducted at the Project by BBI from January 23 to February 27, 2013 (BBI 2013d). The purpose of the surveys was to evaluate use of the Project and surrounding region by wintering and resident golden eagles using a combination of baited camera traps and visual surveys. Camera trapping was used to gauge the use of lands within the study area by golden eagles and other wildlife, as golden eagles will regularly utilize carrion as a food source when it is available. Carcasses were placed as bait, staked to the ground at locations selected based on habitat features spread out across the study area near accessible roads. Reconyx™ 500 series cameras were staked within 15 ft (4.6 m) of the carcass to capture all visiting predators and scavengers. The cameras were set to record activity at a minimum of a picture every five seconds and were in operation 24 hours per day from the time of set-up to removal of the station. Image data stored on the camera memory cards were retrieved and downloaded during weekly survey visits to document all activity. Stations were left operating from the initial set-up date until the surveys ended or until evidence of lack of activity dictated taking down or moving the station. Bait station 1 was in operation for five weeks, station 2 for four weeks, stations 3 and 4 in operation for six weeks, station 6 for five weeks, and station 7 for three weeks. Camera trapping operations were conducted constantly from January 23 to February 27, 2013.

Visual surveys for golden eagles and other avian predators were conducted during each visit to the study area by driving all accessible roads and stopping at random locations and scanning the skyline and potential perch locations such as cliffs, rock outcroppings and trees with high powered binoculars and spotting scopes. Observations were also conducted from the location of each bait station. Large areas of the Palen Mountains and Coxcomb Mountains, as well as smaller portions of the Chuckwalla Mountains, were not accessible and not adequately surveyed. Intensive bird use surveys, designed to document use of the Project by resident and migrating eagles and other raptors, were conducted within the PSEGS boundary during the spring and fall of 2013 (see Section 2.2.1).

Eagle Nest Surveys

Methods

Spring aerial and ground golden eagle nesting surveys were conducted by BBI between March 20 and April 15, 2013 (BBI 2013c). Aerial surveys were conducted by helicopter on April 6 and 7, 2013, within 10 miles of the Project. Surveys covered all areas of suitable golden eagle nesting habitat and known eagle nest sites within the Palen Mountains and the Chuckwalla Mountains, including transmission structures along the I-10 power lines. Due to bighorn sheep (Ovis canadensis) lambing season flight restrictions, aerial surveys in the Chuckwalla Mountains were conducted from heights of greater than 1,500 ft (457 m) AGL in all areas. Aerial surveys were conducted in a helicopter (Bell Jet Ranger) and followed the survey methodology described in Pagel et al. (2010) to the extent possible. During surveys, all areas within the study area were searched for large stick nests used by golden eagles and other raptors on cliff faces and transmission towers. Three follow-up ground-based surveys were conducted on foot in the Chuckwalla Mountains between the dates of April 8 and April 15, 2013, to visit and observe potential golden eagle nest sites identified during aerial surveys. Three additional days of foot and vehicular surveys were conducted on March 20, 21, and 22, 2013, in the Coxcomb Mountains, which could not be surveyed by helicopter at any reasonable height due to flight restrictions in Joshua Tree National Park.

Summer aerial and ground golden eagle nesting surveys were conducted between May 24 and August 3, 2013. Aerial surveys were conducted by helicopter on May 24 and 25, 2013, in the southern Palen Mountains and along a 20-mile (32-km) length of the Devers-Palo Verde #2 transmission lines that follow the I-10 freeway corridor, and again on August 2-3 in the Chuckwalla Mountains, when aircraft flight restrictions related to bighorn sheep lambing no longer applied in this area. Summer ground surveys were conducted in the Coxcomb Mountains on May 24 and 25, 2013, and again for three days on June 9, 11, and 15, 2013.

Spring and summer aerial and ground golden eagle nesting surveys were also conducted April 08 – 12 and July 01 – 03, 2014. Aerial surveys were conducted on April 09 and July 01 – 03, 2014 within a 10-mile (16-km) buffer of the boundary for the proposed Project at the time. Ground-based surveys were also conducted during the entire April survey period, during which all previously documented eagle nests were visited, and observers scanned for suitable habitat for new nests. As in other seasons, aerial surveys were limited due to restrictions for bighorn sheep lambing.

Spring ground-based golden eagle nesting surveys were conducted between March 10 and March 19, 2015, to obtain the status of previously documented golden eagle nests within a 10-mile buffer of the AGS project (WEST 2015). Aerial surveys were not performed during this time period due to flying restrictions as a result of desert bighorn sheep lambing activity.

Golden Eagle Prey Abundance Surveys

Methods

Golden eagle prey abundance surveys were conducted concurrently with SBC surveys by BBI during the spring of 2013, from April 9 to June 29 (BBI 2013a, 2013b). Prey abundance surveys were conducted as surveyors walked along transects between SBC survey points and recorded the number of black-tailed jackrabbits (Lepus californicus) and desert cottontails (Sylvilagus audubonii) detected incidentally since leaving the previous station. These data provide relative measures of abundance which are spatially linked to SBC station locations for these two species.

Burrowing Owl Surveys

Methods

In the spring of 2009 (March 10 – June 14), breeding burrowing owl surveys were conducted throughout the original PSPP by EDAW AECOM (2009). Surveys were performed in conjunction with desert tortoise (Gopherus agassizii) surveys, and were consistent with the survey protocol established by the California Burrowing Owl Consortium (CBOC 1993) and accepted by the CDFW. Surveyors walked slowly and systematically along transects, spaced 10 m (33 ft) apart, throughout the entire disturbance area and a 150-m (492-ft) buffer, while visually searching for burrowing owls, their sign (e.g., pellets, whitewash, feather, bones, etc.), and burrows potentially suitable for use by burrowing owls. All burrowing owl observations, sign, and burrows (regardless of sign presence) were mapped using global positioning system (GPS) units and recorded on datasheets. A minimum of four visits were made to each mapped burrow and carefully examined for burrowing owl sign. All burrows with owl sign were surveyed three additional times during the breeding season to determine burrowing owl presence.

In the spring of 2013, supplemental burrowing owl surveys were conducted by Dr. Alice Karl (Karl 2013) along portions of the Project linear facilities (gen-tie line and natural gas pipeline) that were modified from the original PSPP and not included in the 2009 survey effort; however, the original Project was not resurveyed at this time. Surveys were consistent with the most recent burrowing owl survey guidelines (CDFG 2012) and consisted of four field visits during the breeding season, April 7 – June 26. During each field visit, surveyors walked a transect along the center of the corridor for both the modified gen-tie (120 ft [approximately 40 m] wide) and gas line (50 ft [approximately 20 m] wide), as well as buffer transects spaced at 20-m intervals, out to 120 m (394 ft) from the corridor edges.

In spring and summer 2016, the site was surveyed using 10-to-20 meter spaced transects. All burrows observed during surveys were inspected for burrowing owl sign. All burrows with sign identified in spring 2016 were revisited in summer 2016

Agricultural Pond Surveys

Methods

WEST conducted weekly surveys at the three agricultural ponds within the privately-owned land to the northwest of the Project site and just beyond the palm plantation during the fall of 2013 (August 19 – December 10; Levenstein et al. 2014a), spring of 2014 (March 24 – June 05; Levenstein et al. 2014b), and spring of 2015 (March 13 – June 03, 2015; Levenstein et al. 2015). The objective of the surveys was to evaluate use of three agricultural ponds adjacent to the northwest boundary of the Project site by species that associate with water (e.g., migratory shorebirds, waterbirds, and waterfowl) that might go unobserved during BUC surveys conducted within the Project boundary. While the focus of the surveys was migratory water-dependent species, all medium to large birds seen or heard during each survey were recorded. One survey point was established at each of three agricultural ponds (Figure 4) and each point was surveyed for approximately 2.5 hours during each visit for a total of approximately eight hours of total survey time in the pond area each week; one of the points was dropped for the spring 2014 survey period. Points were selected to achieve good visual coverage of each pond and the surrounding landscape. Each survey plot was an 800-m radius circle centered on the point. Data collection methods were identical to those used during BUC surveys (see Section 2.2.1.1 above). Observations of all water-dependent species and other medium to large birds beyond the 800-m radius were recorded, but were not included in statistical analyses.

Nocturnal Migration Radar Surveys

Methods

WEST conducted nocturnal migration radar surveys at the Project during the fall of 2013 (August 12 – October 31; Levenstein and Nations 2014). The goals of the radar survey were to document and measure nocturnal migration over the Project area, and assess risk related to the proposed infrastructure of PSEGS, which included a tall tower with illumination at night. Surveys employed a mobile radar lab consisting of a mobile X-band marine radar unit mounted on a converted van. The X-band radar unit transmitted at 9,410 megahertz with peak power output of 12 kilowatts, and was similar to other radar labs used to study development sites throughout the US. A single radar site was monitored from approximately sunset until sunrise on approximately 50 nights during the late summer-fall 2013 migration period, with radar coverage of approximately 90% achieved in both horizontal and vertical modes. The radar system used in this study has several controls which affect recognition and tracking of targets. A "target" refers to a single radar echo. A target may represent more than one bird or bat if individuals are flying close together. Targets with air speeds less than 6.0 m/second (m/s; 19.7 ft/s; likely insects) or greater than 35.0 m/s (114.8 ft/s; aircraft) were judged not to be birds or bats and were excluded from further analysis of the data.

Acoustic Bat Surveys and Bat Roost Surveys

Methods

In 2009, EDAW AECOM conducted a 1-day survey for bat roosts within the original PSPP and surrounding region (EDAW AECOM 2009a). During baseline surveys for the Project in spring of 2013, an additional bat roost survey was conducted within one mile of the modified linear facilities for the Project (Karl 2013). During both survey efforts, potential roosting habitat (e.g., freeway underpasses, bridges, buildings) were examined for signs of bat roosting.

Acoustic bat surveys were conducted at the Project in May 2013 and October through mid-December 2013 (Brown and Rainey 2013, 2014). The goal of the surveys was to assess the potential for bat roosting and foraging at the site. A list of the bat species with potential to occur on the site is shown in Table 5. The initial acoustic monitoring was conducted for four nights, from May 11 through May 14, 2013, to sample bats utilizing the Project site. Passive acoustic monitors consisting of an ultrasound detector and a programmable data storage device (AnaBat II and CF-ZCAIM; Titley Electronics, Ballina, New South Wales, Australia) were deployed at 13 locations throughout the Project (Figure 11). All acoustic monitors were placed three ft (one m) above the ground on poles. Half of the detectors had standard Titley ultrasonic microphones (20 kilohertz [kHz] to greater than 120 kHz) and half had low-frequency microphones with the same ultrasonic capability, but higher sensitivity to sounds in the audible range (4.5 to 20 kHz). Higher sensitivity microphones enhance recognition of human audible bat sounds (e.g., pallid [Antrozous pallidus] and California leaf- nosed bat [Macrotus californicus] social calls, and hoary bat [Lasiurus cinereus], western mastiff [Eumops perotis], and other larger free-tail bat calls), but also increases the probability of recording insects, rodents, birds, and leaf rustle.

A second acoustic survey was conducted in the fall of 2013, from October 7 through December 14. This survey effort consisted of four AnaBat SD1 ultrasonic detectors with standard microphones deployed at four sites throughout the Project, including three of the same site sampled during the spring of 2013 and a new site at a large constructed pond adjacent to the agricultural property, approximately one km from the northwest corner of the Project site (Figure 11).

Acoustic data were analyzed using Analook W 3.9c (available at: www.hoarybat.com/Beta), as well as visual examination of call sequences. In this analysis, three multispecies acoustic categories are M50 (typically steep calls that end near 50 kHz) and in the Project could include two species of Myotis bats (Yuma myotis [M. yumanensis] and California myotis [M. californicus]); Q25 (calls ending near 25 kHz attributable to several mid-frequency larger species); and LACI/NYFE calls (largely below 20 kHz) that are attributable to either hoary bats or pocketed free-tailed bats (Nyctinomops femorosacca). All M50 calls were assigned to California myotis based on knowledge of distributional and habitat information. Relative activity rates presented in the results represent counts of 1-min intervals during the night that had at least one identified sequence file for a species or multispecies category (activity index of Miller 2001).

Appendix B. All Bird Types and Species Observed at the Palen Photovoltaic Solar Project during Bird Use Count Surveys, August 20 – December 13, 2013, and March 24 – June 5, 2014

Appendix B1. Summary of the number of observations and groups recorded by species and bird type during bird use count surveys at the Palen Photovoltaic Solar Project[a], August 20 – December 13, 2013, and March 24 – June 5, 2014.

		Fall 2013		Spring 2014		Overall	
Type / Species	***Scientific Name***	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Waterbirds		**132**	**1,090**	**4**	**13**	**136**	**1,103**
American white pelican	*Pelecanus erythrorhynchos*	9	32	0	0	9	32
double-crested cormorant	*Phalacrocorax auritus*	4	34	0	0	4	34
great blue heron	*Ardea herodias*	33	41	0	0	33	41
great egret	*Ardea alba*	43	119	1	2	44	121
sandhill crane	*Grus canadensis*	6	57	0	0	6	57
snowy egret	*Egretta thula*	3	3	0	0	3	3
unidentified bittern		0	0	1	3	1	3
unidentified egret		2	5	0	0	2	5
unidentified waterbird		1	16	0	0	1	16
white-faced ibis	*Plegadis chihi*	31	783	2	8	33	791
Gannets		**1**	**1**	**0**	**0**	**1**	**1**
blue-footed booby	*Sula nebouxii*	1	1	0	0	1	1
Waterfowl		**108**	**973**	**0**	**0**	**108**	**973**
American wigeon	*Anas americana*	1	1	0	0	1	1
blue-winged teal	*Anas discors*	4	23	0	0	4	23
cackling goose	*Branta hutchinsii*	2	2	0	0	2	2
Canada goose	*Branta canadensis*	12	117	0	0	12	117
cinnamon teal	*Anas cyanoptera*	1	11	0	0	1	11
gadwall	*Anas strepera*	1	1	0	0	1	1
greater white-fronted goose	*Anser albifrons*	5	195	0	0	5	195
green-winged teal	*Anas crecca*	3	10	0	0	3	10
northern shoveler	*Anas clypeata*	3	28	0	0	3	28
ring-necked duck	*Aythya collaris*	1	1	0	0	1	1
Ross' goose	*Chen rossii*	14	32	0	0	14	32
snow goose	*Chen caerulescens*	31	230	0	0	31	230
unidentified duck		16	182	0	0	16	182
unidentified goose		12	128	0	0	12	128
unidentified teal	*Anas spp*	1	7	0	0	1	7
unidentified waterfowl		1	5	0	0	1	5
Shorebirds		**50**	**404**	**2**	**2**	**52**	**406**
American avocet	*Recurvirostra americana*	11	276	0	0	11	276
black-bellied plover	*Pluvialis squatarola*	1	2	0	0	1	2
black-necked stilt	*Himantopus mexicanus*	2	43	0	0	2	43
greater yellowlegs	*Tringa melanoleuca*	4	4	1	1	5	5
killdeer	*Charadrius vociferus*	10	15	0	0	10	15

Appendix B1. Summary of the number of observations and groups recorded by species and bird type during bird use count surveys at the Palen Photovoltaic Solar Project[a], August 20 – December 13, 2013, and March 24 – June 5, 2014.

		Fall 2013		Spring 2014		Overall	
Type / Species	***Scientific Name***	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
least sandpiper	*Calidris minutilla*	8	14	0	0	8	14
long-billed curlew	*Numenius americanus*	5	5	0	0	5	5
mountain plover	*Charadrius montanus*	1	6	0	0	1	6
pectoral sandpiper	*Calidris melanotos*	1	1	0	0	1	1
semipalmated plover	*Charadrius semipalmatus*	1	1	0	0	1	1
short-billed dowitcher	*Limnodromus griseus*	1	1	0	0	1	1
unidentified shorebird		1	3	0	0	1	3
western sandpiper	*Calidris mauri*	4	33	0	0	4	33
whimbrel	*Numenius phaeopus*	0	0	1	1	1	1
Gulls/Terns		**65**	**495**	**2**	**2**	**67**	**497**
Bonaparte's gull	*Chroicocephalus philadelphia*	4	6	0	0	4	6
California gull	*Larus californicus*	12	108	0	0	12	108
Herring gull	*Larus argentatus*	5	49	0	0	5	49
laughing gull	*Leucophaeus atricilla*	3	6	0	0	3	6
mew gull	*Larus canus*	4	46	0	0	4	46
ring-billed gull	*Larus delawarensis*	24	184	0	0	24	184
unidentified gull		13	96	2	2	15	98
Shearwaters/Petrels		**1**	**17**	**0**	**0**	**1**	**17**
unidentified shearwater		1	17	0	0	1	17
Diurnal Raptors		**1,346**	**1,587**	**131**	**157**	**1,477**	**1,744**
Accipiters		*189*	*200*	*0*	*0*	*189*	*200*
Cooper's hawk	*Accipiter cooperii*	130	134	0	0	130	134
sharp-shinned hawk	*Accipiter striatus*	52	59	0	0	52	59
unidentified accipiter		7	7	0	0	7	7
Buteos		*588*	*740*	*95*	*117*	*683*	*857*
ferruginous hawk	*Buteo regalis*	9	9	0	0	9	9
red-shouldered hawk	*Buteo lineatus*	3	3	0	0	3	3
red-tailed hawk	*Buteo jamaicensis*	442	488	52	57	494	545
Swainson's hawk	*Buteo swainsoni*	130	236	40	56	170	292
unidentified buteo		2	2	3	4	5	6
zone-tailed hawk	*Buteo albonotatus*	2	2	0	0	2	2
Northern Harrier		*140*	*142*	*0*	*0*	*140*	*142*
northern harrier	*Circus cyaneus*	140	142	0	0	140	142
Eagles		*8*	*8*	*0*	*0*	*8*	*8*
golden eagle	*Aquila chrysaetos*	8	8	0	0	8	8
Falcons		*210*	*219*	*28*	*29*	*238*	*248*

Appendix B1. Summary of the number of observations and groups recorded by species and bird type during bird use count surveys at the Palen Photovoltaic Solar Project[a], August 20 – December 13, 2013, and March 24 – June 5, 2014.

		Fall 2013		Spring 2014		Overall	
Type / Species	***Scientific Name***	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
American kestrel	*Falco sparverius*	54	54	13	14	67	68
merlin	*Falco columbarius*	1	1	0	0	1	1
peregrine falcon	*Falco peregrinus*	2	2	0	0	2	2
prairie falcon	*Falco mexicanus*	149	158	15	15	164	173
unidentified falcon		4	4	0	0	4	4
Osprey		*91*	*109*	*0*	*0*	*91*	*109*
osprey	*Pandion haliaetus*	91	109	0	0	91	109
Other Raptors		*120*	*169*	*8*	*11*	*128*	*180*
unidentified hawk		23	28	4	4	27	32
unidentified raptor		97	141	4	7	101	148
Owls		**3**	**3**	**0**	**0**	**3**	**3**
burrowing owl	*Athene cunicularia*	1	1	0	0	1	1
short-eared owl	*Asio flammeus*	2	2	0	0	2	2
Vultures		**1,959**	**106,379**	**271**	**694**	**2,230**	**107,073**
turkey vulture	*Cathartes aura*	1,959	106,379	271	694	2,230	107,073
Upland Game Birds		**1**	**2**	**0**	**0**	**1**	**2**
ring-necked pheasant	*Phasianus colchicus*	1	2	0	0	1	2
Doves/Pigeons		**6**	**7**	**0**	**0**	**6**	**7**
common ground-dove	*Columbina passerina*	1	1	0	0	1	1
mourning dove	*Zenaida macroura*	3	4	0	0	3	4
rock pigeon	*Columba livia*	1	1	0	0	1	1
white-winged dove	*Zenaida asiatica*	1	1	0	0	1	1
Goatsuckers		**2**	**2**	**0**	**0**	**1**	**1**
lesser nighthawk	*Chordeiles acutipennis*	2	2	0	0	1	1
Large Corvids		**124**	**866**	**3**	**6**	**127**	**872**
American crow	*Corvus brachyrhynchos*	2	4	0	0	2	4
common raven	*Corvus corax*	122	862	3	6	125	868
Swallows		**927**	**2,439**	**120**	**375**	**1,047**	**3,486**
bank swallow	*Riparia riparia*	22	27	0	0	22	27
barn swallow	*Hirundo rustica*	547	1,536	32	63	579	1,599
cliff swallow	*Petrochelidon pyrrhonota*	102	206	30	84	132	290
northern rough-winged swallow	*Stelgidopteryx serripennis*	18	37	13	76	31	113
tree swallow	*Tachycineta bicolor*	50	126	19	70	69	196
unidentified swallow		134	355	19	53	153	408
violet-green swallow	*Tachycineta thalassina*	54	152	7	29	61	181

Appendix B1. Summary of the number of observations and groups recorded by species and bird type during bird use count surveys at the Palen Photovoltaic Solar Project[a], August 20 – December 13, 2013, and March 24 – June 5, 2014.

		Fall 2013		Spring 2014		Overall	
Type / Species	***Scientific Name***	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Swifts/Hummingbirds		**83**	**307**	**12**	**19**	**95**	**326**
Anna's hummingbird	*Calypte anna*	1	1	0	0	1	1
black-chinned hummingbird	*Archilochus alexandri*	2	2	0	0	2	2
Costa's hummingbird	*Calypte costae*	4	4	1	1	5	5
unidentified hummingbird		3	3	6	6	9	9
unidentified swift		2	3	0	0	2	3
Vaux's swift	*Chaetura vauxi*	61	132	2	5	63	137
white-throated swift	*Aeronautes saxatalis*	10	162	3	7	13	169
Overall		**4,808**	**114,572**	**545**	**1,268**	**5,353**	**115,840**

[a] Within an unlimited viewshed

Appendix C. All Bird Types and Species Observed at the Palen Photovoltaic Solar Project during Shorebird/Waterfowl Surveys, August 19 – December 10, 2013, and March 27 – June 2, 2014

Appendix C1. Total number of groups and individuals for each bird type and species during shorebird/waterfowl surveys at the Palen Photovoltaic Solar Project[a], August 19 – December 10, 2013, and March 27 – June 2, 2014.

		Fall 2013		Spring 2014		Overall	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Loons/Grebes		**64**	**267**	**6**	**20**	**70**	**287**
Clark's grebe	*Aechmophorus clarkii*	3	29	0	0	3	29
eared grebe	*Podiceps nigricollis*	25	191	6	20	31	211
pied-billed grebe	*Podilymbus podiceps*	17	23	0	0	17	23
western grebe	*Aechmophorus occidentalis*	19	24	0	0	19	24
Waterbirds		**75**	**173**	**10**	**23**	**85**	**196**
American white pelican	*Pelecanus erythrorhynchos*	2	9	0	0	2	9
cattle egret	*Bubulcus ibis*	2	2	0	0	2	2
double-crested cormorant	*Phalacrocorax auritus*	7	7	0	0	7	7
great blue heron	*Ardea herodias*	21	28	2	2	23	30
great egret	*Ardea alba*	23	46	0	0	23	46
green heron	*Butorides virescens*	7	7	0	0	7	7
snowy egret	*Egretta thula*	2	2	1	1	3	3
unidentified bittern		0	0	1	2	1	2
white-faced ibis	*Plegadis chihi*	11	72	6	18	17	90
Waterfowl		**142**	**492**	**32**	**91**	**174**	**583**
American wigeon	*Anas americana*	10	24	2	2	12	26
blue-winged teal	*Anas discors*	9	21	2	2	11	23
bufflehead	*Bucephala albeola*	4	8	0	0	4	8
canvasback	*Aythya valisineria*	3	6	0	0	3	6
cinnamon teal	*Anas cyanoptera*	5	17	2	8	7	25
common goldeneye	*Bucephala clangula*	12	89	0	0	12	89
gadwall	*Anas strepera*	5	6	0	0	5	6
greater scaup	*Aythya marila*	2	2	0	0	2	2
green-winged teal	*Anas crecca*	16	66	1	1	17	67
hooded merganser	*Lophodytes cucullatus*	4	4	0	0	4	4
lesser scaup	*Aythya affinis*	4	13	0	0	4	13
long-tailed duck	*Clangula hyemalis*	0	0	8	8	8	8
mallard	*Anas platyrhynchos*	7	17	0	0	7	17
northern pintail	*Anas acuta*	7	8	2	4	9	12
northern shoveler	*Anas clypeata*	15	72	2	2	17	74
red-breasted merganser	*Mergus serrator*	0	0	1	1	1	1
redhead	*Aythya americana*	8	10	0	0	8	10
ring-necked duck	*Aythya collaris*	13	37	4	7	17	44
Ross' goose	*Chen rossii*	1	1	0	0	1	1
ruddy duck	*Oxyura jamaicensis*	14	79	8	56	22	135
snow goose	*Chen caerulescens*	2	2	0	0	2	2
unidentified teal	*Anas spp*	1	10	0	0	1	10
Shorebirds		**117**	**360**	**83**	**395**	**200**	**755**
American avocet	*Recurvirostra americana*	14	152	2	18	16	170
black-necked stilt	*Himantopus mexicanus*	3	7	4	6	7	13
dunlin	*Calidris alpina*	0	0	1	1	1	1
greater yellowlegs	*Tringa melanoleuca*	16	26	6	8	22	34
killdeer	*Charadrius vociferus*	27	51	7	9	34	60
least sandpiper	*Calidris minutilla*	21	53	19	109	40	162
lesser yellowlegs	*Tringa flavipes*	1	1	1	1	2	2
long-billed curlew	*Numenius americanus*	1	1	0	0	1	1
long-billed dowitcher	*Limnodromus scholopaceus*	3	4	7	16	10	20
pectoral sandpiper	*Calidris melanotos*	1	1	0	0	1	1

Appendix C1. Total number of groups and individuals for each bird type and species during shorebird/waterfowl surveys at the Palen Photovoltaic Solar Project[a], August 19 – December 10, 2013, and March 27 – June 2, 2014.

Bird Type / Species	Scientific Name	Fall 2013 # grps	Fall 2013 # obs	Spring 2014 # grps	Spring 2014 # obs	Overall # grps	Overall # obs
semipalmated sandpiper	*Calidris pusilla*	0	0	1	1	1	1
short-billed dowitcher	*Limnodromus griseus*	1	2	1	2	2	4
solitary sandpiper	*Tringa solitaria*	3	9	0	0	3	9
spotted sandpiper	*Actitis macularia*	12	15	12	43	24	58
unidentified dowitcher	*Limnodromus spp*	0	0	2	6	2	6
unidentified sandpiper		4	19	0	0	4	19
western sandpiper	*Calidris mauri*	5	11	11	77	16	88
willet	*Tringa semipalmata*	0	0	1	2	1	2
Wilson's phalarope	*Phalaropus tricolor*	1	4	8	96	9	100
Wilson's snipe	*Gallinago delicata*	4	4	0	0	4	4
Gulls/Terns		**21**	**112**	**4**	**5**	**25**	**117**
black tern	*Chlidonias niger*	2	2	1	1	3	3
Bonaparte's gull	*Chroicocephalus philadelphia*	3	8	1	1	4	9
California gull	*Larus californicus*	5	12	2	3	7	15
little gull	*Hydrocoloeus minutus*	1	1	0	0	1	1
ring-billed gull	*Larus delawarensis*	10	89	0	0	10	89
Rails/Coots		**29**	**165**	**11**	**23**	**40**	**188**
American coot	*Fulica americana*	29	165	11	23	40	188
Diurnal Raptors		**66**	**68**	**23**	**26**	**89**	**94**
American kestrel	*Falco sparverius*	1	1	1	1	2	2
Cooper's hawk	*Accipiter cooperii*	9	9	3	3	12	12
merlin	*Falco columbarius*	1	1	0	0	1	1
northern harrier	*Circus cyaneus*	6	7	1	1	7	8
osprey	*Pandion haliaetus*	4	4	0	0	4	4
peregrine falcon	*Falco peregrinus*	1	1	0	0	1	1
prairie falcon	*Falco mexicanus*	10	10	9	9	19	19
red-shouldered hawk	*Buteo lineatus*	1	1	0	0	1	1
red-tailed hawk	*Buteo jamaicensis*	24	25	5	8	29	33
sharp-shinned hawk	*Accipiter striatus*	3	3	1	1	4	4
Swainson's hawk	*Buteo swainsoni*	3	3	2	2	5	5
unidentified accipiter	*Accipiter spp.*	3	3	0	0	3	3
unidentified buteo	*Buteo spp.*	0	0	1	1	1	1
Vultures		**69**	**843**	**57**	**277**	**126**	**1,120**
turkey vulture	*Cathartes aura*	69	843	57	277	126	1,120
Upland Game Birds		**9**	**24**	**7**	**18**	**16**	**42**
ring-necked pheasant	*Phasianus colchicus*	9	24	7	18	16	42
Doves/Pigeons		**3**	**12**	**0**	**0**	**3**	**12**
Eurasian collared-dove	*Streptopelia decaocto*	3	12	0	0	3	12
Large Cuckoos		**2**	**2**	**0**	**0**	**2**	**2**
greater roadrunner	*Geococcyx californianus*	2	2	0	0	2	2
Goatsuckers		**1**	**9**	**1**	**25**	**2**	**34**
lesser nighthawk	*Chordeiles acutipennis*	1	9	1	25	2	34
Large Corvids		**5**	**51**	**0**	**0**	**5**	**51**
common raven	*Corvus corax*	5	51	0	0	5	51
Swallows		**147**	**585**	**97**	**402**	**244**	**987**
bank swallow	*Riparia riparia*	8	20	1	1	9	21
barn swallow	*Hirundo rustica*	82	446	30	125	112	571
cliff swallow	*Petrochelidon pyrrhonota*	12	24	18	92	30	116
northern rough-winged swallow	*Stelgidopteryx serripennis*	3	3	10	14	13	17

Appendix C1. Total number of groups and individuals for each bird type and species during shorebird/waterfowl surveys at the Palen Photovoltaic Solar Project[a], August 19 – December 10, 2013, and March 27 – June 2, 2014.

Bird Type / Species	Scientific Name	Fall 2013		Spring 2014		Overall	
		# grps	# obs	# grps	# obs	# grps	# obs
purple martin	*Progne subis*	1	1	0	0	1	1
tree swallow	*Tachycineta bicolor*	33	73	30	150	63	223
unidentified swallow		3	4	2	3	5	7
violet-green swallow	*Tachycineta thalassina*	5	14	6	17	11	31
Swifts/Hummingbirds		**4**	**6**	**4**	**4**	**8**	**10**
Anna's hummingbird	*Calypte anna*	0	0	2	2	2	2
black-chinned hummingbird	*Archilochus alexandri*	0	0	1	1	1	1
Vaux's swift	*Chaetura vauxi*	4	6	0	0	4	6
white-throated swift	*Aeronautes saxatalis*	0	0	1	1	1	1
Overall		**754**	**3,169**	**335**	**1,309**	**1,089**	**4,478**

[a] Regardless of distance from observer

Appendix D. All Bird Types and Species Observed at the Palen Photovoltaic Solar Project during Small Bird Count Surveys, August 19 – November 14, 2013, and March 25 –June 4, 2014

Appendix D1. Total number of groups and individuals for each bird type and species during small bird count surveys at the Palen Photovoltaic Solar Project[a], August 19 – November 14, 2013, and March 25 – June 4, 2014.

		Fall 2013		Spring 2014		Overall	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Loons/Grebes		**14**	**85**	**0**	**0**	**14**	**85**
eared grebe	*Podiceps nigricollis*	6	65	0	0	6	65
pied-billed grebe	*Podilymbus podiceps*	3	11	0	0	3	11
western grebe	*Aechmophorus occidentalis*	5	9	0	0	5	9
Waterbirds		**29**	**189**	**10**	**21**	**39**	**210**
American white pelican	*Pelecanus erythrorhynchos*	1	1	0	0	1	1
cattle egret	*Bubulcus ibis*	1	8	0	0	1	8
great blue heron	*Ardea herodias*	5	6	0	0	5	6
great egret	*Ardea alba*	8	11	0	0	8	11
green heron	*Butorides virescens*	4	4	0	0	4	4
snowy egret	*Egretta thula*	3	3	0	0	3	3
unidentified bittern		0	0	10	21	10	21
white-faced ibis	*Plegadis chihi*	7	156	0	0	7	156
Waterfowl		**27**	**63**	**1**	**20**	**28**	**83**
American wigeon	*Anas americana*	1	1	0	0	1	1
blue-winged teal	*Anas discors*	4	13	0	0	4	13
bufflehead	*Bucephala albeola*	2	3	0	0	2	3
greater scaup	*Aythya marila*	2	2	0	0	2	2
green-winged teal	*Anas crecca*	2	6	0	0	2	6
northern shoveler	*Anas clypeata*	2	3	0	0	2	3
redhead	*Aythya americana*	4	4	0	0	4	4
ring-necked duck	*Aythya collaris*	2	3	0	0	2	3
ruddy duck	*Oxyura jamaicensis*	4	9	1	20	5	29
snow goose	*Chen caerulescens*	2	9	0	0	2	9
unidentified duck		1	8	0	0	1	8
unidentified teal		1	2	0	0	1	2
Shorebirds		**43**	**93**	**0**	**0**	**43**	**93**
American avocet	*Recurvirostra americana*	2	22	0	0	2	22
black-necked stilt	*Himantopus mexicanus*	3	19	0	0	3	19
greater yellowlegs	*Tringa melanoleuca*	3	4	0	0	3	4
killdeer	*Charadrius vociferus*	15	15	0	0	15	15
least sandpiper	*Calidris minutilla*	6	15	0	0	6	15
lesser yellowlegs	*Tringa flavipes*	1	2	0	0	1	2
long-billed dowitcher	*Limnodromus scholopaceus*	3	3	0	0	3	3
semipalmated plover	*Charadrius semipalmatus*	1	1	0	0	1	1
short-billed dowitcher	*Limnodromus griseus*	1	2	0	0	1	2
spotted sandpiper	*Actitis macularia*	4	4	0	0	4	4
unidentified dowitcher	*Limnodromus spp*	1	1	0	0	1	1
unidentified shorebird		1	1	0	0	1	1
western sandpiper	*Calidris mauri*	1	3	0	0	1	3
Wilson's snipe	*Gallinago delicata*	1	1	0	0	1	1
Gulls/Terns		**1**	**9**	**1**	**1**	**2**	**10**
Herring gull	*Larus argentatus*	1	9	0	0	1	9
unidentified gull		0	0	1	1	1	1
Rails/Coots		**8**	**48**	**0**	**0**	**8**	**48**
American coot	*Fulica americana*	8	48	0	0	8	48
Diurnal Raptors		**123**	**128**	**31**	**32**	**154**	**160**
American kestrel	*Falco sparverius*	5	6	7	7	12	13
Cooper's hawk	*Accipiter cooperii*	8	8	0	0	8	8
ferruginous hawk	*Buteo regalis*	2	2	0	0	2	2
northern harrier	*Circus cyaneus*	22	22	0	0	22	22

Appendix D1. Total number of groups and individuals for each bird type and species during small bird count surveys at the Palen Photovoltaic Solar Project[a], August 19 – November 14, 2013, and March 25 – June 4, 2014.

		Fall 2013		Spring 2014		Overall	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
osprey	*Pandion haliaetus*	4	4	0	0	4	4
prairie falcon	*Falco mexicanus*	24	26	4	4	28	30
red-shouldered hawk	*Buteo lineatus*	2	2	0	0	2	2
red-tailed hawk	*Buteo jamaicensis*	42	43	13	13	55	56
sharp-shinned hawk	*Accipiter striatus*	3	4	0	0	3	4
Swainson's hawk	*Buteo swainsoni*	6	6	5	5	11	11
unidentified accipiter	*Accipiter spp*	1	1	0	0	1	1
unidentified buteo	*Buteo spp*	1	1	0	0	1	1
unidentified raptor		3	3	1	2	4	5
white-tailed kite	*Elanus leucurus*	0	0	1	1	1	1
Owls		**3**	**3**	**0**	**0**	**3**	**3**
burrowing owl	*Athene cunicularia*	2	2	0	0	2	2
short-eared owl	*Asio flammeus*	1	1	0	0	1	1
Vultures		**100**	**1877**	**63**	**148**	**163**	**2,025**
turkey vulture	*Cathartes aura*	100	1877	63	148	163	2,025
Upland Game Birds		**22**	**144**	**17**	**48**	**39**	**192**
California quail	*Callipepla californica*	0	0	1	2	1	2
Gambel's quail	*Callipepla gambelii*	22	144	16	46	38	190
Doves/Pigeons		**112**	**302**	**60**	**108**	**172**	**410**
Eurasian collared-dove	*Streptopelia decaocto*	10	23	2	3	12	26
mourning dove	*Zenaida macroura*	96	266	53	98	149	364
white-winged dove	*Zenaida asiatica*	6	13	5	7	11	20
Cuckoos		0	0	6	7	6	7
greater roadrunner	*Geococcyx californianus*	0	0	6	7	6	7
Goatsuckers		0	0	3	4	3	4
lesser nighthawk	*Chordeiles acutipennis*	0	0	3	4	3	4
Passerines		2,573	7,076	780	1,705	3,353	8,781
Blackbirds/Orioles		*52*	*194*	*36*	*71*	*88*	*265*
Brewer's blackbird	*Euphagus cyanocephalus*	6	21	0	0	6	21
brown-headed cowbird	*Molothrus ater*	7	7	0	0	7	7
Bullock's oriole	*Icterus bullockii*	3	3	4	5	7	8
European starling	*Sturnus vulgaris*	6	52	6	25	12	77
great-tailed grackle	*Quiscalus mexicanus*	15	78	25	37	40	115
red-winged blackbird	*Agelaius phoeniceus*	2	3	0	0	2	3
western meadowlark	*Sturnella neglecta*	0	0	1	4	1	4
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	2	3	0	0	2	3
Corvids		379	1,002	109	150	488	1,152
common raven	*Corvus corax*	379	1,002	109	150	488	1,152
Finches/Crossbills		*354*	*1,124*	*47*	*93*	*401*	*1,217*
American goldfinch	*Spinus tristis*	2	2	0	0	2	2
house finch	*Haemorhous mexicanus*	337	1,098	44	81	381	1,179
Lawrence's goldfinch	*Spinus lawrencei*	1	1	0	0	1	1
lesser goldfinch	*Spinus psaltria*	14	23	0	0	14	23
unidentified finch		0	0	3	12	3	12
Flycatchers		*164*	*171*	*51*	*60*	*215*	*231*
ash-throated flycatcher	*Myiarchus cinerascens*	9	10	35	41	44	51
black phoebe	*Sayornis nigricans*	33	34	0	0	33	34
Cassin's kingbird	*Tyrannus vociferans*	0	0	1	2	1	2
gray flycatcher	*Empidonax wrightii*	0	0	1	1	1	1
Hammond's flycatcher	*Empidonax hammondii*	0	0	1	1	1	1
Pacific-slope flycatcher	*Empidonax difficilis*	0	0	2	4	2	4

Appendix D1. Total number of groups and individuals for each bird type and species during small bird count surveys at the Palen Photovoltaic Solar Project[a], August 19 – November 14, 2013, and March 25 – June 4, 2014.

Bird Type / Species	Scientific Name	Fall 2013 # grps	Fall 2013 # obs	Spring 2014 # grps	Spring 2014 # obs	Overall # grps	Overall # obs
Say's phoebe	*Sayornis saya*	112	117	8	8	120	125
unidentified flycatcher		1	1	1	1	2	2
western kingbird	*Tyrannus verticalis*	3	3	1	1	4	4
western wood-pewee	*Contopus sordidulus*	0	0	1	1	1	1
willow flycatcher	*Empidonax traillii*	6	6	0	0	6	6
Gnatcatchers/Kinglet		*96*	*122*	*34*	*50*	*130*	*172*
black-tailed gnatcatcher	*Polioptila melanura*	86	106	27	41	113	147
blue-gray gnatcatcher	*Polioptila caerulea*	5	9	5	6	10	15
ruby-crowned kinglet	*Regulus calendula*	5	7	2	3	7	10
Grassland/Sparrows		*567*	*2,798*	*147*	*259*	*714*	*3,057*
American pipit	*Anthus rubescens*	7	9	2	2	9	11
Bell's sparrow	*Artemisiospiza belli*	61	106	0	0	61	106
black-throated sparrow	*Amphispiza bilineata*	0	0	1	1	1	1
Brewer's sparrow	*Spizella breweri*	1	3	8	23	9	26
chipping sparrow	*Spizella passerina*	4	5	1	2	5	7
dark-eyed junco	*Junco hyemalis*	1	2	0	0	1	2
horned lark	*Eremophila alpestris*	446	2,541	127	204	573	2,745
house sparrow	*Passer domesticus*	2	2	0	0	2	2
lark sparrow	*Chondestes grammacus*	1	1	0	0	1	1
Lincoln's sparrow	*Melospiza lincolnii*	3	4	0	0	3	4
Savannah sparrow	*Passerculus sandwichensis*	4	9	1	1	5	10
song sparrow	*Melospiza melodia*	1	1	0	0	1	1
unidentified sparrow		5	7	0	0	5	7
white-crowned sparrow	*Zonotrichia leucophrys*	31	108	7	26	38	134
Mimids		*45*	*48*	*6*	*6*	*51*	*54*
crissal thrasher	*Toxostoma crissale*	1	1	0	0	1	1
Le Conte's thrasher	*Toxostoma lecontei*	39	42	6	6	45	48
northern mockingbird	*Mimus polyglottos*	4	4	0	0	4	4
sage thrasher	*Oreoscoptes montanus*	1	1	0	0	1	1
Swallows		*178*	*520*	*107*	*711*	*285*	*1,231*
bank swallow	*Riparia riparia*	2	3	0	0	2	3
barn swallow	*Hirundo rustica*	112	321	28	87	140	408
cliff swallow	*Petrochelidon pyrrhonota*	12	42	25	138	37	180
northern rough-winged swallow	*Stelgidopteryx serripennis*	12	26	4	17	16	43
tree swallow	*Tachycineta bicolor*	18	72	21	120	39	192
unidentified swallow		14	33	26	341	40	374
violet-green swallow	*Tachycineta thalassina*	8	23	3	8	11	31
Tanagers		*7*	*8*	*0*	*0*	*7*	*8*
lazuli bunting	*Passerina amoena*	4	4	0	0	4	4
painted bunting	*Passerina ciris*	1	1	0	0	1	1
western tanager	*Piranga ludoviciana*	2	3	0	0	2	3
Grosbeaks		*2*	*2*	*0*	*0*	*2*	*2*
black-headed grosbeak	*Pheucticus melanocephalus*	1	1	0	0	1	1
blue grosbeak	*Guiraca caerulea*	1	1	0	0	1	1
Shrikes		*152*	*159*	*69*	*83*	*221*	*242*
loggerhead shrike	*Lanius ludovicianus*	152	159	69	83	221	242
Thrushes		*2*	*2*	*8*	*10*	*10*	*12*
hermit thrush	*Catharus guttatus*	1	1	6	6	7	7
unidentified thrush		1	1	2	4	3	5

Appendix D1. Total number of groups and individuals for each bird type and species during small bird count surveys at the Palen Photovoltaic Solar Project[a], August 19 – November 14, 2013, and March 25 – June 4, 2014.

		Fall 2013		Spring 2014		Overall	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Titmice/Chickadees		*219*	*242*	*89*	*105*	*308*	*347*
verdin	*Auriparus flaviceps*	219	242	89	105	308	347
Vireos		*2*	*2*	*5*	*6*	*7*	*8*
Bell's vireo	*Vireo bellii*	1	1	0	0	1	1
Cassin's vireo	*Vireo cassinii*	1	1	0	0	1	1
warbling vireo	*Vireo gilvus*	0	0	5	6	5	6
Warblers		*269*	*553*	*49*	*74*	*318*	*627*
black-throated gray warbler	*Setophaga nigrescens*	1	1	1	2	2	3
common yellowthroat	*Geothlypis trichas*	10	10	1	1	11	11
Lucy's warbler	*Oreothlypis luciae*	0	0	2	2	2	2
MacGillivray's warbler	*Geothlypis tolmiei*	4	4	2	2	6	6
Nashville warbler	*Oreothlypis ruficapilla*	1	1	1	1	2	2
orange-crowned warbler	*Oreothlypis celata*	15	20	6	8	21	28
Townsend's warbler	*Setophaga townsendi*	0	0	2	2	2	2
unidentified warbler		2	2	4	6	6	8
Wilson's warbler	*Cardellina pusilla*	13	14	14	29	27	43
yellow-breasted chat	*Icteria virens*	1	1	0	0	1	1
yellow-rumped warbler	*Setophaga coronata*	216	493	16	21	232	514
yellow warbler	*Setophaga petechia*	6	7	0	0	6	7
Waxwings		*5*	*5*	*0*	*0*	*5*	*5*
phainopepla	*Phainopepla nitens*	5	5	0	0	5	5
Wrens		*40*	*53*	*13*	*13*	*53*	*66*
Bewick's wren	*Thryomanes bewickii*	3	3	0	0	3	3
cactus wren	*Campylorhynchus brunneicapillus*	31	44	13	13	44	57
house wren	*Troglodytes aedon*	2	2	0	0	2	2
rock wren	*Salpinctes obsoletus*	4	4	0	0	4	4
Unidentified Passerines		*40*	*71*	*10*	*14*	*50*	*85*
unidentified passerine		40	71	10	14	50	85
Swifts/Hummingbirds		**6**	**9**	**14**	**18**	**20**	**27**
Anna's hummingbird	*Calypte anna*	0	0	2	2	2	2
black-chinned hummingbird	*Archilochus alexandri*	0	0	1	1	1	1
unidentified hummingbird		0	0	7	7	7	7
Vaux's swift	*Chaetura vauxi*	6	9	3	6	9	15
white-throated swift	*Aeronautes saxatalis*	0	0	1	2	1	2
Woodpeckers		36	42	2	2	38	44
Gila woodpecker	*Melanerpes uropygialis*	**1**	**1**	**0**	**0**	**1**	**1**
ladder-backed woodpecker	*Picoides scalaris*	1	1	0	0	1	1
northern flicker	*Colaptes auratus*	34	40	2	2	36	42
Unidentified Birds		**3**	**4**	**3**	**33**	**6**	**37**
Unidentified small bird		3	4	2	26	5	30
unidentified large bird		0	0	1	7	1	7
Overall		**3,100**	**10,072**	**991**	**2,147**	**4,091**	**12,219**

[a] Regardless of distance from observer

Appendix E. All Bird Types and Species Observed at the Palen Photovoltaic Solar Project during Bird Use Count Surveys, March 9 – June 5, 2015

Appendix E1. Summary of the number of observations and groups recorded by species and bird type during spring bird use count surveys at the Palen Photovoltaic Solar Project[a], March 9 – June 5, 2015.

Type / Species	*Scientific Name*	# grps	# obs
Shorebirds		**1**	**1**
unidentified shorebird		1	1
Diurnal Raptors		**112**	**128**
Buteos		*67*	*81*
red-tailed hawk	*Buteo jamaicensis*	50	61
Swainson's hawk	*Buteo swainsoni*	15	18
unidentified buteo	*Buteo spp*	2	2
Northern Harrier		*3*	*3*
northern harrier	*Circus cyaneus*	3	3
Falcons		*34*	*34*
American kestrel	*Falco sparverius*	14	14
merlin	*Falco columbarius*	1	1
prairie falcon	*Falco mexicanus*	17	17
unidentified falcon	*Falco spp*	2	2
Osprey		*2*	*2*
osprey	*Pandion haliaetus*	2	2
Other Raptors		*6*	*8*
unidentified hawk		1	2
unidentified raptor		5	6
Owls		**1**	**1**
burrowing owl	*Athene cunicularia*	1	1
Vultures		**413**	**1,924**
turkey vulture	*Cathartes aura*	413	1,924
Doves/Pigeons		**2**	**3**
Eurasian collared-dove	*Streptopelia decaocto*	1	1
mourning dove	*Zenaida macroura*	1	2
Passerines		**103**	**233**
barn swallow	*Hirundo rustica*	31	75
cliff swallow	*Petrochelidon pyrrhonota*	10	43
common raven	*Corvus corax*	17	17
loggerhead shrike	*Lanius ludovicianus*	1	1
tree swallow	*Tachycineta bicolor*	14	44
unidentified swallow		28	51
western kingbird	*Tyrannus verticalis*	1	1
Wilson's warbler	*Cardellina pusilla*	1	1
Swifts/Hummingbirds		**7**	**11**
rufous hummingbird	*Selasphorus rufus*	1	1
unidentified swift		1	1
Vaux's swift	*Chaetura vauxi*	5	9
Unidentified Birds		**1**	**29**
unidentified bird (small)		1	29
Overall		**640**	**2,330**

[a] Within an unlimited viewshed

Appendix F. All Bird Types and Species Observed at the Palen Photovoltaic Solar Project during Shorebird/Waterfowl Surveys, March 13 – June 3, 2015

Appendix F1. Total number of groups and individuals for each bird type and species during spring shorebird/waterfowl surveys at the Palen Photovoltaic Solar Projecta, March 13 – June 3, 2015.

Bird Type / Species	Scientific Name	# grps	# obs
Waterbirds		**13**	**89**
double-crested cormorant	*Phalacrocorax auritus*	1	1
great blue heron	*Ardea herodias*	4	4
great egret	*Ardea alba*	1	3
green heron	*Butorides virescens*	1	1
snowy egret	*Egretta thula*	2	2
white-faced ibis	*Plegadis chihi*	4	78
Waterfowl		**17**	**49**
bufflehead	*Bucephala albeola*	2	2
cinnamon teal	*Anas cyanoptera*	3	12
green-winged teal	*Anas crecca*	1	1
mallard	*Anas platyrhynchos*	3	4
Mexican duck	*Anas diuzi*	1	1
redhead	*Aythya americana*	1	2
ring-necked duck	*Aythya collaris*	1	10
ruddy duck	*Oxyura jamaicensis*	5	17
Shorebirds		**65**	**321**
American avocet	*Recurvirostra americana*	2	100
black-necked stilt	*Himantopus mexicanus*	2	8
greater yellowlegs	*Tringa melanoleuca*	8	8
killdeer	*Charadrius vociferus*	12	41
least sandpiper	*Calidris minutilla*	7	46
long-billed curlew	*Numenius americanus*	2	9
long-billed dowitcher	*Limnodromus scholopaceus*	4	8
semipalmated plover	*Charadrius semipalmatus*	2	3
snowy plover	*Charadrius nivosus*	2	4
spotted sandpiper	*Actitis macularia*	6	41
western sandpiper	*Calidris mauri*	9	36
willet	*Tringa semipalmata*	1	1
Wilson's phalarope	*Phalaropus tricolor*	5	13
Wilson's snipe	*Gallinago delicata*	3	3
Gulls/Terns		**5**	**6**
California gull	*Larus californicus*	1	1
Forster's tern	*Sterna forsteri*	1	1
ring-billed gull	*Larus delawarensis*	3	4
Rails/Coots		**8**	**19**
American coot	*Fulica americana*	8	19
Diurnal Raptors		**44**	**46**
Buteos		*28*	*30*
ferruginous hawk	*Buteo regalis*	2	2
red-tailed hawk	*Buteo jamaicensis*	23	25
Swainson's hawk	*Buteo swainsoni*	3	3
Northern Harrier		*3*	*3*
northern harrier	*Circus cyaneus*	3	3
Falcons		*12*	*12*
American kestrel	*Falco sparverius*	3	3
peregrine falcon	*Falco peregrinus*	2	2
prairie falcon	*Falco mexicanus*	6	6
unidentified falcon	*Falco spp*	1	1
Osprey		*1*	*1*
osprey	*Pandion haliaetus*	1	1

Appendix F1. Total number of groups and individuals for each bird type and species during spring shorebird/waterfowl surveys at the Palen Photovoltaic Solar Projecta, March 13 – June 3, 2015.

Bird Type / Species	Scientific Name	# grps	# obs
Vultures		**63**	**861**
turkey vulture	*Cathartes aura*	63	861
Passerines		**112**	**554**
bank swallow	*Riparia riparia*	1	1
barn swallow	*Hirundo rustica*	30	70
cliff swallow	*Petrochelidon pyrrhonota*	24	163
northern rough-winged swallow	*Stelgidopteryx serripennis*	11	19
tree swallow	*Tachycineta bicolor*	29	245
unidentified swallow		10	42
violet-green swallow	*Tachycineta thalassina*	3	9
white-crowned sparrow	*Zonotrichia leucophrys*	1	1
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	1	1
yellow-rumped warbler	*Setophaga coronata*	1	2
yellow warbler	*Setophaga petechia*	1	1
Goatsuckers		**1**	**3**
lesser nighthawk	*Chordeiles acutipennis*	1	3
Swifts/Hummingbirds		**9**	**9**
white-throated swift	*Aeronautes saxatalis*	9	9
Kingfishers		**1**	**1**
belted kingfisher	*Ceryle alcyon*	1	1
Overall		**338**	**1,958**

[a] Regardless of distance from observer

Appendix G. All Bird Types and Species Observed at the Palen Photovoltaic Solar Project during Small Bird Count Surveys, March 16 – June 5, 2015

Appendix G1. Total number of groups and individuals for each bird type and species during spring small bird count surveys at the Palen Photovoltaic Solar Project[a], March 16 – June 5, 2015.

Bird Type / Species	Scientific Name	# grps	# obs
Waterbirds		**2**	**8**
cattle egret	*Bubulcus ibis*	1	1
white-faced ibis	*Plegadis chihi*	1	7
Waterfowl		**4**	**19**
bufflehead	*Bucephala albeola*	1	1
cinnamon teal	*Anas cyanoptera*	1	3
ruddy duck	*Oxyura jamaicensis*	1	9
unidentified duck		1	6
Shorebirds		**12**	**37**
American avocet	*Recurvirostra americana*	1	17
killdeer	*Charadrius vociferus*	4	7
least sandpiper	*Calidris minutilla*	2	6
long-billed dowitcher	*Limnodromus scholopaceus*	1	2
marbled godwit	*Limosa fedoa*	1	2
solitary sandpiper	*Tringa solitaria*	1	1
spotted sandpiper	*Actitis macularia*	1	1
willet	*Tringa semipalmata*	1	1
Rails/Coots		**2**	**7**
American coot	*Fulica americana*	2	7
Diurnal Raptors		**30**	**30**
American kestrel	*Falco sparverius*	5	5
Cooper's hawk	*Accipiter cooperii*	1	1
ferruginous hawk	*Buteo regalis*	1	1
northern harrier	*Circus cyaneus*	3	3
osprey	*Pandion haliaetus*	1	1
prairie falcon	*Falco mexicanus*	4	4
red-tailed hawk	*Buteo jamaicensis*	11	11
Swainson's hawk	*Buteo swainsoni*	3	3
unidentified raptor		1	1
Vultures		**126**	**494**
turkey vulture	*Cathartes aura*	126	494
Upland Game Birds		**9**	**18**
Gambel's quail	*Callipepla gambelii*	9	18
Doves/Pigeons		**84**	**132**
Eurasian collared-dove	*Streptopelia decaocto*	6	16
mourning dove	*Zenaida macroura*	71	107
white-winged dove	*Zenaida asiatica*	7	9
Passerines		**534**	**886**
Corvids		*81*	*156*
common raven	*Corvus corax*	81	156
Blackbirds/Orioles		*22*	*52*
Brewer's blackbird	*Euphagus cyanocephalus*	2	3
brown-headed cowbird	*Molothrus ater*	1	12
European starling	*Sturnus vulgaris*	5	14
great-tailed grackle	*Quiscalus mexicanus*	12	20
red-winged blackbird	*Agelaius phoeniceus*	1	1
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	1	2
Finches/Crossbills		*51*	*79*
house finch	*Haemorhous mexicanus*	51	79

Appendix G1. Total number of groups and individuals for each bird type and species during spring small bird count surveys at the Palen Photovoltaic Solar Project[a], March 16 – June 5, 2015.

Bird Type / Species	Scientific Name	# grps	# obs
Flycatchers		*37*	*41*
ash-throated flycatcher	*Myiarchus cinerascens*	13	13
black phoebe	*Sayornis nigricans*	5	6
olive-sided flycatcher	*Contopus cooperi*	1	1
Pacific-slope flycatcher	*Empidonax difficilis*	2	2
Say's phoebe	*Sayornis saya*	10	12
unidentified flycatcher	*NA*	1	1
western kingbird	*Tyrannus verticalis*	5	6
Gnatcatchers/Kinglet		*24*	*29*
black-capped gnatcatcher	*Polioptila nigriceps*	1	1
black-tailed gnatcatcher	*Polioptila melanura*	22	27
ruby-crowned kinglet	*Regulus calendula*	1	1
Grassland/Sparrows		*61*	*81*
Brewer's sparrow	*Spizella breweri*	2	4
horned lark	*Eremophila alpestris*	56	72
house sparrow	*Passer domesticus*	1	1
unidentified sparrow		1	3
white-crowned sparrow	*Zonotrichia leucophrys*	1	1
Mimids		*10*	*11*
Le Conte's thrasher	*Toxostoma lecontei*	8	9
northern mockingbird	*Mimus polyglottos*	2	2
Swallows		*74*	*232*
barn swallow	*Hirundo rustica*	29	66
cliff swallow	*Petrochelidon pyrrhonota*	11	48
tree swallow	*Tachycineta bicolor*	15	54
unidentified swallow		17	59
violet-green swallow	*Tachycineta thalassina*	2	5
Tanagers		*1*	*1*
western tanager	*Piranga ludoviciana*	1	1
Grosbeaks		*1*	*1*
rose-breasted grosbeak	*Pheucticus ludovicianus*	1	1
Shrikes		*41*	*48*
loggerhead shrike	*Lanius ludovicianus*	41	48
Titmice/Chickadees		*102*	*121*
verdin	*Auriparus flaviceps*	102	121
Vireos		*2*	*2*
warbling vireo	*Vireo gilvus*	2	2
Warblers		*19*	*24*
MacGillivray's warbler	*Geothlypis tolmiei*	1	1
orange-crowned warbler	*Oreothlypis celata*	3	4
unidentified warbler		3	4
Wilson's warbler	*Cardellina pusilla*	9	12
yellow-rumped warbler	*Setophaga coronata*	3	3
Waxwings		*4*	*4*
phainopepla	*Phainopepla nitens*	4	4
Wrens		*4*	*4*
cactus wren	*Campylorhynchus brunneicapillus*	2	2
house wren	*Troglodytes aedon*	1	1
unidentified wren		1	1
Cuckoos		**8**	**8**
greater roadrunner	*Geococcyx californianus*	8	8

Appendix G1. Total number of groups and individuals for each bird type and species during spring small bird count surveys at the Palen Photovoltaic Solar Project[a], March 16 – June 5, 2015.

Bird Type / Species	Scientific Name	# grps	# obs
Goatsuckers		**5**	**8**
lesser nighthawk	*Chordeiles acutipennis*	5	8
Swifts/Hummingbirds		**9**	**9**
black-chinned hummingbird	*Archilochus alexandri*	4	4
Costa's hummingbird	*Calypte costae*	3	3
unidentified hummingbird		2	2
Kingfishers		**1**	**1**
belted kingfisher	*Ceryle alcyon*	1	1
Unidentified Birds		**31**	**59**
unidentified bird (small)		31	59
Overall		**857**	**1,716**

[a] Regardless of distance from observer

Appendix H. Wildlife Incident Reporting System (WIRS) Example Data Sheet

PALEN SOLAR PHOTOVOLTAIC PROJECT WILDLIFE INCIDENT REPORTING

The following procedures are to be followed when Palen personnel or subcontractors discover a wildlife fatality or injury while on site. These procedures are intended to be in place for the life of the project and are independent of the post-construction monitoring studies. Prior to the initiation of operations, on-site training will be provided to Palen personnel and subcontractors regarding the implementation of this WIRS.

When To Use The WIRS - What Constitutes A Reportable Incident?

For the purposes of this reporting system, *incident* is a general term that refers to any wildlife species, or evidence thereof, that is found dead or injured within the wind project. Note that an incident may include an injured animal and does not necessarily refer only to a carcass or fatality.

An intact carcass, carcass parts, bones, scattered feathers, or an injured wildlife species all represent reportable incidents. Palen personnel and subcontractors shall report all such discoveries even if you are uncertain if the carcass or parts are associated with the facility.

A ***fatality*** is any find where death occurred, such as a carcass, carcass parts, bones, or feather spot. To be considered a feather spot, the detection must include at least five tail feathers or two primary flight feathers within five m or less of each other, or a total of 10 feathers concentrated together in an area of three square m (1 m^2; 32 square ft [ft2]).

An ***injury*** or injured animal is any wildlife species with an apparent injury, or that exhibits signs of distress to the point where it cannot move under normal means or does not display normal escape or defense behavior.

Prior to assuming a wildlife species is injured, it should be observed to determine if it cannot or does not display normal behaviors. For example, raptors will occasionally walk on the ground, especially if they have captured a prey item. Raptors also "mantle" or hold their wings out and down to cover a prey item. These types of behaviors may make the wings appear broken or the animal injured. Identification of specific behaviors typical to the life cycles and distress behaviors of wildlife will be part of the Palen wildlife training program. Always exercise caution before approaching an injured wildlife species. **Under no circumstances are site personnel that are not included in the SPUT permit allowed to handle carcasses or injured animals.**

Note: *Any incident involving a federally or state listed threatened or endangered species, bald eagle, or golden eagle must be reported to USFWS and/or California Department of Fish and Wildlife (CDFW) within 24 hours of identification. See project personnel listing for contact information.*

MATERIALS NEEDED TO REPORT AN INCIDENT

1. A copy of this WIRS
2. A Wildlife Incident Report Form (see below)
3. Project Personnel Listing and Contact Information
4. Pencil, Pen
5. Camera
6. Flagging

PALEN SOLAR PHOTOVOLTAIC PROJECT WILDLIFE INCIDENT REPORTING PROCEDURES

The following procedures apply if the incident involves a **Wildlife Fatality** or **Injured Wildlife Species**:

- **Leave the subject animal in place**. A flag may be used to mark its location for easy finding while the data sheet is being completed. It is recommended that any flagging be marked with the date, time, and initials of the recorder. **DO NOT HANDLE THE CARCASS.**

- **Report** the find to the Site Operations Manager immediately.

- The Site Operations Manager shall complete the following steps:

  - **Photograph** the incident as it was found in the field. Take at least two pictures: a close up shot of the animal as it lays in the field and a broader view of the animal (marked by a flag) with the road, turbines, or other local features in the view. For the close up picture, place an object (e.g., radio, pencil, coin, etc.) next to the carcass for a scale of size.

  - **Prepare a Wildlife Incident Report Form.** The form and associated instructions are presented below.

  - **Report** the find to Palen's Environmental Department.

The following procedures apply if the incident involves an **Injured Wildlife Species**:

- **Move** to a distance far enough away that it is not visibly disturbed or uneasy due to your presence. **DO NOT ATTEMPT TO CAPTURE OR HANDLE AN INJURED ANIMAL.**

- **Report** the find immediately to the Operations Site Manager

- The Site Operations Manager shall complete the following steps:

  - **Report** the find to the Environmental Affairs Lead immediately.

- **<u>Contact</u>** a local rehabilitation center (*see contact list in section 5.3*) for further instructions on handling and transport/pickup of the injured animal.

- **<u>Prepare a Wildlife Incident Report Form.</u>** The form and instructions for filling out the form are provided below.

*** Any incident involving a federally or state listed threatened or endangered species or a bald or golden eagle must be reported to the USFWS and/or CDFW within 24 hours of identification. These incidents will be reported to the agency verbally by the Operations Manager or Palen's Environmental Department.**

PALEN SOLAR PHOTOVOLTAIC
WILDLIFE INCIDENT REPORTING FORM

INCIDENT DETAILS

Project Location/Name:

Name of Observer/s:___________________ Date: ___________ Time: _______

Type of Incident: ☐ Injury ☐ Fatality

Carcass Condition: ☐ Intact Carcass ☐ Partial Carcass ☐ Feathers Only

Age of Remains (days): ☐ 1-2 (fluid filled eyes) ☐ 2-4 (maggots) ☐ 5+ (dried bones/feathers)

Photos Taken: ☐ Yes ☐ No (Take photos of - Birds: beak, legs, feathers, body. Wildlife: face and ears, tail and feet, body)

Who was notified of incident? (see contact list below)____________________________________

Comments on Carcass Condition or Behavior of Injured Animal:________

____

____

____

LOCATION

Where Found: ☐ On Access Road ☐ Solar Array ☐ Under Power Line ☐ Substation

GPS Coordinates: UTM N: UTM E: DATUM:__________

Comments on Location:____

____

____

IDENTIFICATION

☐ Bird ☐ Bat ☐ Mammal ☐ Other:________________________

Species (to best of ability):____

Description of Color/Markings:____

Does Animal Resemble a Species of Concern discussed at Training? ☐ Yes ☐ No

Identification Remarks:____

____

____

(Describe details of - Birds: beak size, color, and shape; leg size, color, and shape; feather color; body size. Bats: color of fur and wings; muzzle long or short, tail attached or extending; ear color and shape); Other Wildlife: color of fur, any markings, and body size.

____

____

ENVIRONMENTAL CONDITIONS

Weather (Check all that apply): ☐ Clear ☐ Cloudy ☐ Rain ☐ Dust Storm

Approximate Temperature (F°):__________

Wind: ☐ Calm ☐ Breezy/Gusty ☐ Strong Winds

Habitat where found: ☐ Gravel (access road/turbine pad) ☐ Bare Ground ☐ Wash ☐ Desert scrub

OTHER NOTES/COMMENTS:____

CONTACT LIST (Immediately notify one of these individuals of incident)

1. Operations Manager:
2. Environmental Affairs Lead:

Appendix I. Technical Memorandum: Understanding Potential Risk, and Patterns of Avian Fatalities from Utility-Scale Photovoltaic Solar Facilities

TECHNICAL MEMORANDUM

Date: January 23, 2017

To: Javier De La Garza
EDF Renewable Energy

From: Karl Kosciuch, Daniel Riser-Espinoza, Wally Erickson; WEST, Inc.

Subject: Understanding potential risk, and patterns of avian fatalities from utility-scale photovoltaic solar facilities

INTRODUCTION

Palen Solar III, LLC, a wholly owned subsidiary of EDF Renewable Energy (EDF RE), is developing the Palen Solar Photovoltaic (PV) Project (Project), which consists of single axis PV panel arrays with a net capacity of 500 megawatts (MW). The proposed Project will occupy approximately 4,200 acres (17.0 square kilometers [km^2]) of Bureau of Land Management (BLM)-administered land in Riverside County, California (Figure 1.1). The name Palen was applied to an earlier project called the Palen Solar Power Project (PSPP) that proposed developing the site with a parabolic trough solar thermal facility. The site was subsequently re-evaluated for a solar thermal energy generating project (power tower) called the Palen Solar Electric Generating System (PSEGS). Unlike the current Project, both earlier proposals were regulated by the California Energy Commission (CEC). The BLM prepared a Final Environmental Impact Statement (EIS) for the PSPP in 2011 after the CEC completed a Final Staff Assessment and approved the PSPP in 2010. The CEC prepared a new Staff Assessment and the BLM prepared a Draft Supplemental EIS for PSEGS in 2013; however, the CEC never approved the PSEGS and the BLM never issued a Final Supplemental EIS because the project proponent withdrew the PSEGS from the permitting process. Although the name Palen is consistent across projects, the use of technology has changed along with the potential risks to birds, as the project is now a solar PV facility rather than solar trough or power tower.

The purpose of this technical memorandum is to support and update the Supplemental EIS for the Project with the most current information related to the "lake effect" hypothesis, and describe the patterns in mortality risk for avian and bat species posed by utility-scale PV solar facilities based on currently available monitoring data. At least three studies with a full year of data collected at PV solar facilities have been completed since the Draft Supplemental EIS for the PSEGS project was prepared. Furthermore, the Draft Supplemental EIS was written with respect to a different utility-scale solar technology (power tower) with different known and potential risks to avian and bat species. This document will address the hypothesized causal mechanism for avian risk posed by PV solar facilities known as the lake effect hypothesis, discuss the data (or lack thereof) to support the hypothesis, describe the studies and results of available standardized monitoring data at PV solar facilities, and provide conclusions that can be drawn from available data in the context of the lake effect hypothesis.

LAKE EFFECT HYPOTHESIS

Origin of the Lake Effect Hypothesis

The distinct origin of the lake effect hypothesis is difficult to pinpoint as it could have been discussed in various contexts (e.g., wildlife agency meetings, public scoping meetings) without being documented. However, one of the earlier documents to formalize the idea that solar energy facilities could be interpreted by birds as a water body was a report (hereafter, "forensics report") prepared by the staff of the National Fish and Wildlife Forensics Laboratory (Kagan et al. 2014). Bird species that are water-dependent and cannot easily walk on land, including American coot (*Fulica americana*), pied-billed grebe (*Podilymbus podiceps*), eared grebe (*Podiceps nigricollis*), western grebe (*Aechmophorus occidentalis*), and double-crested cormorant (*Phalacrocorax auritus*), were found as fatalities at solar energy facilities leading Kagan et al. (2014, p. 11) to state:

> *This suggests a link between predation and stranding and/or impact resulting from confusion of the solar panels with water (see Discussion).*

And to further suggest on p. 16 of the forensic report:

> *A desert environment punctuated by a large expanse of reflective, blue panels may be reminiscent of a large body of water.*

The forensics report is regarded as formalizing the idea that solar panels could be mistaken as water by birds, but in some cases the lake effect is assumed to be evident. Scientific American reported on the forensics report (Scientific American 2014) and incorrectly interpreted the suggestion by Kagan et al. (2014) as fact of a lake effect:

> *Much of the problem appears to lie in the "lake effect," in which birds and their insect prey can mistake a reflective solar facility for a water body, or spot water ponds at the site, then hone in on it. Because of the power of the lake effect, the federal investigators described such solar farms as "mega-traps" in their report.*

The forensics report was an examination of bird carcasses, and not an ecological study or bird behavior study, and the Scientific American article misinterprets the findings of the forensics report.

The forensics report did not define the hypothesis, but suggested that birds could mistake solar energy facilities for water. In a review of bird monitoring studies at solar energy facilities, Walston et al. (2015) defined the lake effect hypothesis as (p. A-2):

> *Lake Effect Hypothesis – The hypothesis that water-dependent bird species may potentially mistake the extensive solar arrays for water features on which the*

birds can land, usually at night. Such collisions, often do not result in direct mortality, but the birds sometimes cannot take off after collisions because they are adapted to take off from water, not dry land.

Refinement and Application of the Lake Effect Hypothesis

Though Kagan et al. (2014) and Walston et al. (2015) did not hypothesize a casual mechanism; work by Horváth et al. (2009, 2010) has been invoked to provide specificity in the lake effect hypothesis. Horváth et al. (2009) introduced the term polarized light pollution (PLP) to describe the presence of polarized light from artificial surfaces that could alter patterns experienced by organisms in a natural system. Horváth et al. (2009) have been cited as hypothesizing that the lake effect is attributable to PLP (Huso et al. 2016). The only mention of solar panels by Horváth et al. (2009) is a statement that solar panels are a possible source of polarized light pollution.

For example, photovoltaic solar panels are a possible source of PLP (Figure 6a), and production of these is predicted to increase in response to rising energy prices.

In a draft discussion document for the preparation of bird and bat conservation strategies for solar energy projects, the USFWS (2016) states (p. 12):

For example, projects should consider alternative configurations for the project to reduce the potential that the project would present the illusion of a large water body (i.e., "lake effect"). This might include increased spacing between panels or mirrors to minimize visual overlap. Similarly, the use of single and dual axis tracking panels or mirrors could allow panels to be offset to break-up any lake effect, particularly during storage at night.

The USFWS (2016) suggests design features for solar energy facilities based on an interpretation of the causal mechanism that the solar energy project represents an illusion to birds. However, no studies exist to demonstrate that bird perceive an illusion of a lake when approaching a solar energy facility.

Summary of Lake Effect Hypothesis

The presence of water-associated bird species fatalities at solar energy facilities has led some scientists to suggest that these species might interpret solar facilities as water (Kagan et al. 2014, Walston et al. 2015, Huso et al. 2016). Thus, the lake effect hypothesis was developed based on the idea that water-associated bird species that cannot walk easily on land should not occur at a solar facility and arrived at the facility by mistake. How water-associated birds see and respond to solar energy facilities is poorly understood; thus, the mechanism responsible for the presence of water-associated birds at solar facilities is unknown. Because aspects of water-associated bird biology (such as how they perceive polarized light) are poorly understood, the lake effect hypothesis cannot be used to predict if water-associated bird fatalities would occur at a proposed solar energy project. More, if water-associated bird fatalities were detected, the number of additional fatalities could not be predicted with precision from the fatalities documented. Further, understanding water-associated bird vision alone is unlikely to predict whether or not fatalities would occur, and other environmental factors, such as proximity of a proposed project to water or a proposed project's location in a water-associated bird migratory pathway, likely have influence on fatality risk.

Understanding the causal mechanism is essential to determining if the lake effect hypothesis is viable, but understanding the casual mechanism is not essential to estimating bird fatalities at solar energy facilities. Regardless of the mechanism, fatalities occurred, and with a robust sampling design and statistical methods, a fatality estimate can be calculated. Fatality estimates and variability in the estimates can be reviewed among sites to understand the patterns of occurrence of waterbirds to draw inference regarding the prevalence of waterbirds at solar energy projects. Thus, it is important to separate inference regarding the mechanism responsible for the presence of waterbirds at solar energy facilities (i.e., lake effect) and the fatality estimates for waterbirds and the potential effects to populations.

Additional Study

The lake effect hypothesis should be refined and causal mechanisms more carefully considered. Recently, the CEC released Grant Funding Opportunity CEC GFO-16-306 (CEC 2016) that contained an opportunity for "Investigating the Impacts of "Lake Effect" from Solar Energy-Generating Facilities on Avian Behavior". A proposed study could include experiments to evaluate how birds respond to solar panels, and field studies to understand the landscape and local responses of birds to solar energy facilities. Thus, if a proposal is funded, a study could provide an understanding of how birds perceive solar energy facilities and if there is actually a lake effect.

SUMMARY OF PUBLICLY AVAILABLE FATALITY MONITORING STUDIES

Overview

Currently, there are only three publicly available studies from utility-scale solar facilities with data collected under standardized monitoring protocols for at least one year: California Valley Solar Ranch (CVSR; H. T. Harvey and Associates 2014), Topaz (Althouse and Meade 2014), and Desert Sunlight (DSL; WEST 2016). CVSR and Topaz are located in San Luis Obispo County, California, and have rated capacities of 250 and 550 MW, respectively; DSL is located in Riverside County, California, and has a rated capacity of 550 MW. Prior to 2016, CVSR and Topaz were only two PV solar facilities with at least one year of publicly available, standardized avian fatality monitoring data. Both of these projects are located in a predominantly agricultural and grassland setting. In contrast, the DSL project is located in a desert environment.

The occurrence of different species and species groups of birds are of interest at PV solar projects. Two species guilds are often discussed: waterbirds (or water-associated birds), and non-water-associated birds. Water-associated birds of interest include American coot, loons, grebes, and some waterfowl and geese. The occurrence of water-associated bird species led to the development of the lake effect hypothesis previously discussed. All other bird species, including diverse groups such as raptors, hummingbirds, and songbirds, are referred to as non-water-associated birds. The terms waterbirds or water-associated birds and non-water-associated birds are used throughout.

As discussed below, results from the three available monitoring studies in California suggest that direct impacts to birds are relatively low compared to other sources of anthropogenic avian mortality, including (but not limited to) wind turbines, tall buildings, communication towers, annual harvests, and domestic cats (*Felis catus*; Klem 2009; Calvert et al. 2013; Longcore et al. 2013; Loss et al. 2013a, 2013b, 2014; Erickson et al. 2014). For example, annual harvest of water-associated game birds in Canada was estimated to be almost 1.7 million, while approximately 50,000 annual water-associated bird fatalities were estimated for medium and high-rise buildings (Calvert et al. 2013). Furthermore, data from the three publicly available standardized monitoring studies suggest water-associated bird mortality is not ubiquitous at PV solar facilities, is generally lower in magnitude than other bird groups, and may be site specific (Althouse and Meade 2014; H. T. Harvey and Associates 2014; WEST 2016). Water-associated bird fatalities were discovered among energized arrays only at DSL (Althouse and Meade 2014; H. T. Harvey and Associates 2014; WEST 2016). Unlike CVSR and Topaz, which are located in landscape dominated by grassland and agriculture and with water resources nearby, DSL is located in a desert habitat with relatively few water resources in close proximity to the site. The nearest sources of water are an aquaculture facility (three kilometers [two miles]) and a small lake complex in the community of Lake Tamarisk (6.4 kilometers [4.0 miles]; WEST 2014a). At this time it is not known if surrounding habitat (e.g., grass land versus desert), proximity to water bodies, or the size and quality of nearby waterbodies (if they exist) is correlated with water-associated bird mortality at PV solar facilities in a statistically meaningful way.

PV solar projects pose little mortality risk to bats, particularly among PV arrays, based on the data collected to date. For example, no bat fatalities were reported during the first year of standardized monitoring at DSL; three bats were discovered incidentally within the facility prior to initiation of operations, and all three were associated with buildings or fences (WEST 2014b, 2016). No bats were discovered during monitoring at CVSR (H. T. Harvey and Associates 2014). A single bat was detected[1] incidentally at Topaz; however, it was discovered upon opening a shipping container for the first time and was identified as a non-native species, and thus was not attributable to the Topaz project (Althouse and Meade 2014).

Across all three projects with publicly available monitoring data, non-water-associated birds made up the largest percentage of detections among arrays (303 of 358 detections, or 85% of detections). The majority of non-water-associated bird detections among arrays has been passerines, doves, and pigeons (83%), and comprised 34 identifiable species. Only four raptors (two species) have been detected among the arrays at the three facilities, one each at DSL and Topaz, and three at CVSR. All 55 of the water-associated bird detections among completed

[1] For clarity, the term “detection” will be used throughout to describe any discovery of any carcass, partial carcass, feather spot, or injured birds as part of a standardized search, or an incidental discovery.

arrays occurred at DSL, the only desert site among the three studies available. The 55 water-associated bird detections comprised 15 identifiable species. Thus, overall impacts to birds have been spread across a large number of species and do not appear to disproportionately affect any one species relative to their overall abundance.

Project Specific Data

During weekly post-construction monitoring at all elements (e.g., arrays, fences, overhead lines, references sites, and evaporation ponds) of CVSR, there were 368 detections. The most frequent bird type (taxonomic group) observed was passerines (56%), followed by doves and pigeons (30%). Only one water-associated bird detection was discovered (American coot) during the 12-month period analyzed, and it was found during standardized searches under the gen-tie line, away from solar arrays. The most frequently found individual species were mourning doves (*Zenaida macroura*; 30%), horned larks (*Eremophila alpestris*; 26%), house finches (*Haemorhous mexicanus*; 14%), and western meadowlarks (*Sturnella neglecta*; 7%). Overall, the majority of detections on regular weekly surveys occurred in the sampled arrays (approximately 55%).

At Topaz, 66 bird fatalities were detected during the 12-month monitoring period analyzed (41 during surveys, and 25 incidental), with carcasses found in construction areas (prior to operations), reference sites outside of the facility, energized arrays, energized power equipment, and linear features (e.g., fences and overhead lines). Six fatalities were domestic chickens (*Gallus gallus domesticus*) from adjacent private land, likely brought into the project by a canid and thus not attributable to the project (Althouse and Meade 2014). Passerines constituted the largest percentage (33%) of the 60 fatalities potentially attributable to the project, followed by corvids (22%) and doves/pigeons (20%). The most frequently found individual species were common ravens (*Corvus corax*; 22%), horned larks (20%), and mourning doves (12%). Only 7% (four detections) of the birds found were water-associated birds and they were found in construction areas, along a road, or in a water retention pond. Of the 41 detections found on regular surveys, 34% of birds were found among arrays, 64% within reference sites, and 2% were found under overhead lines.

The first year of standardized monitoring at DSL, which like the Project is situated in a desert habitat, was completed in February 2016 (WEST 2016); 149 avian detections were recorded. Water-associated birds were the most frequently discovered species guild within sampled arrays during standardized searches, with 36 detections (52%), followed by passerines with 16 (23%). The most common water-associated birds observed were grebes (36% of water-associated birds in the arrays, including western, eared [*Podiceps nigricollis*], and pied-bill grebe), American coot (16%), common loon (*Gavia immer*; 7%), ruddy duck (*Oxyura jamaicensis*; 5%) and sora (*Porzana carolina*; 5%).

The estimated density of carcasses for the DSL project components within the fence (solar arrays and fence) was approximately 0.19 carcasses/acre/year, or 1.05 fatalities/MW/year, which translates to an estimated 579 fatalities within the facility during the first year of monitoring. The estimates of water-associated birds and passerines were nearly the same for the solar arrays (265 and 252 detections, respectively), with an estimated density of 0.08 birds/acre/year. Estimates for other groups (e.g., doves/pigeons, corvids, etc.) were generally fewer than 10 birds, with the exception of doves and pigeons (22 detections). In other words, despite finding more water-associated bird carcasses or feather spots, the estimated fatalities per acre, per year for water-associated birds was similar to the rates for passerines because most water-associated birds are large-bodied animals that persist for longer than small passerines, and are detected at high rates within the solar arrays compared to small songbirds. Also, more fatalities were estimated for the gen-tie line, which is a common feature on the landscape that is associated with all varieties of power infrastructure and not unique to solar facilities, than the solar arrays.

Background Mortality Studies

At CVSR and Topaz, background avian fatality monitoring was conducted in an effort to assess causation and determine if avian fatalities were likely the result of interactions with facility infrastructure (e.g., PV panels) or whether some of the fatalities might be unrelated to the presence of the facility. Based on background studies at CVSR and Topaz, bird mortality within both project sites was found to either not differ significantly from background mortality (H. T. Harvey and Associates 2014) or was measured greater in magnitude than facility related mortality (Althouse and Meade 2014). Furthermore, the species composition of birds found during background mortality studies was similar to the composition of species found among the arrays, and cause of death was generally not determinable or was suspected to be predation for fatalities found in either location. Thus, similar species were detected as fatalities inside and outside the facility, cause was not immediately attributable to collision with panels and was more often related to predation, and the number of fatalities detected outside the facility was either comparable or greater than that measured among the arrays. The results suggest the possibility that predation or other natural process are occurring at a high enough rate among the arrays that a significant number of fatalities from natural process are being detected on surveys that are intended to measure direct, facility related impacts. Put another way, the fatality rates that have been observed at the arrays of the CVSR and Topaz studies may not be different from what would be measured if the facilities had never been built and the same monitoring program had occurred; however, a note of caution is in order. Background avian mortality is naturally tied to avian use; if there are more birds in an area, there are more opportunities for bird fatalities, and thus bird carcasses or feather spots to be generated. An additional correlate is the predator activity and density within the same area. At this time, it is not known how avian use and predator use correlates with background mortality in a quantifiable way. Additionally, the background studies at these solar facilities were conducted adjacent to the projects (generally within one mile [1.6 kilometer] of the project boundary), and the researchers were not able to isolate the proportion of project-related fatalities that may have entered the reference sample. Avian use rates were not factored into the comparisons of background and array fatalities in either the CVSR or Topaz study, and thus those background studies must be interpreted with some caution. Assuming use rates are similar inside and outside of the facilities, it may be appropriate to conclude that fatality rates measured among the arrays is likely inflated by background mortality, and fatality rates from arrays may not be significantly different from background mortality.

Inferences from Monitoring Data and Connection to the Lake Effect Hypothesis

Data from three publicly available studies at PV solar facilities suggests that impacts to avian species are generally distributed across numerous species, typically passerines, doves, and pigeons, which are common birds with robust populations regionally and nationally. Furthermore, background mortality studies at two sites (CVSR and Topaz) suggest fatality rates in and outside of the facility may be comparable in some circumstances, and thus observed fatality estimates being attributed to the facility may be inflated by carcasses and feather spots occurring from natural processes. Most of the birds commonly detected among arrays at CVSR, Topaz, and DSL belong to species guilds which are naturally short lived and reproduce rapidly. Short-lived birds with high fecundity are generally resilient to adult mortality and are unlikely to experience biologically significant impacts at the local, regional, or national level, even accounting for multiple sources of anthropogenic avian mortality, such as wind turbines, communication towers, tall buildings, and feral and domestic cats (Stahl and Oli 2006, Erickson et al. 2014). The lack of bat fatalities discovered among arrays show there is no evidence to conclude PV arrays are a risk factor for bats in any setting. Thus, the results of fatality monitoring at three utility-scale PV solar facilities suggest that PV arrays do not pose a biologically significant threat to the avian populations most commonly detected among arrays, or any bat species at a local, regional, or national scale.

Water-associated bird fatalities were discovered at the DSL project; however, overall estimates of water-associated bird mortality did not differ significantly from estimates of non-water-associated bird mortality among arrays (WEST 2016). Thus, although more water-associated birds were detected during surveys, the estimated mortality is not higher than non-water associated birds for DSL. Similarly to the non-water-associated birds discovered at DSL, the water-associated bird fatalities were spread across several species, including American coot, common loon, western grebe, ruddy duck, sora, mallard (*Anas platyrhynchos)*, eared grebe, Virginia rail (*Rallus limicola*), northern shoveler (*A. clypeata*), northern pintail (*A. acuta*), cinnamon teal (*A. cyanoptera*), blue-winged teal (*A. discors*), pied billed grebe, least sandpiper (*Calidris minutilla*), and double-crested cormorant. Also of note, no water-associated bird fatalities were discovered at CVSR and Topaz. Thus, the data collected and analyzed to date suggest that impacts to water-associated birds are not ubiquitous at PV solar facilities, do not disproportionately affect one species, the incidence of water-associated bird mortality is similar to that of other species guilds, and overall impacts to water-associated birds are low in comparison to other sources of anthropogenic avian mortality (e.g., medium and high-rise buildings, permitted harvest, power lines, communication towers, and domestic and feral cats; Calvert et al. 2013).

The data are inconclusive with respect to supporting or refuting the lake effect hypothesis. As described above, the lake effect hypothesis was developed to explain a pattern observed in the data and has no predictive utility. Thus, water-associated bird fatalities that may occur at a future PV solar energy project cannot be predicted utilizing the lake effect hypothesis because it is a form of abductive reasoning. The presence of water-associated birds at DSL does not “support” the lake effect hypothesis; rather, it facilitates the same form of abductive reasoning:

water-associated birds were found at DSL, therefore these species mistake the solar facility for a lake. Similarly, the absence of water-associated birds at Topaz and CVSR does not lead to the rejection of the lake effect hypothesis. Thus, it is not possible at this time to determine if the conditions present at the Project would facilitate an attraction by water-associated birds based on either the lake effect hypothesis or the observed detection patterns at the three projects studied to date.

REFERENCES

Althouse and Meade, Inc. 2014. Topaz Solar Farms 2013 Fourth Quarter/Second Annual Report for Avian and Bat Protection Plan and Bird Monitoring and Avoidance Plan. Prepared for Topaz Solar Farms LLC, Santa Margarita, California. Prepared by Althouse and Meade, Inc., Paso Robles, California. March 2014.

Calvert, A. M., C. A. Bishop, R. D. Elliot, E. A. Krebs, T. M. Kydd, C. S. Machtans, and G. J. Robertson. 2013. A Synthesis of Human-Related Avian Mortality in Canada. Avian Conservation and Ecology 8(2): 11; http://dx.doi.org/10.5751/ACE-00581-080211.

California Energy Commision (CEC). 2016. Grant Funding Opportunity CEC GFO-16-306. Available online at: http://www.energy.ca.gov/contracts/GFO-16-306/

Erickson, W. P., M. M. Wolfe, K. J. Bay, D. H. Johnson, and J. L. Gehring. 2014. A Comprehensive Analysis of Small Passerine Fatalities from Collisions with Turbines at Wind Energy Facilities. PLoS ONE 9(9): e107491. doi: 10.1371/journal.pone.0107491.

H. T. Harvey and Associates. 2014. California Valley Solar Ranch Project Avian and Bat Protection Plan Annual Postconstruction Fatality Report: 16 August 2012 – 15 August 2013. Project # 3326-03. Prepared for HPR II, LLC, California Valley Solar Ranch, Santa Margarita, California. Prepared by H. T. Harvey and Associates, San Luis Obispo, California. March 28, 2014.

Horváth, G., G. Kriska, P. Malik, and B. Robertson. 2009. Polarized Light Pollution: A New Kind of Ecological Photopollution. Frontiers in Ecology and the Environment 7: 317-325.

Horváth, G., M. Blahó, A. Egri, G. Kriska, I. Seres, and B. Robertson. 2010. Reducing the Maladaptive Attractiveness of Solar Panels to Polarotactic Insects. Conservation Biology 24:1644-1653.

Huso, M., T. Dietsch, and C. Nicolai. 2016. Mortality Monitoring Design for Utility-Scale Solar Power Facilities. US Geological Survey (USGS) Open-File Report 2016-1087. 44 pp. Available online at: http://dx.doi.org/10.3133/ofr20161087.

Kagan, R. A., T. C. Viner, P. W. Trail, and E. O. Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory. Ashland, Oregon. 28 pp.

Klem, D. Jr. 2009. Avian Mortality at Windows: The Second Largest Human Source of Bird Mortality on Earth. Pp. 244-251. *In*: Proceedings of the 4th International Partners in Flight Conference: Tundra to Tropics. T. D. Rich, C. Arizmendi, D. Demarest, and C. Thompson, eds. McAllen, Texas.

Loss, S. R., T. Will, and P. P. Marra. 2013a. Estimates of Bird Collision Mortality at Wind Facilities in the Contiguous United States. Biological Conservation 168: 201-209.

Loss S. R., T. Will, and P. P. Marra. 2013b. The Impact of Free-Ranging Domestic Cats on Wildlife of the United States. Nature Communications 4: e1396; doi: 10.1038/ncomms2380.

Loss, S. R., T. Will, S. S. Loss, and P. P. Marra. 2014. Bird-Building Collisions in the United States: Estimates of Annual Mortality and Species Vulnerability. Condor 116 (1): 8-23.

Scientific American. 2014. Solar Farms Threaten Birds. Available at: https://www.scientificamerican.com/ article/solar-farms-threaten-birds/

Stahl, J. T. and M. K. Oli. 2006 Relative Importance of Avian Life-History Variables to Population Growth Rate. Ecological Modelling 198: 183-194.

Longcore, T., C. Rich, P. Mineau, B. MacDonald, D. G. Bert, L. M. Sullivan, E. Mutrie, S. A. Gauthreaux, Jr., M. L. Avery, R. L. Crawford, A. M. Manville, II, E. R. Travis, and D. Drake. 2013. Avian Mortality at Communication Towers in the United States and Canada: Which Species, How Many, and Where? Biological Conservation 158: 410-419.

US Fish and Wildlife Service (USFWS). 2016. Discussion Document for Development of a Project-Level Bird and Bat Conservation Strategy for Utility-Scale Solar Energy Facilities and Related Transmission Lines.

Walston, L., Jr., K. E. Rollins, K. P. Smith, K. E. LaGory, K. Sinclair, C. Turchi, T. Wendelin, and H. Souder. 2015. A Review of Avian Monitoring and Mitigation Information at Existing Utility-Scale Solar Facilities. Argonne National Laboratory and National Renewable Energy Laboratory, ANL/EVS-15/2, http://www.evs.anl.gov/downloads/ANL-EVS_15-2.pdf

Western EcoSystems Technology, Inc. (WEST). 2014a. Desert Sunlight Bird and Bat Conservation Strategy. Technical Document Prepared for Desert Sunlight LLC, and submitted to the Bureau of Land Management (BLM).

Western EcoSystems Technology, Inc. (WEST). 2014b. Sources of Avian Mortality and Risk Factors Based on Empirical Data from Three Photovoltaic Solar Facilities. Prepared by WEST. June 17, 2014.

Western Ecosystems Technology, Inc. (WEST). 2016. Avian and Bat Monitoring at the Desert Sunlight Solar Farm Project Riverside County, California, 2015 – 2016 Annual Report [*Draft*]. Prepared for Desert Sunlight 250, LLC and Desert Sunlight 300, LLC, Juno Beach, Florida. Prepared by WEST, Cheyenne Wyoming.

Western Ecosystems Technology, Inc. (WEST). 2017. Technical Memorandum: Understanding Potential Risk, and Patterns of Avian Fatalities from Utility-Scale Photovoltaic Solar Facilities. Prepared by WEST, Cheyenne Wyoming.